# Consolidated Report on User Survey and PQAA Workshop

SAF/NWC/IOP/INM/MGT/PAR/US+WS/RPT, Issue 1, Rev. 3

*7 November 2005*

**Prepared by INM**

## REPORT SIGNATURE TABLE

| Function | Name | Signature | Date |
|---|---|---|---|
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## DOCUMENT CHANGE RECORD

| Version | Date | Pages | CHANGE(S) |
|---|---|---|---|
| 1.0 | 27 October 2005 | 90 | Creation |
| 1.1 | 3 November 2005 | 106 | • Inclusion of a new field (7.- Workshop Discussion and Outcomes) in section 3.1, Software and Engineering for MSG.<br>• Section 2.3.3 (Main outcomes for PPS Part) filled by SMHI.<br>• Section 3.2 (Software and Engineering for PPS) filled by SMHI.<br>• Inclusion of a new field (7.- Workshop Discussion and Outcomes) for MSG Products PGE01, 02, 03, 05, 06, 07, 08, 09, 10, 11 and 12 in section 3.4, NWCSAF/MSG PGEs.<br>• 3 editorial errata. |
| 1.2 | 4 November 2005 | 114 | • Inclusion of a new field (7.- Workshop Discussion and Outcomes) for MSG Product PGE04 and for PPS Products PGE01, 02, 03, and 04. |
| 1.3 | 7 November 2005 | 114 | • Rearranging of contents for Section 3: Definition of different sections for presentation of (1) User Survey Synthesis and (2) Workshop Discussion Outcomes.<br>• Inclusion of last minute input from SMHI for Section 3.2.2. |

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# List of Tables and Figures

# 1. INTRODUCTION

## 1.1 PURPOSE

The purpose of the document is to report on User Survey and PAR Workshop of the NWCSAF IOP PAR process.

## 1.2 SCOPE OF THE DOCUMENT

Document contains information compiled about the topics:

1) Engineering/Software
2) Users Support, and
3) PGEs, one by one

It covers aspects related with both packages: MSG and PPS.

## 1.3 DEFINITIONS, ACRONYMS AND ABBREVIATIONS

**PQAA** Products Quality and Applicability Assessment
**PAR** Products Assessment Review

## 1.4 REFERENCES

### 1.4.1 Applicable Documents

| Reference | Title | Code | Vers | Date |
|---|---|---|---|---|
| [AD. 1] | | | | |
| [AD. 2] | | | | |

*Table 1: List of Applicable Documents*

### 1.4.2 Reference Documents

| Reference | Title | Code | Vers | Date |
|---|---|---|---|---|
| [RD.1] | | | | |
| [RD.2] | | | | |

*Table 2: List of Referenced Documents*

# 2. OVERVIEW OF THE PAR PROCESS

## 2.1 INTRODUCTION

A major control point within the NWCSAF IOP project is the so named PAR. As foreseen in the Detailed Operations Proposal the PAR process includes:

- A User Survey on new UR and Product Quality and Applicability
- A Workshop on UR and Product Quality and Applicability Assessment.

The User Survey and the Workshop are very intimately related.

## 2.2 USER SURVEY QUESTIONNAIRE AND WORKSHOP ANNOUNCEMENTS

Concerning the User Survey, a Questionnaire Form containing aspects related to (1) Engineering/Software, (2) Users Support and (3) PGEs was prepared by the OT.

The announcement of the Workshop together with the User Survey Form was put in the entry page of the NWCSAF Help Desk on 11th July 2005. An e-mail notification to all the users was also sent at that time.

The Workshop announcement also asked for the users contributions in particular in the areas of experiences in the use of the software packages and in the validation of the products.

A continuous process of reminder of the Workshop itself and of the importance of answering to the questionnaire has been done by the SAFNWC/MSG Operations Manager at INM.

## 2.3 PROCESS OF ANALYSIS OF THE REPLIES TO THE US AND MAIN OUTCOMES

### 2.3.1 Analysis of the Replies

Even if the deadline for the Replies to the Questionnaire was established by 15th of September, the OT have considered and processed the replies received up to just a few days before the Workshop.

For the compilation of the information related to the PGEs contained in the replies, a Template Form was prepared by the LE and forwarded to the OT members by 28th of September.

As a synthesis of the User Survey results, two documents were prepared (1) “Synthesis Report on NWCSAF/MSG PAR User Survey”, “SAF/NWC/IOP/INM/MGT/PAR/US/RPT, Issue 1, Rev. 0”, dated 13 October 2005, and (2) “Synthesis Report on NWCSAF/PPS PAR User Survey”, “SAF/NWC/IOP/SMHI/MGT/PAR/US/RPT, Issue 1, Rev. 0, dated 13 October 2005.These documents follow in a broad sense the structure of the Questionnaire and contains sections devoted to (1) Engineering/Software, (2) Users Support and (3) PGEs, one by one.

### 2.3.2 Main Outcomes for MSG Part

The Nowcasting SAF has around 30 licensed users. According with the information from the last OQR and concerning only with the MSG part there up to 22 active users reporting regularly; they

are running the SAFNWC/MSG package with Linux (11 users), with Solaris (9 users) and with SGI (2 users).

Up to 15 out of these 22 users have replied to the User Survey Questionnaire:

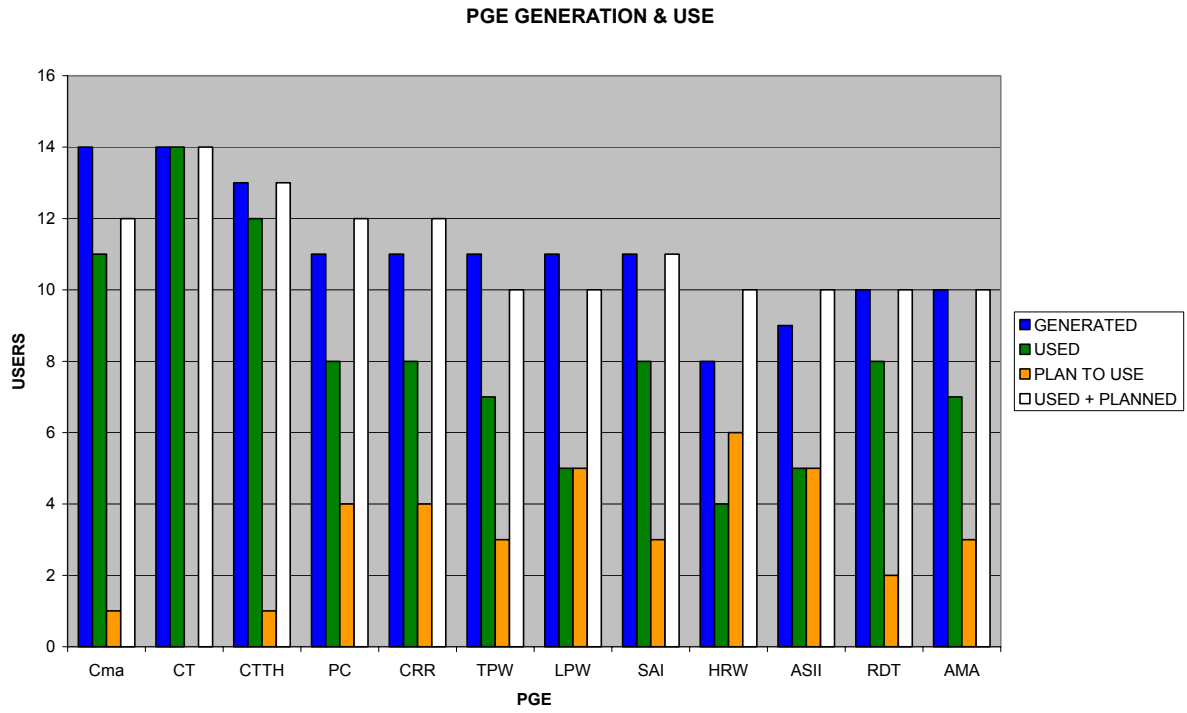
- 13 are using the last version, v1.2, and 2 are using version v1.1.
- 10 are using Solaris, and 5 are using Linux.

Next Table reflects the evolution on the use:

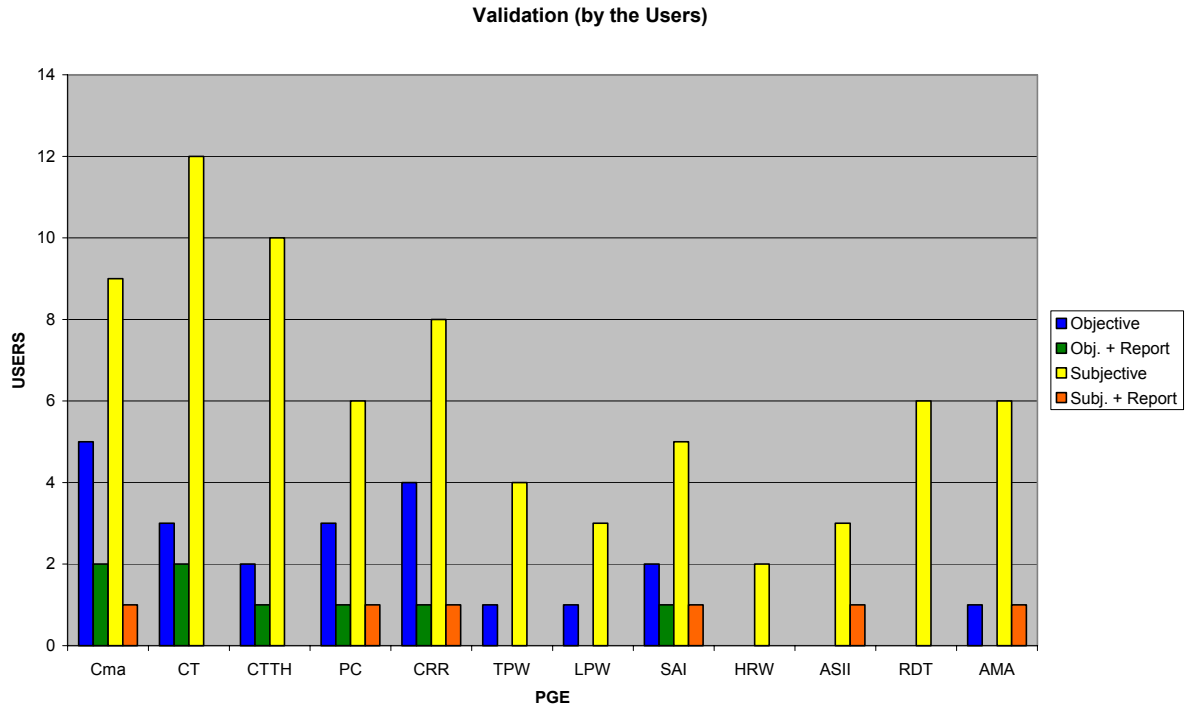
| User Environment | | | | |
|---|---|---|---|---|
| v1.0 | Downloaded | *11 (73%)* | SUN platform | *8* |
| | Installed | *10 (67%)* | Linux platform | *1* |
| | Running | *3 (20%)* | | |
| v1.1 | Downloaded | *12 (80%)* | SUN platform | *7* |
| | Installed | *11 (73%)* | Linux platform | *3* |
| | Running | *5 (33 %)* | | |
| v1.2 | Downloaded | *14 (93%)* | SUN platform | *9* |
| | Installed | *12 (80%)* | Linux platform | *4* |
| | Running | *12 (80%)* | | |

Concerning with the PGEs, the results from the 3 most direct and easier to process questions are reflected in the next graphics.

The first graphic refers to the generation and use/exploitation of each PGE. In blue is the number of users generating the product, in green is the number of users exploiting the product, in amber is the number of users that plan to exploit it in a future and in white is the number of users that already exploit the product plus the number of user that plan to do it in a future.

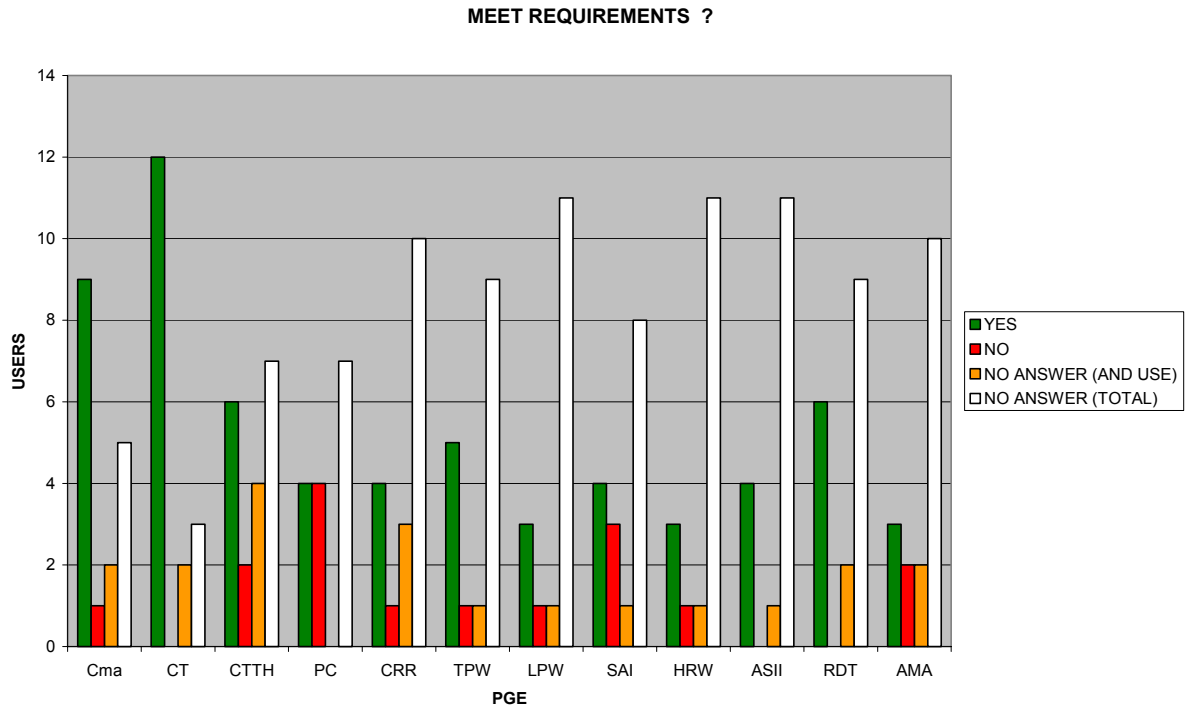



The second graphic refers to the validation effort done by the users. In blue is the number of users that have validated in a objective manner the product (in green those that have also prepared a report). In yellow is the number of users that have validated in a subjective manner the product (in amber those that have prepared a report).




The last graphic reflects the answer to the question about if the product meets the expected requirements. In green is the number of users saying YES, in red those saying NO, in amber is the

number of users that, even if they exploit the product, have not answered to this question, and in white is the total number of users with no answer.




### 2.3.3 Main Outcomes for PPS Part

According to information from the last OQR and user contact we know that 8 users have the Downloaded, installed, and running the PPS software package and one additional user downloaded the software. Of six users that do have PPS installed and running operationally, only one (MET.NO) has not answered the questionnaire. Other users are planning to use PPS actively FMI, Switzerland and IM (LANDSAF). Some Baltic states are using the reference system output on the web, and there is some interest to receive and even validate products (Estland). The Swedish military receives PPS products from SMHI and uses them operationally (included in user survey). The total number of answers received for PGE part of the user survey is six. PPS output is used by forecasters, as input for mesoscale analysis, as input to specific nowcasting models for certain parameters and as input for other SAF's.

Six users have replied to the User Survey Questionnaire:

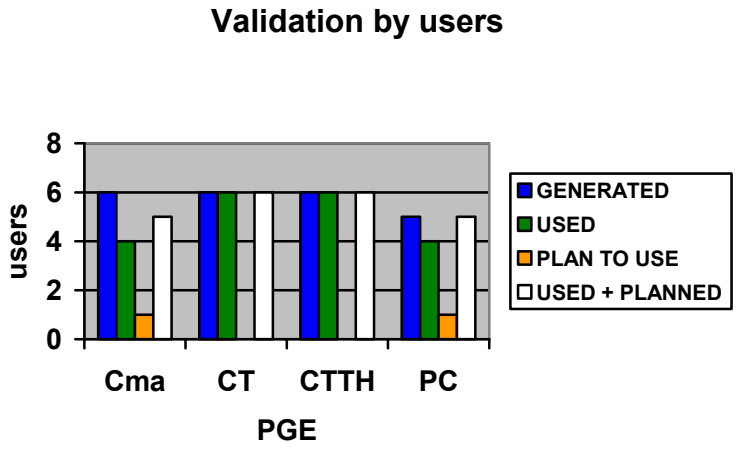
- 4 are using the last version, v1.1, and 2 are using version v1.0.
- 3 users are using Linux, one user Solaris and one IBM.

Next Table reflects the evolution on the use:

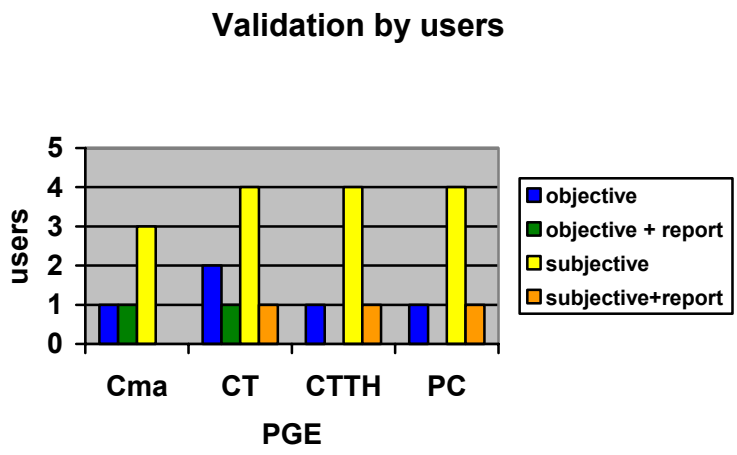
| 1.- Current environment | | | | |
|---|---|---|---|---|
| v1.0 | Downloaded | *3* | SUN platform | |
| | Installed | *2* | Linux platform | *1* |
| | Running | *2* | IBM/AIX | *1* |
| v1.1 | Downloaded | *4* | SUN platform | *2* |
| | Installed | *4* | Linux platform | *2* |
| | Running | *4* | IBM/AIX | |
| Pre-operational versions 0.x | Downloaded | *2* | SUN platform | |
| | Installed | *1* | Linux platform | *1* |
| | Running | *1* | IBM/AIX | |

Concerning with the PGEs, the results from the 3 most direct and easier to process questions are reflected in the next graphics.

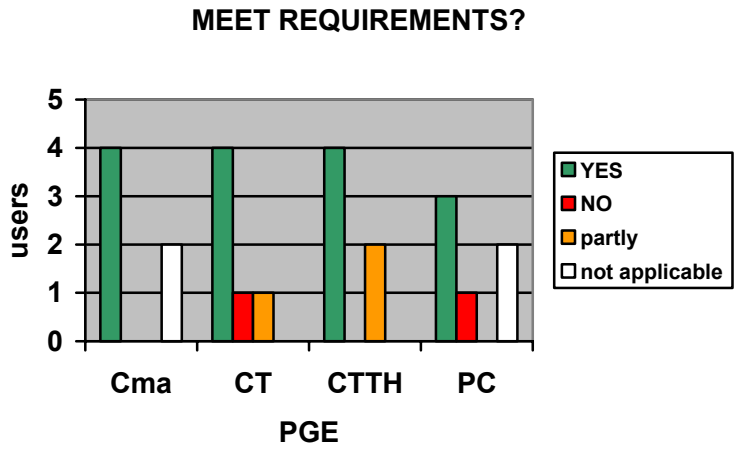
The first graphic refers to the generation and use/exploitation of each PGE. In blue is the number of users generating the product, in green is the number of users exploiting the product, in amber is the number of users that plan to exploit it in a future and in white is the number of users that already exploit the product plus the number of user that plan to do it in a future.




The second graphic refers to the validation effort done by the users. In blue is the number of users that have validated in a objective manner the product (in green those that have also prepared a report). In yellow is the number of users that have validated in a subjective manner the product (in amber those that have prepared a report).




The last graphic reflects the answer to the question about if the product meets the expected requirements. In green is the number of users saying YES, in red those saying NO, in amber is the number of users with requirements partly met and white is the total number of users were an answer was not applicable (not generated or not used) .




## 2.4 WORKSHOP

The PAR Workshop was held at the HQ of the INM in Madrid. Started the 17th October at 14:00 and ending the 19th at 13:00.

The Workshop was arranged around the 3 major blocks foreseen in the Agenda:

- Consortium presentation on Product Validation results
    - Around 10 minutes plus 5 minutes for discussion for each one of the products. (12 MSG and 4 PPS).

- For most of the products, the ppt presentation and/or the full validation report were available on the NWCSAF Help Desk some days in advance to the Workshop

- Users experience presentations
  - Around 20 minutes plus 10 minutes for discussion for each one of the users' presentations.
  - There were in total 7 presentations from the users within this block.

- User Survey Results, Product Applicability and New User Requirements
  - The presentation and further discussion was arranged around 3 major points: (1) The software and Engineering matters, (2) The User Services and (3) The PGEs.
  - Furthermore, for the PGEs the presentation and discussion was organised by group of products as follow:
    - Cloud products
      - MSG Cloud products: CMa, CT, CTTH
      - PPS Cloud products: CMa, CT, CTTH
    - Precipitation products
      - MSG Precipitation products: PC, CRR
      - PPS Precipitation product: PC
    - MSG Clear Air products: TPW, LPW, SAI
    - MSG Thunderstoms product: RDT
    - MSG Weather Analysis products: ASII, AMA
  - All the user survey result presentations, discussions about product quality and applicability, and new requirements were done in plenary session.
  - For each one of the matters the development followed the same basis structure:
    - Presentation of the User Survey results for that matter
    - Confirmation by the users of the results and update or inclusion of new inputs or views
    - Open Discussion, lead by the relevant local manager or developer for the case of groups of products, about the requested improvements, ideas and suggestions, and priorities for new developments and improvements.

# 3. USER SURVEY + WORKSHOP OUTCOMES

Because User Survey and Workshop are part of the same process and are aimed to the same objective, the OT considered appropriated to present the workshop outcomes as an additional section, to be added to the contents of the original User Survey Synthesis reports and in each one of the mayor topics there defined: Software and Engineering for MSG, Software and Engineering for PPS, NWCSAF User Services, SAFNWC/MSG PGE01 to PGE12, SAFNWC/PPS PGE01 to PGE04.

Finally, in order to give more visibility to the Workshop Outcomes, it was decided to present the results for each one of the topics in two parts: (1) User Survey Synthesis and (2) Workshop Discussion and Outcomes.

## 3.1 SOFTWARE AND ENGINEERING FOR MSG

**Compiled by:** ***Integrator (GMV) (System Software and Engeneering)***
***INM (User Services)¬***

### 3.1.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Current environment | | | | |
|---|---|---|---|---|
| v1.0 | Downloaded | *11 (73%)* | SUN platform | *8* |
| | Installed | *10 (67%)* | Linux platform | *1* |
| | Running | *3 (20%)* | | |
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| v1.2 | Downloaded | *14 (93%)* | SUN platform | *9* |
| | Installed | *12 (80%)* | Linux platform | *4* |
| | Running | *12 (80%)* | | |

| 2.- Engineering | |
|---|---|
| Installation and compilation | Experiences *Nothing to remark*<br>Problems *Minor problems*<br>Suggestions *See below* |
| Synthesis of results and comments: | • *Compilation rather easy*<br>• *Minor problems with compilation flags in different environments. Solved by each user.*<br>• *Regions installation procedure for PGE01-03 is not easy to find.*<br>• *The swap utility for little endian environment, should not overwrite the data files in case of problems during the processing.* |
| Monitoring and control | Experiences *Nothing to remark*<br>Problems *Log problems (too much information)*<br>Suggestions *Improve log messages* |
| Synthesis of results and comments: | • *Some users have found problems identifying the source of the error analysing the information provided in the log messages.*<br>*It is expected a better (more intuitive) identification of errors* |
| Integration of the application (input data) | |
| SEVIRI | Experiences *Nothing to remark*<br>Problems *Processing old events with UMARF*<br>Suggestions *See below* |
| NWP | Experiences *Nothing to remark*<br>Problems *Availability of NWP parameters*<br>Suggestions *See below* |
| Lightning data | Experiences *Better results in RDT using Lightning data*<br>Problems *None*<br>Suggestions *See below* |
| Synthesis of results and comments: | SEVIRI data<br>• *Is not possible to reprocess old event as the UMARF only deliver native format*<br>• *To eliminate the need for full segment as input (at least for the reprocessing with NWCSAF/MSG)*<br><br>NWP data |

| | |
|---|---|
| | • *To use climatological data when no NWP data are available*<br>• *To use of different NWP models at once*<br>• *Log messages responding to NWP missing parameters shouldn't be reported as errors*<br>• *Difficult to understand the reported errors*<br>• *Problems finding information about the NWP fields*<br><br>Lightning data<br>• *Data exchange*<br>• *Since these data are not mandatory, the log message "Input lightning data not found" should not be designated as an error* |
| Integration of the application (output data) | |
| HDF5 | Experiences *Nothing to remark*<br>Problems *Conversion to GIF format*<br>Suggestions *See below* |
| BUFR | Experiences *Nothing to remark*<br>Problems *Can not be visualized*<br>Suggestions *See below* |
| Synthesis of results and comments: | HDF5<br>• *Problems using h52gif conversion tool provided in the HDF 3rd party SW.*<br>• *DMI suggest to provide a projection tool with the package, but this is considered out of the scope of the application, because it is not an exploitation tool.*<br>• *ARPAL asks for the products in GRIB format*<br>BUFR<br>• *BUFR products converted to HDF5 to be managed*<br>*PGE10 and PGE12 uses an old version of BUFR format, Use the latest definition of BUFR files.*<br>• *Quite slow to read RDT files before visualization, because of time series, a lot of previous RDT output must be read as well* |

## 3.- Other aspects

**Documentation**

Installation, configuration and execution docs *Comprehensive documentation*

Scientific Reports contents *See below*

Synthesis of results and comments:

SW documentation

- *It is considered enough, but a few users point out the difficulty to find some information due to the amount of data*
- *It's a good idea to have all the information in the same document.*

SCI Reports:

- *More information on how to use quality information in the products, as well as on error characteristics, is desirable.*
- *It is expected a list of product changes (including calibration time interval, change in thresholds) between versions.*
- *Some scientific document is very short some is very detailed*

**Help Desk**

Experiences *Very positive*

Problems *Low downloading*

Suggestions *See below*

Synthesis of results and comments:

- *Fast and effective answers*
- *Download process seems to be very low.*
- *It could be useful to have the Software and the Scientific documentation separated in different sections.*
- *Update the FAQs section*
- *It should be available the track of changes between SW versions.*

**User Interaction with NWC SAF**

Synthesis of results and comments:

- 8 users have made specific comments about the user interaction.
- Summarising:
  - *Good to Very good interactions (Help Desk and Workshops)*
  - *Fast answer / Quick response (Help Desk)*

**Intended cooperation with NWC SAF**

Synthesis of results and comments:

- 4 users have expressed their will to cooperate in the framework of VSA programme.
- Summarising the areas of interest:
  - *Use of products in operational forecasting*
  - *Validation activities and local tuning:*
    - *Precipitation products (comparison with Radar and rain gauges measurements*
    - *Fog*
    - *Separation of stratiform – cumuliform clouds*
    - *Storm related products: SAI, CRR, LPW, RDT*
  - *Use of products in operational forecasting (i.e RDT)*

4.- Additional comments

*To make the calibrated single channel region subcut images as official output.*

*Maybe the Task Manager could monitor whether the BUFR to HDF5 conversion has ended and only after give the 'endregion' signal.*

*Low connection to download the SAFNWC/MSG package. to explore the possibilities of a fast ftp connections.*

### 3.1.2 Workshop Discussion and Outcomes

7.- Workshop Discussion and Outcomes

| ***User comments and requirements*** | ***Analysis*** | ***Proposal*** | ***Priority*** |
|---|---|---|---|
| Minor problems with compilation flags in different environments | This is not a generalised problem and have to be treated in a case basis. | To reinforce the use of the mailbox tool of the Help Desk and the SPR/SMR generation. | |
| ***Decision:*** To use as it is | N/A | | |
| Regions installation procedure for PGE01-03 is not easy to find. | That's true. It is not clear stated in the SUM the appropriate steps for this installation. | To advise the user about the required region installation for cloud PGEs at the end of the installation procedure section, in the SW user manual. | |
| ***Decision:*** Update Documentation (RRD) | | Next version (2.0) | |
| The swap utility for little endian environment, should not overwrite the data files in case of problems during the processing | This problem can be solved swapping the files in a temporal directory and move them when the process ends, or keeping history about swapped files for avoid re-swapping in further compilations. | It is not needed a new requirement, but considered as an improvement | |
| ***Decision:*** Generate the appropriate SPR/SMR | | Next version (2.0) | |
| Some users have found problems identifying the source of the error analysing the information provided in the log messages. | It has been found that the log messages sometimes shows irrelevant or redundant information and this can be a mess for the users. | ***Decision:*** To add a new requirement in the URD: | |
| UR-6.3.13 | The logged information shall be categorized and structured in such a way to allow a quick and easy analysis and recovery of the errors. | Next version (2.0) | |
| Is not possible to reprocess old event as the UMARF only deliver native format | | | Nowadays |
| UMARF provide the image segment in XRIT format. | | ***Decision:*** To use as it is | N/A |
| To eliminate the need for full segment as input (at least for the reprocessing with NWCSAF/MSG) | | | Taking into |
| account that UMARF can provide segments partially cut, the need of manage this kind of files is understood. | | | ***Decision:*** |
| Considered as an improvement. To add a new *SW* requirement | | | CDOP phase |
| To use climatological data when no NWP data are available | | | This issue has to be decided by each PGE |
| developer | | ***Decision:*** To address this proposal to each developer | - |
| To use of different NWP models at once | | After technical analysis, the use of different | |
| models at the same time seems to be not feasible and not widely required by the user community | | | ***Decision:*** To |
| use as it is. | N/A | | |
| Problems finding information about the NWP fields | Description of all required NWP parameters is included in the SUM and ICD/1 | | |
| User is expected to be familiarized with NWP format and data fields | | ***Decision:*** To use as it is. | N/A |
| Problems using h52gif conversion tool provided in the HDF 3rd party SW. | This problem is related to a tool which maintenance is not a SAFNWC/MSG project responsibility. | | |

First analysis gives that problems are related to the palette management inside this tool, but all palettes inside the SAFNWC/MSG package, accomplish the specifications described in the HDF5 documentation.

In addition, the last version of HDFView tool is able to visualize all the image-like products of the SAFNWC/MSG package.

| | | |
|---|---|---|
| | ***Decision:*** To send a report describing this situation to the HDF5 help desk for analysis | Next version (2.0) |
| DMI suggest to provide a projection tool with the package This kind of tool is not foreseen. The SAFNWC/MSG package idea is to provide basic products that can be exploited by each NMS. | | |
| This requirement is considered out of the scope of the application | ***Decision:*** To use as it is. | N/A |
| ARPAL asks for the products in GRIB format | Products are currently provided in well established and standard formats (HDF5 & BUFR). Therefore, support to new additional formats is not foreseen. ***Decision:*** To use as it is. | N/A |
| Quite slow to read RDT files before visualization, because of time series, a lot of previous RDT output must be read as well | This issue has to be decided by the PGE11 developer ***Decision:*** To address this proposal to MF-DPr | - |
| To make the calibrated single channel region subcut images as official output. | This requirement is out of the scope of the SAFNWC/MSG. MSG images are not considered an output of the application (although they are internally used) ***Decision:*** To use as it is. | N/A |
| Maybe the Task Manager could monitor whether the BUFR to HDF5 conversion has ended and only after give the 'endregion' signal. | The execution of external applications (like the hdf5 conversion tool) cannot be monitored by the SAFNWC/MSG. | |
| Several approaches, using dedicated scripts, driven by the SAFNWC/MSG can be defined to implement the required functionality. | ***Decision:*** To use as it is. | N/A |
| Low connection to download the SAFNWC/MSG package. To explore the possibilities of a fast ftp connections. | Problem of the INM infrastructure. To be studied internally. ***Decision:*** To address the problem to INM- | |
| Possibility of starting processing after relevant segments are available. | The application is fully configurable to do this. It is on the user side the decision of consider which trigger mechanism has to be used to start the processing (an specific segment availability, a number of segments…) | |
| Nevertheless, the user request for commanding separately the execution of different regions of a single slot | ***Decision:*** Considered as an improvement. To add a new *SW* requirement | Next version (2.0) |
| DWD requires the portability to IBM AIX on further versions | Only the DWD user shows interest on using this platform. But almost all the work is done by DWD and should be easily integrated in the SAFNWC/MSG application. To include the IBM/AIX as the fourth committed platform. | |

***Decision:*** To split UR-6.8.3 in two:

UR-6.8.3.1 The MSG SW package shall be able to run on the following UNIX environments: Sun Ultra/Solaris, SGI/IRIX, Intel/Linux and IBM/AIX.

| | | |
|---|---|---|
| *UR-6.8.3.2* | *To be completed by the PPS responsible* | CDOP |

Accepted. Action to be performed by the integrator

Action to be addressed to other centre.

Requirement/Comment not accepted. To use as it is

## 3.2 SOFTWARE AND ENGINEERING FOR PPS

**ENGENEERING PART**

**Compiled by: SMHI**

### 3.2.1 User Survey Synthesis

| | |
|---|---|
| Number of filled form: | 5* |

* There are totally 6 filled forms, but one of them has only answers in the scientific part since the Swedish Air Force is receiving products generated by SMHI. Thus there are only 5 filled forms for the engineering part. Please note that we are also missing questionnaire answers from the **Norwegian Meteorological Institute.**

## 1.- Current environment

| | | | | |
|---|---|---|---|---|
| v1.0 | Downloaded | *3* | SUN platform | |
| | Installed | *2* | Linux platform | *1* |
| | Running | *2* | IBM/AIX | *1* |
| v1.1 | Downloaded | *4* | SUN platform | *2* |
| | Installed | *4* | Linux platform | *2* |
| | Running | *4* | IBM/AIX | |
| Pre-operational versions 0.x | Downloaded | *2* | SUN platform | |
| | Installed | *1* | Linux platform | *1* |
| | Running | *1* | IBM/AIX | |

Third party software

The number in parenthesis, after a version number, is the number of users using that version.

Platform: SUN Blade 2000 Ultra Sparc III

SUN Solaris

SuSE Linux Enterprise Server

Linux

IBM/AIX 5.x

OS (e.g. Red Hat Enterprise 3)Solaris 8

SunOS 5.8 Generic_108528-26 sun4u sparc SUNW,Sun-Fire-V210

SLES 9

SLES 8

Red Hat Enterprise ES 3

C-compiler and version SUN Forte Compiler Collection 7

Native SUN WorkShop Compilers 5.0 98/12/15 C 5.0

gcc 3.3.4

gcc 3.2.2

GNU C Compiler

IBM C-Compiler, the gcc

Fortran-compiler and version SUN Forte Compiler Collection 7

Native SUN WorkShop Compilers 5.0 98/12/21 FORTRAN 90 2.0

IFORT 8.1

IFORT 7

Fortran 90 Compiler

IBM Fortran-Compiler

HDF5-version *1.4.4 ( 1)*

*1.6.3 (3)*

HL-HDF-version *0.48 (3)*

*1.0 (1)*

zlib-version *1.1.4 (3)*

*1.2.1 (1)*

*1.2.2 (1)*

szip-version *1.1 (1)*

*1.2 (1)*

tcl/tk-version *8.3 (1)*

*8.3.3 (1)*

*8.3.5 (1)*

*8.4 ( 1)*

Proj.4-version *4 (1)*

*4.4.8 (2)*

*4.4.9 (1)*

Python-version*2.2.1 (1)*

*2.2.2 (1)*

*2.2.3(2)*

*2.3.4 (1)*

Numeric-version *19.0 (2)*

*22.0 (1)*

*23.8 (1)*

Pmw-version *1.1 (1)*

*1.2 (2)*

ScientificPython-version *2.2 (1)*

*2.4.3 (1)*

*2.4.9 (1)*

Imaging (PIL)-version *1.1.4 (1)*

*1.1.5 (1)*

RTTOV-version *7.0 (2)*

*7.1 (2)*

Emos-lib-version *000160 (3)*

*16 (1)*

| | |
|---|---|
| | AAPP *3.5 (1)*<br>*4.x ( 1)*<br>*4.3 (1)*<br>*4.5 (2)* |
| *5 ( 1)* | |

One user replied **"**All version numbers as they were coming with PPS1.0.". Those are not included in the sums above.

| 2.- Engineering | |
|---|---|
| Do you interface other (e.g. in-house developed) software to NWCSAF/PPS software (do you use compiled PPS static/shared libraries)? | Yes *2 (40%)*<br>No *3 (60%)* |
| | |
| PPS mode used | Real time *4 (80%)*<br>Offline *2 (40%)* |
| Which PPS components do you use? | AHAMAP *5 (100%)*<br>PPS Task Manager *2 (40%)*<br>ACPG *5 (100%)* |
| What is the size of the coastal zone you are using for PPS.? Please give the values of the environment variables: | SM_COASTALZONE_LIMIT: *0 (3)*<br>*64 (1)*<br>*127 (1)*<br>SM_LANDSEA_FRACTION_MAX: *255 (3)*<br>*191(1)*<br>*127 (1)*<br>The number in parenthesis is the number of users using the different settings. |
| Do you run ANA or any other type of post-navigation software to improve | Yes *4 (80%)*<br>No *1 (20%)* |

| | |
|---|---|
| satellite navigation accuracy? | Experiences "Significantly improvement", "We run ANA"<br>Problems "A lot of rejected landmarks"<br>Suggestions - |
| Synthesis of results and comments: | |
| Monitoring & Control | |
| | Experiences *see below*<br>Problems -<br>Suggestions - |
| Synthesis of results and comments: | • TM NOT USED, log files informative<br>• see beta-tester report<br>• It's nice that the tm has a GUI, it makes it easy to rerun different modules and areas. You can also check module status, current jobs, log, statistics etc. It's good to have all these possibilities easy accessible in the same GUI. The logging could perhaps need some improvement. The logfile is quite large and is sometimes containing "too much" INFO. |

| Integration of the application in user environment | |
|---|---|
| INPUT DATA<br>NOAA | Experiences *see below*<br>Problems -<br>Suggestions -<br>• ok<br>• It worked without any ingestion/adaption of NOAA-data |
| NWP Fields | Experiences *see below*<br>Problems different grib formats<br>Suggestions -<br>• ok<br>• adaptions necessary<br>• we use GME data<br>• No ingestion/adaption needed |
| Synthesis of results and comments: | NOAA Fields:<br>*seems to be unproblematic*<br>NWP Fields:<br>*Some needed adaptations, but most did not need any adaptation.* |
| OUTPUT DATA<br>Imagery products (Output Format HDF5) (PGE01, 02, 03, 04) | Experiences *Ok. See below*<br>Problems *See below*<br>Suggestions *See below* |
| Synthesis of results and comments: | ○ Experiences: So far alright, but the use of new versions of HDF5 (none backward compatible) makes upgrading difficult (DMI)<br>○ Problems: requires new compilation of in-house SW which is dependant on ACPG output, e.g OSISAF SW. (DMI)<br>○ Suggestions: stick to specific HDF5/HLHDF version or make possibility for use of previous versions of HDF/HLHDF (DMI) |

| 3.- Other aspects | |
|---|---|
| Documentation | Installation, configuration and execution docs Ok<br>Scientific Reports contents *Ok* |

| | |
|---|---|
| Synthesis of results and comments: | **SW documentation**<br>• There was enough information for the installation of PPS, but perhaps there should be some more information about the thirdparty-installations. The configuration and execution parts fulfilled our needs. (SMHI)<br>•<br>Scientific Reports:<br>• Easy to read and understand. (SWEDAF) |
| Help Desk | Experiences: very good<br>Problems: *No*<br>Suggestions: - |
| Synthesis of results and comments: | • We have not had that much contact with the helpdesk concerning The PPS-package. But our general impression of the helpdesk is that it works well. The possibility to search for a specific problem in the mailbox is useful. The possibility to search for and download document is also useful for us. (SMHI) |
| User intereraction with NWC SAF | As already pointed out during the workshop in 2004 I would like to encourage NWC-SAF to establish an Algorithm Forum where users and developers are presenting ideas, results, new approaches etc. (CMSAF)<br><br>Works well, quick response. (SMHI) |
| Intended cooperation with NWC SAF | • The needs of CM-SAF. Validation, long-term studies (CMSAF) |

| 4.- Additional comments and suggestions for improvements in version 2.0 |
|---|
| Installation rather difficult due to the third party software. Better solved in the NWCSAF/MSG-package. (BGIO) |

### 3.2.2 Workshop Discussion and Outcomes

| 7.- Workshop and Survey Discussion and Outcomes | | | |
|---|---|---|---|
| ***User comments and requirements*** | ***Analysis*** | ***Proposal*** | ***Priority*** |
| Backward compatibility of HDF/HLHDF | The PPS package contains source code and various ancillary datafiles (static tables etc) some of which are stored using the hdf5 file format. It is recommended that the users try to use the latest version of the hdf5 and hl-hdf libraries, and for each version of the PPS package there is a detailed list of verified 3rd party software versions.<br>However, often users do not update their hdf5/hl-hdf libraries in the same speed as they might update their version of PPS. At least one user has experienced problems reading some static ancillary data with an older (than recommended) version of hdf5. It proved that PPS version 1.1 contained ancillary datafiles stored using a newer version of the hdf5 library than what the user was using. | With each new release state in user documentation (e.g. release note) the oldest version of the hdf5 library (and hl-hdf) which is known to work with PPS.<br>In the PPS development be conservative and whenever possible try not to use the most recent versions of the hdf5 library when creating new static tables etc.<br>Urge users to use recent versions of the hdf5 library. | |
| Third party software installation still not easy enough | The PPS package is designed from the very beginning to be flexible and portable. Also it has been important to make as much as possible use of existing software, both to keep development costs low and to secure high quality and user friendliness. This, we acknowledge, has made it more difficult for the user in terms of installing the software. A lot of 3rd party software is required to be available prior to installation. The PPS software and most of its required 3rd party software (including AAPP and RTTOV) can be made available as RPM packages for users running Linux RedHat Enterprise 3. This may ease installations for users having the same computer environment as the operational environment at SMHI. | It might be possible to do something similar to this for the other supported platform (Solaris) but only if the PPS dedicated user (currently BGIO) agrees to do so. SMHI will not be able to deliver PPS and 3rd party software as Sun Packages. | |
| Third party software installation still not easy enough | | | Discuss at PAR |

## 3.3 NWCSAF USER SERVICES

The contents of this topic are compiled under 3.1. and 3.2.

In general the opinion of the users about User Services is highly positive. Modesty does not let for expanding here.

The only negative aspect concerns with the low connection to download the software packages:

| | | |
|---|---|---|
| Low connection to download the SAFNWC/MSG package. To explore the possibilities of a fast ftp connections. | Problem of the INM infrastructure. To be studied internally. | ***Decision:*** To address the problem to INM |

## 3.4 NWCSAF/MSG PGES

### 3.4.1 PGE01 CMa

**Compiled by: *MFL (Météo-France/Lannion)***

#### 3.4.1.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation(1) | *14 (93 %)* |
| | Exploitation(2) | *11 (73 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used (not only as input for generation of other PGEs) | |
| PGE output parameter used: | *CMa categories* | *11 (73 %)* |
| | *Dust flag* | *4 (27 %)* |
| | *Volcanic flag* | *2(13 %)* |
| | *Quality flag* | *4(27 %)* |
| | *Test (for dvpt)* | *0 (0 %)* |
| Processing Areas: | Geographical Areas | |
| | *MSG full disk, 4 continental areas to cover MSG full disk* | |
| | *MSG-N, Europe, Central Europe* | |
| | *Southern Scandinavia+north sea+northern part of middle Europe* | |
| | *Portugal+Madeira+Azores, Spain, Poland, Austria, Italy, Romania* | |
| NWP model used as input: | *ECMWF* | *7 (47 %)* |
| | *HIRLAM* | *2 (13 %)* |
| | *ARPEGE* | *1 (7 %)* |
| | *UKMO model* | *1 (7 %)* |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *5* | *2* |
| Subjectively | *9* | *1* |

Synthesis of results and comments:

- *CMa categories: subjectively good, but some clouds may be not detected such as low clouds in twilight, thin cirrus, night-time low cloud in Atlantic maritime advection. Some erroneous cloudiness in very cold atmosphere are reported. Inconsistency are noted between "partly cloudy" (CMa) and "fractional" (CT).*
- *Dust flag: dust detection incomplete (ex: spurious disappearing in the peak of the day in some event) but useful because indicative of affected zone.*
- *Volcanic ash flag: disappointing over Africa.*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *9 (60 %)*<br>No *1 (7 %)*<br>No answer *5 (33 %)* |
| Synthesis of comments: | *-Meet requirements except for Land SAF application ("The Land SAF products require a good identification of clear sky pixels, but the PGE01 presents many cases of un-detected cloud-pixels").*<br>*-Nevertheless, numerical applications need to identify day/night transition areas where low clouds detection is rather poor (MF).* |
| Applications using PGE output(s) | |
| Current applications | • *Visualisation of dust and volcanic ash flag for forecaster*<br>• *Input for the elaboration of cloudiness map*<br>• *Cloud-free area identification for SST, LST, albedo and vegetation indices (ex: Land SAF, OSI-SAF, some NMS)*<br>• *Cloudy area identification for cloud parameters computation*<br>• *Input to road condition model*<br>• *Input to Hirlam*<br>• *Input to short term cloud forecasting model*<br>• *Input data to automatic nowcasting software that send warning in case severe weather situations.*<br>• *Research*<br>• *Forecast* |
| Planned applications | • *Visualisation of dust flag on HRV*<br>• *Scientific research*<br>• *Input to earth radiation budget (clear sky fluxes) computation*<br>• *Input to other Land SAF products using CMa*<br>• *Input for estimation of UV dose* |
| If not used, | |
| | You do not have any application using PGE01 output_____*0 (0 %)*<br>You do not use PGE01 output because its quality does not meet your requirements_____*0 (0 %)*<br>You do not yet use PGE01, but you are planning to do_____*1 (7 %)*<br>*PGE01 is only used to generate other PGEs 3 (20 %)*<br>*PGE01 is not generated because SAFNWC/MSG package is not yet running 1 (7 %)* |
| Comments: | • *CMa main categories and quality flag are mandatory to generate CT product.* |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • *Improve dust detection (over sea, over Iberian Peninsula)*<br>• *Improve cloud free delineation (especially low cloud at twilight, but also thin cirrus, daytime valley fog, night-time low cloud in Atlantic maritime advection)*<br>• *Decrease wrong cloudiness in very cold air*<br>• *Add a SO2 flag* |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above | |
|---|---|
| *NWP input* | *The users request that the warnings messages in case missing NWP fields are clearer (SPR198).* |

| 6.- Additional |
|---|
| *To document the applicability of CMa to compute cloud free parameters, the SAFNWC validation report quantifies the percentage of undetected clouds and the expected improvement if only good quality cloud free pixels are retained. It can be seen that still clouds remain undetected. Interaction with Land SAF is needed to to find corrective solutions.*<br><br>*Feed-back from CM-SAF is available through direct contact but not reported in the User Survey. The SEVIRI Cloud mask product has been recently labelled "operational". A validation report is available. A different behaviour over sea and land has been noticed (more clouds over sea) and has to be explained and possibly improved/solved. There is also a requirement to get the possibility to use only pure IR channels in the cloud masking process to avoid diurnal cycle.* |

### 3.4.1.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|
| **PGE01: Summary of quality assessment and users's requests for improvement:**<br><br>A summary of the replies to the user survey for PGE01 has been presented to the users during the workshop. The main points on the quality assessment and the requests for improvements, listed below, have been confirmed by the users:<br><br>Cloud detection:<br>• The cloud detection is subjectively good. It meets the user requirements except for the Land SAF applications because some clouds remain un-detected.<br>• A cloud detection improvement is needed, especially in case:<br>  ○ low cloud at twilight,<br>  ○ thin cirrus,<br>  ○ daytime valley fog, |

- night-time low cloud in Atlantic maritime advection.
- The decrease of erroneous cloudiness is needed, especially:
  - in very cold atmosphere,
  - in snowy areas in the Alps at daytime (has already been reduced in v1.2),
  - in snowy areas at nighttime.
- Inconsistencies are noted between "partly cloudy" (PGE01) and "fractional" (PGE02).
- CM-SAF needs a flexible cloud detection scheme that can be configured to only use pure IR channels.

Dust flag:

- It meets the user requirement: the dust detection is incomplete but is useful because it is indicative of affected zone.
- The dust detection over sea should be improved especially at mid-day.
- The dust detection over the Iberian Peninsula is desirable.

Volcanic ash flag:

- The volcanic ash cloud detection has not been sucessfull for the main event since SEVIRI is operational (over Africa).
- There is a need of Météo-France to add a SO2 flag which could complement the volcanic ash cloud flag in case volcanic eruption.

**Discussion on content and priority for PGE01 improvements:**

The SAFNWC/MSG PGE01 development team (Météo-France/Lannion) has then presented potential areas for PGE01 improvements in line with the users's requests (see the list below). A discussion was then held with the aim to settle priorities amongst proposed PGE01 improvements. This discussion was especially fruitful, thanks to the presence of F.Olsesen representing the Land SAF which has the only application for which PGE01 does not meet the requirements.

The users' priority is clearly the cloud detection improvement, the improvement of the dust flag is also seen as useful (especially for the mediteranean countries) whereas the additional flag for volcanic eruption, only required by Météo-France, should preferably not be developped within the SAFNWC.

Cloud detection:

It was concluded that the improvements proposed by the SAFNWC/MSG PGE01 development team are appropriate, even for solving the non compliance to the LandSAF applications. It was also agreed that the Land SAF will have to implement a post-processing (as the OSI SAF), including a cloud mask spreading (to mask thin cloud edges and shadows), the use of the cloud mask quality flag (not to use bad quality cloud free areas) and an additional filtering based on the temporal variation (to finally remove still non detected clouds). It was also concluded that the specific cloud mask developments for Land SAF proposed by the SAFNWC/MSG PGE01 development team (see last point of the list below) are not necessary and should not be proposed within the SAFNWC.

The improvements proposed by the SAFNWC/MSG PGE01 development team are the following (presented in decreasing priority order agreed with users):

- Use temporal analysis to:
  - improve low clouds detection at day/night transition
  - improve thin cirrus detection,
  - decrease wrong cold snowy ground confused with clouds
- Use of HRV to:
  - improve low cloud detection at daytime (Cu, valley fog)

- Use of RTTOV online to:
  - improve cloud detection (ex: night-time low clouds in Atlantic maritime advection)
  - decrease wrong detection in extrem cases (ex: very cold air)
- Modification of software to allow the processing with only pure IR channels (CM-SAF need)
- Specific improvements for continental remote sensing were suggested by the SAFNWC/MSG PGE01 development team [prepare specific configuration files (tested on SYNOP dataset) or add specific new tests (key in configuration files to select them)], but are not needed by the Land SAF and will therefore not be proposed.

Dust detection:

The improvement of the dust flag is also seen as useful (especially for mediteranean countries), although with a lower priority than the cloud detection improvement. Potential improvements have been proposed by the SAFNWC/MSG PGE01 development team (listed below) and agreed with the users:

- Improving the dust detection over sea at daytime using additional solar channels.
- Implementing a dust detection over sea at night-time (according conclusions of a OSI-SAF VSA study performed by University of Edinburgh).
- Improving dust detection over Iberian Peninsula seems too ambitious and will not be proposed by the SAFNWC.

Volcanic ash flag:

- The volcanic ash flag was not sucessful over Africa because of masking effects (high atmospheric water vapour content and ice clouds). No improvements can be yet proposed by the SAFNWC/MSG PGE01 development team.
- Adding a SO2 flag is not a priority as it is only requested by Météo-France. It will not be proposed in the frame of the SAFNWC.

Inconsistency between “partly cloudy” (PGE01) and “fractional” (PGE02):

The SAFNWC/MSG PGE01 development team thinks that the PGE02 information is more reliable and should be used instead. The Software User Manual (Scientific part) will be modified accordingly. The “cloud contaminated” and “cloud filled” classes will not be merged not to force the users to modify their applications.

Technical improvement:

As requested by the user (SPR198), the warning messages in case missing NWP fields will be improved.

The technical improvement covered by the SPR will be implemented in v2.0. The other improvements (see the list above) are too time-consuming to be performed within the remaining IOP Work-Packages under the SAFNWC/MSG PGE01 development team’s responsibility. They will therefore be proposed for the CDOP (Continuous Development and Operational Phase, 2007-2012).

### 3.4.2 PGE02 CT

## Compiled by: *MFL (Météo-France/Lannion)*

#### 3.4.2.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation(1) | *14 (93 %)* |
| | Exploitation(2) | *14 (93 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used (not only as input for generation of other PGEs) | |
| PGE output parameter used: | *CT categories* | *14 (93 %)* |
| | *Quality flag* | *4 (27 %)* |
| | *Phase flag* | |
| | *(not yet available)* | *0 (0 %)* |
| Processing Areas: | Geographical Areas | |
| | *MSG full disk* | |
| | *MSG-N, Europe_B, Europe, Central Europe* | |
| | *Southern Scandinavia+north sea+northern part of middle Europe* | |
| | *Scandinavia + northern Europe* | |
| | *Portugal+Madeira+Azores, Spain, Poland, Austria, Italy, România* | |
| NWP model used as input: | *ECMWF* | *8 (53 %)* |
| | *HIRLAM* | *2 (13 %)* |
| | *ARPEGE* | *1 (7 %)* |
| | *GME* | *1(7 %)* |
| | *UKMO model* | *1 (7 %)* |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *3* | *2* |
| Subjectively | *12* | *0* |

Synthesis of results and comments:

- *Main opinion: useful, good quality. Some drawbacks listed below:*
- *Forecasters may have problems with low cloud non detected in day/night transitions or with wrong cloudiness in case very cold air (CMa problem)*
- *Low cloud or fog may be classified as medium clouds in case thermal inversion (note: this trend has been decreased in v1.2, but not completely suppressed (still present in Castilla-leon))*
- *Some forecasters have problems with sudden change of colors due*
- *Confusion of low clouds and snow in the Alps has been noted*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *12 (80 %)*<br>No *0 (0 %)*<br>No answer *3 (20 %)* |
| Synthesis of comments: | *-Meet requirements.*<br>*-Identification of fog and Cb would be useful.* |
| Applications using PGE output(s) | |
| Current applications | • *Visualized in the forecasting offices for various purposes: weather analysis, nowcasting, cloud system analysis, aviation meteorology, fog/low clouds monitoring*<br>• *Decision support for communities in road preparation for slippery roads*<br>• *Snow mapping (on test)*<br>• *Input for icing cloud identification (on test)*<br>• *Input for the elaboration of cloudiness map*<br>• *Input to automatic nowcasting software that send warning in case severe weather situations.*<br>• *Input to automatic nowcasting system to identify potential fog*<br>• *Input to automatic system (using model output and ground-based observation) to estimate fog probability (under development)*<br>• *Input to aladin to help assimilate cloud free SEVIRI radiance*<br>• *Input to mesoscale cloud cover and cloud base analysis*<br>• *Radar clutter correction*<br>• *Input for downwelling fluxes computation (OSISAF)*<br>• *Made available to scientific community through SATMOS service*<br>• *research* |
| Planned applications | • *Masking of semi-transparent cloudiness (for aviation)*<br>• *Comparison with limited area model outputs*<br>• *Improve Land-SAF downwelling surface fluxes*<br>• *Scientific research*<br>• *Input to Earth radiation budget studies, Radiation component calculation for climatology, Climate change research for central Europe region* |
| If not used, | |
| | You do not have any application using PGE02 output_____*0 (0 %)*<br>You do not use PGE02 output because its quality does not meet your requirements_____*0 (0 %)*<br>You do not yet use PGE02, but you are planning to do_____*0 (0 %)*<br>*PGE02 is not generated because SAFNWC/MSG package is not yet running 1 (7 %)* |

| | |
|---|---|
| Comments: | |

## 4.- Improvements and modifications to PGE requested/suggested by users

- *Decrease the mis-classification of low clouds as medium clouds*
- *Improve snow identification (CMa problem)*
- *Compute a Cloud phase flag*
- *Perform the separation between stratiform and cumuliform clouds (mainly, identify Cb, Cu, strato-cumulus and stratus).*
- *The identification of fog would be useful.*

## 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above

*NWP input*

*The users request that the warnings messages in case missing NWP fields are clearer (SPR198).*

*The users request that the NWP availability flag should not be set to 0% in case missing tropopause NWP field (SPR 212)*

*Cloud phase flag*

*Is there a need for a cloud phase flag?*

| | |
|---|---|
| Yes | *8(53 %)* |
| No | *3(20 %)* |
| No answer | *4(27 %)* |

*Separation stratiform/cumuliform*

Is there a need for a separation between stratiform and cumuliform clouds?

| | |
|---|---|
| Yes | *11 (73 %)* |
| No | *1 (7 %)* |
| No answer | *3(20 %)* |

| 6.- Additional |
|---|
| *Feedback from CM-SAF is available through direct contact but not reported in User Survey. The SEVIRI Cloud type product has been recently labelled "operational". A validation report is available. There is a requirement to get the possibility to use only pure IR channels in the cloud type process to avoid diurnal cycle.* |

### 3.4.2.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|

**PGE02: Summary of quality assessment and users's requests for improvement:**

A summary of the replies to the user survey for PGE02 has been presented to the users during the workshop. The main points on the quality assessment and the requests for improvements, listed below, have been confirmed by the users:

Cloud Type main categories:

- The main opinion is that the PGE02 is useful and of good quality. It meets the requirements for all the users.
- The following improvements are nevertheless needed:
  - The misclassification of low clouds/fog as medium clouds in case thermal inversion especially in winter should be less frequent (note: this trend has been decreased in v1.2, but not completely suppressed).
  - The misclassification of thin cirrus above lower clouds as medium clouds should be less frequent.
  - The separation between stratiform and cumuliform clouds (mainly, identify Cb, Cu, strato-cumulus and stratus. And if possible even fog) is requested by 73% of the users.
  - Some forecasters have problems with sudden change of colours.

Cloud phase flag:

- 53% of the users request a cloud phase flag.

**Discussion on content and priority for PGE02 improvements:**

The SAFNWC/MSG PGE02 development team (Météo-France/Lannion) has then presented potential areas for PGE02 improvements in line with the users's requests (see the list below). A discussion was then held with the aim to settle priorities amongst proposed PGE02 improvements.

The users' priorities are clearly the separation between stratiform and cumuliform clouds and the cloud phase flag. For INM, the improvement of low clouds classification in case thermal inversion is still a priority although this aspect has aready been improved in v1.2. Finally during the open discussion, the SAFNWC/MSG PGE02 development team asked the users whether other micro-physical parameters such as cloud optical thickness or cloud droplet effective radius would be needed. Although these parameters may be useful, they are clearly not priorities and will therefore not be proposed for MSG in the SAFNWC.

Cloud Type main categories:

- Separation between stratiform and cumuliform clouds:
  - The types of clouds to be separated have been discussed with the users and

are the following:
    - identify Cu, Stratus and Strato-cumulus
    - identify fog: it seems unrealistic to the SAFNWC/MSG PGE02 development team and will therefore not be proposed
    - identify Cb
    - the users agreed that a product defined as: "stratiform/cumuliform/unknown" would remain useful as it would have the advantage to propose two clean classes (stratiform, cumuliform). Nevertheless, the users stress that this should be done in a way not to force them to change their applications (the stratiform/cumuliform/unknown separation should be described by a flag, not by adding classes).
  - The SAFNWC/MSG PGE02 development team has presented its strategy for development: a feasibility study in daytime conditions using HRV information (textural and spectral analysis). If successful, an implementation will follow.
- Mis-classification of low clouds as medium clouds:
  - The SAFNWC/MSG PGE02 development team has clarified that efforts have already be done to improve this aspect in v1.2 and that it has at present time no further ideas.
- Thin cirrus over low clouds classified as medium:
  - The SAFNWC/MSG PGE02 development team has clarified that it has at present time no further ideas.
- Sudden color changes:
  - It is a problem inherent to thresholds techniques.
  - A default colour palette has been included in the hdf file. The user may modify it to make color jumps smoother.

Phase:

- The SAFNWC/MSG PGE02 development team has presented its strategy for development:
  - A Visiting Scientist Activity has started with LMD and will end in February 2007:
    - An algorithm for cloud phase retrieval in daytime and possibly in night-time conditions will be prototyped,
    - A limited validation with lidar/radar (ground and satellite-based) is planned,
    - Icing cloud pilot reports are also available for validation purposes.
  - If successful, an implementation will follow in CDOP.

Technical improvement:

As requested by users (SPR198 and SPR 212), the warning messages in case missing NWP fields and the NWP availability flag in case missing NWP tropopause fields will be improved.

The technical improvements covered by the two SPRs will be implemented in v2.0. The cloud phase flag, already requested during the last users' workshop in June 2004, is already under development through a VSA (WP 23.53.10). The other improvements (see the list above) are too time consuming to be performed within the remaining IOP Work-Packages under the SAFNWC/MSG PGE02 development team's responsability. They will therefore be proposed for the CDOP (Continuous Development and Operational Phase, 2007-2012).

### 3.4.3 PGE03 CTTH

## Compiled by: *MFL (Météo-France/Lannion)*

#### 3.4.3.1 User Survey Synthesis

| Number of filled forms | 15 |
|---|---|

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation[1] | *13 (87 %)* |
| | Exploitation[2] | *12 (80 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used (not only as input for generation of other PGEs) | |
| PGE output parameter used: | *Temperature* | *8 (53 %)* |
| | *Height* | *7 (47 %)* |
| | *Pressure* | *8 (53 %)* |
| | *Effectiv cloudiness* | *1 (7 %)* |
| | *Quality flag* | *2 (13 %)* |
| Processing Areas: | Geographical Areas | |
| | *MSG full disk, 4 continental areas to cover MSG full disk* | |
| | *MSG-N, Europe_B, Europe, Central Europe* | |
| | *Southern Scandinavia+north sea+northern part of middle europe* | |
| | *Scandinavia + northern Europe* | |
| | *Portugal+Madeira+Azores, Spain, Italy, Romania* | |
| NWP model used as input: | *ECMWF* | *7 (47 %)* |
| | *HIRLAM* | *3 (20 %)* |
| | *ARPEGE* | *1 (7 %)* |
| | *GME* | *1(7 %)* |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *2* | *1* |
| Subjectively | *10* | *0* |

Synthesis of results and comments:

- *Box structures in CTTH results and inconsistencies between adjacent boxes clearly limits the acceptance of the product in the forecast branch (DWD)*
- *Box structure in CTTH results are also noted by RMIB.*
- *In case thermal inversion, CTTH may be inconsistent with CT for low clouds (this trend has been decreased in v1.2)*
- *CTTH less used by forecasters than CT (MF)*

*The product seems consistent with NWP model output (DMI)*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *6 (40 %)*<br>No *2 (13 %)*<br>No answer *7 (47 %)* |
| Synthesis of comments: | *-Does not meet requirement for two institutes for following reasons:*<br>*-BTIM: Does not meet requirement for visualisation for forecaster because problem to convert HDF to GIF; otherwise meets requirement for Land SAF application*<br>*-DWD: Only partly meet requirement, due to box structures in CTTH results and inconsistencies between adjacent boxes*<br>*-Among the lack of answer, following comments: "not yet assessed", "don't know yet, look promising compared to our old analysis"* |
| Applications using PGE output(s) | |
| Current applications | • *Visualized in the forecasting offices for various purposes: weather forecasting, nowcasting, aviation meteorology, cloud system analysis, evaluation by forecaster*<br>• *Input to road condition model*<br>• *Input to automatic nowcasting software that send warning in case severe weather situations.*<br>• *Input to hirlam and to Aladin*<br>• *Input to mesoscale model cloud top analysis*<br>• *Input for Land SAF products generation*<br>• *Made available to scientific community through SATMOS service*<br>• *Research* |
| Planned applications | • *Input to identification of flight level with deep cloudiness*<br>• *Input to fog monitoring*<br>• *Scientific research*<br>• *Input to Earth radiation budget studies* |
| If not used, | |
| | You do not have any application using PGE03 output_____*1 (7 %)*<br>You do not use PGE03 output because its quality does not meet your requirements_____*0 (0 %)*<br>You do not yet use PGE03, but you are planning to do_____*1 (7 %)*<br>*PGE03 is not generated because missing mandatory NWP fields 1 (7 %)*<br>*PGE03 is not generated because SAFNWC/MSG package is not yet running 1 (7 %)* |
| Comments: | • *NWP fields are mandatory to retrieve CTTH. This is the reason why Poland could not run PGE03, but intends to do.* |

| | |
|---|---|
| | • *ZAMG generates PGE03, but does not use the output.* |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • *As possible, eliminate box structure and inconsistency between adjacent boxes (semi-transparent clouds)*<br>• *Improve low cloud CTTH in case thermal inversion (v1.2 has been improved in that respect).* |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above | |
|---|---|
| *NWP input* | *The users request that the warnings messages in case missing NWP fields are clearer (SPR198).* |

| 6.- Additional |
|---|
| *Quantification of CTTH accuracy is available in the SAFNWC validation report where CTTH has been compared to radio-sounding, lidar and cloud radar measurements.*<br><br>*Feed-back from CM-SAF is available through direct contact but not reported in User Survey. The SEVIRI Cloud top product has been recently labelled "operational". A validation report is available.* |

### 3.4.3.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|
| **PGE03: Summary of quality assessment and users's requests for improvement:**<br>A summary of the replies to the user survey for PGE03 has been presented to the users during the workshop. The main points on the quality assessment and the requests for improvements, listed below, have been confirmed by the users:<br><br>The PGE03 does not meet the requirements for two institutes for the following reasons:<br><br>• BTIM: Does not meet requirement for visualisation for forecaster because problem to convert HDF to GIF;<br>• DWD: Only partly meet requirement, due to box structures in PGE03 results and inconsistencies between adjacent boxes (clearly limits the acceptance of the product in the forecast branch)<br><br>Moreover, there is a need to improve the following aspects:<br><br>• In case thermal inversion, improve the PGE03 for low clouds (the cloud may be set too high in the atmosphere). This aspect has already been improved in v1.2.<br>• Reduce the bias that have been observed by comparison with radio-sounding/radar/lidar (cf validation report).<br><br>**Discussion on content and priority for PGE03 improvements:** |

The SAFNWC/MSG PGE03 development team (Météo-France/Lannion) has then presented potential areas for PGE03 improvements in line with the users's requests (see the list below). During the discussion, it has also been clarified the necessity for the user to input NWP fields up to 100hPa to allow a more accurate PGE03 retrieval for high clouds; the Software User Manual (scientific part) will be modified accordingly to reflect this point.

Box structures in PGE03:
Box structure in PGE03 are mainly due to the use of histogram method applied on a 32 by 32 grid. The SAFNWC/MSG PGE03 development team has presented potential improvements to limit this box aspect:

- The possibility to compute histograms in 32x32 boxes centred on a smaller mesh grid defined by the user will be analysed and if possible implemented: this will decrease the box aspect.
- The possibility to apply, when possible, the Radiance Ratioing technique (result available at pixel level) instead the histogram method will be analysed and possibly implemented (at present time, this radiance ratioing technique is restricted to the thicker semi-transparent clouds).

Improve the PGE03 for low clouds:
The SAFNWC/MSG PGE03 development team has clarified that efforts have already be done to improve this aspect in v1.2 and that it has at present time no further ideas.

Bias on opaque clouds:
The SAFNWC/MSG PGE03 development team proposes to test whether the radiance ratioing technique (used to account for semi-transparency) could be applied to medium/high clouds to decrease the bias. If this is the case, the software will be modified accordingly.

Technical improvement:
As requested by the user (SPR198), the warning messages in case missing NWP fields will be improved.

The technical improvement covered by the SPR will be implemented in v2.0. The other improvements (see the list above) are too time-consuming to be performed within the remaining IOP Work-Packages under the SAFNWC/MSG PGE03 development team's responsability. They will therefore be proposed for the CDOP (Continuous Development and Operational Phase, 2007-2012).

### 3.4.4 PGE04 PC

## Compiled by: SMHI

#### 3.4.4.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation[1] | *11(73%)* |
| | Exploitation[2] | *8 (53 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used | |
| PGE output parameter used: | *PC_PROB1* | *8 ( 53%)* |
| | *PC_PROB2* | *4 (27 %)* |
| | PC_QUALITY | *1(7%)* |
| | PROB1+PROB2 | *3(20%)* |
| Processing Areas: | Geographical Areas | |
| | *MSG-N, Europe, Central Europe* | |
| | *Southern Scandinavia+north sea+northern part of middle europe* | |
| | *Scandinavia + northern Europe* | |
| | *Portugal+Madeira+Azores, Spain, Poland, Austria, Italy, Romania* | |
| NWP model used as input: | *ECMWF* | *8 (53 %)* |
| | *HIRLAM* | *1 (7 %)* |
| | (UKMO model) | *(1 (7%))* |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *3* | *1(soon)* |
| Subjectively | *6* | *1* |

Synthesis of results and comments:

*Fazit of comments below and discussions with users:*
*-day algorithm superior to night algorithm*
*-discontinuity between day and night algorithm hampers applications*
*-not useful in strong frontal situations*
*-very useful for convective situations*
*- applicable in weak frontal situations*

Detailed comments:
Comments refer both to version 1.1 (two precipitation classes) and 1.2(only one precipitation class):

- Strong discontinuity between daytime and nighttime algorithm
- Dawn/dusk underestimations (values and coverage)
- V1.1: the precipitations areas seem very similar to the clouds fields in version 1.1. And for this version, no signal for heavy precipitation probabilities.
- Seemed to be burdened by high false alarm rates independent of probability class (v1.0/1.1)

- Conclusion of verification of PC with TB (10-minute surface rain gauge) data:

1. The satellite retrieved rain probability fits well to the observed ratios. (The highest probabilities fit less.)
2. The verification gave better results using the 10-minute data set than the 30-minute data set.
3. The daytime algorithm gave better results than the nighttime algorithm (it works with more information as solar channel data is also available)
4. In the most cases the observed ratios are increasing with the estimated likelihood, but at night the PC=40% case is an exception, here the ratio is decreasing.
5. The ratios of the rainy cases are lower for Algorithm 4 (cirrus over lower clouds) than for the other algorithms, as these cloud types have the most uncertain precipitation characteristics.

- From Case studies with Hungarian radar:

1. Most useful in convective and week front situations, and less useful in strong front situation. Particularly daytime for the smaller isolated convective clouds it often gives very nice results, almost perfectly fit. There is a strong discontinuity between daytime and night-time algorithm.

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *4 (27 %)*<br>No *4(27 %)*<br>No answer *7(47%)* |
| Synthesis of comments: | See also verification. Mixed evaluation. Two cases of not meeting requirements due to technical reasons outside PGE04 responsibility:<br>• PGE04 isn't correctly processed with our configuration. PC_PROB1 is calculated only for the pixels over Atlantic - westword from 20°W (or 25°W), the values for the other pixels are the same and =15 (UKMO model, Poland, also technical difficulties with PGE03)<br>• Due to problems in converting from h5 format to gif format, the visualization of v1.1 is not carried out correctly (only products in v1.0 are correctly visualized)<br><br>Related to product quality:<br>• The quality is not very good. There is a large difference between night and day and heavy precipitation seems to be underestimated.<br>• we didn't manage to set a threshold that realized an useful discrimination between cloud and precipitation (v1.0/1.1). |
| Applications using PGE output(s) | |
| Current applications | • *Nowcasting,* weather analysis by forecaster etc.<br>• Support aviation meteorology<br>• We visualize it for forecasters. They look at if radar measurements are missing.<br>• I verify it in a Visiting Scientist Activity.<br>• A total precipitation product (9 classes), was developed (for version 1.1)(INM)<br>• Forecast, research<br>• Want to derive "Precipitation motion vectors" from it (ZAMG) |
| ,Planned applications | • Comparison with limited area model outputs<br>• It will be an input data in an automatic software (MEANDER) developed for nowcasting purposes, which will use it if there is no radar data.<br>• Radar anomalies correction (e.g. ground echoes) (INM).<br>• Rain statistics (based on accumulations and –possibly- merging with radar)(INM)<br><br>• Comparison PC_PROB1 with precipitation estimated from microwave data AMSU/NOAA and with radar data – validation of the method and data.<br>• Possibly inclusion in integrated precipitation analyses |
| If not used, | |

| | |
|---|---|
| | You do not have any application using PGExx output_____*0 (0%)*<br>You do not use PGExx output because its quality does not meet your requirements_____*0 (0%)*<br>You do not yet use PGExx, but you are planning to do_____*4 (27%)*<br>*Others factors limiting its use 0(0%)* |
| Comments: | • MF planned at the end of September 2005 for research use; testing for operational use is considered, but not yet scheduled. |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • The quality must be significantly improved especially for heavy precipitation (v1.1).<br>• We would like to use it as input data in our automatic software (MEANDER) developed for nowcasting purposes, which will use it if there is no radar data. But the discontinuity between daytime and nighttime algorithm results may cause mathematical problem (Hungary)<br>• PC should include more data other that SEVIRI (e.g. consider equivalent product from polar, PC from SAFNWC/PPS), or use these to provide a realistic threshold for (likely) significant precipitation values (INM).<br>• Some improvements are mandatory, because PGE04 isn't correctly processed with our configuration (Poland, using UKMO model) |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above |
|---|
| |

| 6.- Additional |
|---|
| |

### 3.4.4.2 Workshop Discussion and Outcomes

| Workshop and US Diskussions and proposed Development |
|---|
| The precipitating clouds product exhibits some problems due to a rather indirect physical coupling between spectral features and precipitation. In the following, status is summerized and developments until the end of IOP suggested.<br><br>**Following problems have been identified by users in the user survey and in validation activity:**<br>1) Generally high false alarm rates, difficult to define useful likelihood threshold for |

precipitation identification
2) Pour performance in strong frontal areas
3) Day algorithm performs better than night algorithm.
4) Discontinuaty between day and night algorithm is a problem
5) Precipitation missed at low sun elevations

**During the Validation activities, a software bug was identified, which only had a minor influence on the results for version 1.2. However, a different algorithm configuration, tuned on French gauge data, was also tested and gives significantly better results for day algorithm.**

**For this new algorithm configuration it is however vital that the software bug is corrected, since the affected term in the calculation of the precipitation index gets a much higher weight (version 2.0 at latest, improvements will be made available to users after PAR if requested)**

Point (1) and (2): ***High false alarm rates – suggested improvements***

For the day algorithm, performance has significantly improved when using the French tuning.

POD has increased, FAR decreased and is decreasing more significantly for higher precipitation thresholds. Suggested threshold for new day algorithm precipitation identification is 30% instead of 20%.

Update for algorithm configuration and bug fix for PI calculation will be provided.

Whether this update also improves performance in strong fronts has to be evaluated. If this is not the case we do not have any further ideas how to substantially improve performance in strong fronts.

Point (3) and (4): ***Discontinuity between day and night algorithm and night algorithm performance***

The update suggested above to achieve a better day time performance will even further increase differences between day and night algorithm. It can however be investigated, whether the night time algorithm performance can be increased by making use of the 3.9µm channel at night. We propose to investigate this during IOP. If the night algorithm can be improved in this way, the development of a PC algorithm for twilight will also be necessary. Possible implementation, depending on results, in CDOP.

Another development planned for IOP is to use the current datasets to do a cloud type dependent mapping of precipitation index to likelihood. Hope is to slightly improve algorithm performance, especially for night.

Point(5):***Precipitation missed at low sun elevations***

Problem solved for new day time tuning.

**Workshop discussion:**

At the workshop there was a suggestion/request from MFT (Senesi) for improving PGE04/MSG by using on-the-flight continuous cross calibration with microwave information from polar satellites

Comment:

We have an ongoing VS study on this. Results so far have been not encouraging when studying correlations between MW rain and VIS/IR features. We propose to await final results and deal with this issue in CDOP if outcome is positive. Development might take form of a across SAF activity (making use of hyrology SAF expertise) or VS activity. Part of the possible development work might be accommodated in PC work for PPS, see corresponding section 7.

### 3.4.5 PGE05 CRR

## Compiled by: INM

#### 3.4.5.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation[1] | *11, (73 %)* |
| | Exploitation[2] | *8, (53 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used | |
| PGE output parameter used: | CRR rainfall rate classes | *8* |
| | *CRR-quality2* | *1* |
| | CRR-dataflag | *1* |
| Processing Areas: | Geographical Areas | |
| | *MSG-N, Europe-B, Europe, Central Europe;* | |
| | *Portugal mainland, Madeira, Azores; Italy; Spain mainland; Poland; Autria; Romania; & surrounding areas* | |
| NWP model used as input: | *ECMWF* | *5* |
| | *GME* | *1* |
| | *UKMO Global* | *1* |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *4* | *1* |
| Subjectively | *8* | *1* |

Synthesis of results and comments:

- *CRR responds reasonably well when heavy precipitations are mainly concentrated in 10 minutes. Underestimation of the rate in comparison to RADAR. (IM)*
- *It seems that the product underestimates the quantity and some convective cells does not precipitation even if there strong convection (SMFAI)*
- *Under investigation. A verification study of CRR against RADAR rain rates over Germany is envisaged to be performed in October/November 05. First careful comparisons with rain gauge measurements revealed an overestimation. (DWD –no solar channel, no corrections)*
- *Verification with 10' TP –objective- (HMS)*

  *Summarizing: we can say that - for CRR>0 cases - the area is overestimated but the rain rate is underestimated. This is something like we can see comparing satellite and radar imagery, the area of the rain is usually smaller than the area of the cloud.*
- *Verification with Radar –subjective- (HMS)*

  *Conclusion: We should emphasize that CRR detects well the developed thunderstorms even at night! In some cases RDT identify convective cloud, radar also shows moderate or heavy precipitation but CRR=0. Sometimes CRR gives values where neither RDT nor ASII_NWP indicate any.*
- *Efficient to discriminate convective rain only, but misses relatively few developed cells, especially nigh-time (intensities not checked). (INM)*
- *CRR is a good indicator for convective rainfall clouds (Poland)*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *4*<br>No *1*<br>No answer *3* |
| Synthesis of comments: | • *Discrepancies between product and ground observations (BGIO)*<br>• *Of coarse it would be better to have more reliable results. But maybe it is not possible using only MSG channel data. (HMS)* |
| Applications using PGE output(s) | |
| Current applications | • *Forecasting – Nowcasting - Visualisation*<br>• *Aviation meteorology*<br>• *Convection monitoring*<br>• *Research*<br>• *Validation activities* |
| Planned applications | • *Combination with radar – Extended radar coverage*<br>• *Possible: Input to automatic systems for nowcasting and warning*<br>• *Comparison with limited area model outputs*<br>• *Objective validation* |
| If not used, | |
| | You do not have any application using PGE05 output_____*0*<br>You do not use PGE05 output because its quality does not meet your requirements_____*0*<br>You do not yet use PGE05, but you are planning to do_____*4*<br>Not generated/used because SAFNWC/MSG is not yet running *1*<br>No answer *2* |
| Comments: | • *1 user plan to start testing by end of September 2005 (MF)* |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • *As for PC product, should include more data other than SEVIRI. (INM)* |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above | |
|---|---|
| *No use of solar channel – 2D calibration* | *5 (BGIO, IM, DWD, Poland, Rumania)* |
| *No corrections used* | *4 (BGIO, IM, DWD, Poland)* |
| *Use of solar channel – 3D calibration* | *3 (SMFAI, HMS, INM)* |
| *Use of all the corrections* | *4 (SMFAI, HMS, INM, Rumania)* |

| 6.- Additional |
|---|
| |

### 3.4.5.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|
| **From User Survey**<br>General remarks about the intensity underestimation and size overestimation of the algorithm.<br><br>**Response:** That's true. The CRR generally underestimates the rainfall rate (high values of radar rainfall rate are not reached by CRR) and sometimes overestimates the area of precipitation when the convection is well developed.<br><br>**Implications:** To modify the calibration approach: use mm/hr instead of classes for the basic value and to try with another more convective Z-R relationship (reflectivity-rainfall rate) instead of using the classic Marshall Palmer for v2.0. Update the SW code accordingly.<br><br>Further considerations about cell size could be introduced during the CDOP phase. |
| |
| **From User Survey**<br>Remark about missed objects mainly associated with warm tops.<br><br>**Response**: That's true. The CRR behaviour is better on well developed convection associated with the colder tops and misses the cells associated with the warmer ones, mainly using 2-D calibration.<br><br>**Implications**: To use a cloud top threshold (based on height or brightness temperature) in order to use a different calibration for warm/cold tops during the next CDOP phase. |
| |
| **From User Survey**<br>Discrepancies between product and ground observations were reported by one user in the User Survey.<br><br>**Response**: The future improvements could solve part of the discrepancies. Moreover, the direct comparison between these different sources is not the best way, being the responsible of part of the discrepancies. Other validation approach (i.e. accumulations instead of instantaneous RR, different size of the boxes, …).<br><br>**Implications**: N/A |

| |
|---|
| |
| **From User Survey**<br>Comment about including more data than SEVIRI in CRR product.<br>**Response:** The occurrence of lightning data could be used in order not to allow the rate to be lower than 3mm/hr (filter threshold), for the next CDOP phase.<br>**Implications**: To add a new requirement in the URD. To change the SW in the CDOP phase. |
| |
| **From Workshop**<br>Forecasters interested in precipitation occurring over time intervals. (Workshop comment).<br>**Response:** To calculate accumulations over several time intervals (1-6-24 hr) for the next CDOP phase. This will allow also for a validation with accumulations, not only with instantaneous RR.<br>**Implications**: To add a new requirement in the URD. To change the SW in the CDOP phase. |
| |

### 3.4.6 PGE06 TPW

## Compiled by: INM

#### 3.4.6.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation(1) | *11 (73 %)* |
| | Exploitation(2) | *7 (47 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used | |
| PGE output parameter used: | TPW main output | *7* |
| | *TPW quality flag* | *0* |
| Processing Areas: | Geographical Areas | |
| | *MSG-N, Europe-B, Europe; 4 areas covering all land pixels within Meteosat disk;* | |
| | *Portugal mainland, Azores, Madeira; Spain mainland; Poland; Austria; Romania; & surrounding areas* | |
| NWP model used as input: | *NOT NEEDED* | - |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *1* | *0* |
| Subjectively | *4* | *0* |

Synthesis of results and comments:

- *The quality of the product has been assessed indirectly, through the validation of DSLF using TPW (v1.0) from NWCSAF and ECMWF forecasts; the latter tends to perform better (IM; v1.0)*
- *Rather good for spatial features distribution. But lack of sensitivity (actual range is quite reduced), and diurnal cycle still too much apparent. (INM)*
- *Still testing phase. There is lower gradation of precipitable values than LPW-PGE07. (Poland)*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *5*<br>No *1*<br>No answer *2* |
| Synthesis of comments: | • *Due to problems in converting from h5 format to gif format, the visualization is not carried out correctly and TPW product is not regularly used for forecasting. (IM)*<br>• |
| Applications using PGE output(s) | |
| Current applications | • *Forecasting – Nowcasting – Visualisation*<br>• *Monitoring of convective and preconvective environment*<br>• *Input for the generation of Land SAF product DSLF*<br>• *Input for generation of PGE12*<br>• *Research* |
| Planned applications | • *The use of PGE06 for other Land SAF products may be considered.*<br>• *Comparison with limited area model outputs*<br>• *Comparison with water vapour profile from NOAA/HIRS data* |
| If not used, | |
| | You do not have any application using PGE06 output_____*2*<br>You do not use PGE06 output because its quality does not meet your requirements_____*0*<br>You do not yet use PGE06, but you are planning to do_____*3*<br>Not generated/used because SAFNWC/MSG is not yet running *1*<br>No answer *2* |
| Comments: | • *1 user started tests with v1.1 and found incoherent results. Decided to stop. No time to test with v1.2. (HMS).*<br>• *1 user plan to start testing by end of September 2005 (MF)* |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • *Reduce LPW (total) and TPW to just one product. (INM)* |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above |
|---|
| *Problems in converting from h5 to gif* |

| 6.- Additional |
|---|
| |

### 3.4.6.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|
| **From User Survey**<br>One remark in the "Improvements and modifications to PGE requested/suggested by users" section 4:<br>- Reduce LPW (total) and TPW to just one product.<br><br>**Response:** It is not wise to stop the potential improvement of PGE06 at this time. Both products will be maintained during IOP. After v2.0 a detailed comparison between both parameters will be performed.<br><br>**Implications:** Perform the detailed comparison between both parameters after distribution of v2.0. |
| |
| **From User Survey**<br>Several remarks into the "PGE Quality Analysis (by the users)" section 2:<br>- Rather good for spatial features distribution but lack of sensitivity (actual range is quite reduced), and diurnal cycle still too much apparent.<br>- There is lower gradation of Precipitable values than LPW-PGE07.<br>- The quality of the product has been assessed indirectly, through the validation of DSLF using TPW (v1.0) from NWCSAF and ECMWF forecasts; the latter tends to perform better.<br><br>**Response:** That's true. The TPW range is smaller than the true and the diurnal and the seasonal cycles are not accurately monitored. Concerning the poor performance for v1.0, It has been improved for v1.2.<br><br>**Implications:** Better representation of Diurnal and Seasonal cycles (Surface Temperature or other air mass low levels indicator). A first SW code update for v2.0. Further improvements will be included into the CDOP phase. |
| |
| **From Workshop**<br>The Land/Sea jumps detected into the TPW images were commented by the users during the meeting and a homogenization of both features requested.<br><br>**Response:** That's true. A land/sea jump is some times observed.<br><br>**Implications:** No further ideas at present, apart of the ones in the previous point. |
| |
| **From Workshop** |

New tuning with Integrated Water Vapour was suggested by the users during the meeting. Quality when compared with IWV GPS provided at the workshop is poor.

**Response:** New datasets can be created at INM taking advance of the IWV GPS data.

**Implications:** Validation activities will include also IWV GPS in the future CDOP project.

### 3.4.7 PGE07 LPW

## Compiled by: INM

#### 3.4.7.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation(1) | *11 (73 %)* |
| | Exploitation(2) | *5 (33 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used | |
| PGE output parameter used: | LPW low level | *5* |
| | *LPW mid level* | *5* |
| | *LPW high level* | *5* |
| | *LPW -Total* | *5* |
| | *LPW quality flag* | *0* |
| Processing Areas: | Geographical Areas | |
| | *MSG-N, Europe-B, Europe;* | |
| | *Portugal mainland, Azores, Madeira; Spain mainland; Poland; Austria; Rumania; & surrounding areas* | |
| NWP model used as input: | *NOT NEEDED* | - |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *1* | *0* |
| Subjectively | *3* | *0* |

Synthesis of results and comments:

- *Quite good. Land/sea boundaries in the ML product (not expected). (INM)*
- *Still testing phase. There is better gradation of precipitable values than TPW-PGE06. (Poland)*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *3*<br>No *1*<br>No answer *1* |
| Synthesis of comments: | • *Due to problems in converting from h5 format to gif format, the visualization is not carried out correctly and LPW is not regularly used for forecasting purposes (IM)* |
| Applications using PGE output(s) | |
| Current applications | • *Forecasting – Nowcasting – Visualisation*<br>• *Monitoring of convective and preconvective environment (specially BL and ML subproducts)*<br>• *Research* |
| Planned applications | • *Nowcasting of fog using the Lower Layer output*<br>• *Comparison with water vapour profile from NOAA/HIRS data* |
| If not used, | |
| | You do not use PGE07 because its outputs do not meet your requirements _____ *1*<br>You do not use PGE07 output because its quality does not meet your requirements _____ *0*<br>You do not yet use PGE07, but you are planning to do _____ *5*<br>Not generated/used because SAFNWC/MSG is not yet running *1*<br>No answer *3* |
| Comments: | • *1 user started tests with v1.1 and found incoherent results. Decided to stop. No time to test with v1.2. (HMS).*<br>• *1 user plan to start testing by end of September 2005 (MF)* |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • *Improve vertical resolution, particularly below 700hPa, or provide fixed-level products. (INM)* |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above |
|---|
| *Problems in converting from h5 to gif*<br>*No use of smoothing* |

| 6.- Additional |
|---|
| *Comparison between LPW (BL), (ML), (HL) products seems very interesting. Provide useful information about precipitable water in different levels. (Poland)*<br>*I might use TPW from LPW as input to PGE12 if it turns out to be superior over the PGE06 output. (ZAMG)* |

### 3.4.7.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|
| **From Workshop**<br>During the users' presentations they demanded accuracy in Central Europe similar to the Iberian Peninsula.<br><br>**Response:** Based on the VAL report, developers informed that the problem in Central Europe was a wetter bias over this area. They proposed to review the radiance bias correction between simulated and observed radiances (Motivation: increase the quality of the parameters in Central Europe).<br><br>**Implications:** Identify the bias between simulated and observed radiances for each IR band and for each pixel (lat,lon) using the reference period (from July 2004 to June 2005). To change the software for v2.0 in the pre-processed and the post-processed steps to include this improved bias correction. The majority of the users expressed that it must be assigned the maximum priority. |
| |
| **From User Survey**<br>One user in the User Survey asked if he might use TPW from LPW as input to PGE12 if it turns out to be superior over the PGE06 output.<br><br>**Response:** Both products will improve following the comments proposed by the developers. After, v2.0 a detailed comparison between both parameters will be performed.<br><br>**Implications:** Perform the detailed comparison between both parameters after distribution of v2.0. |
| |
| **From User Survey**<br>The option of improving the vertical resolution, particularly below 700hPa was suggested by one user in the user survey.<br><br>**Response:** INM will train two neural networks for two layers (below and above 700 hPa) during CDOP (potentially as new PGE), in two ways: splitting middle levels in two layers (BL, ML_lower700, ML_higher700, HL and TPW) or splitting the column in two layers (BL, ML, HL, TPW, PW_lower700 and PW_higher700). |

| |
|---|
| **Implications:** To add a new requirement in the URD. To change the software in the corresponding version during the CDOP phase. |
| |
| **The developers** reported that the PGE07 is not useful over desert areas. (Motivation: increase the quality of the parameters in desert areas).<br><br>**Implications:** it is proposed to reallocate the manpower associated with the improvement of this product to identify the bias between simulated and observed radiances. After this task will finish, the desert areas problem will be boarded. The users expressed that their priority is Central EUROPE no desert areas. |

### 3.4.8 PGE08 SAI

## Compiled by: INM

#### 3.4.8.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation(1) | *11 (77 %)* |
| | Exploitation(2) | *8 (53 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used | |
| PGE output parameter used: | Lifted Index | *8* |
| | *SAI quality flag* | *0* |
| Processing Areas: | Geographical Areas | |
| | *MSG-N, Europe-B, Europe;* | |
| | *Portugal mainland, Madeira, Azores; Italy; Spain mainland; Poland; Austria; Romania; & surrounding areas* | |
| NWP model used as input: | *NOT NEEDED* | - |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *2* | *1* |
| Subjectively | *5* | *1* |

Synthesis of results and comments:

- *Land/sea differences, diurnal cycle (over land). Likely, dependences of air mass and perhaps surface temperature appear in the product. (INM)*
- *SAI do not achieve high value in our (POLAND) latitude, even in cases of severe convective weather. (In lower latitude the highest SAI values occur quite often). (Poland)*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *4*<br>No *3*<br>No answer *1* |
| Synthesis of comments: | • *Due to problems in converting from h5 format to gif format, the visualization is not carried out correctly and PGE08 is not regularly used for forecasting purposes (IM)*<br>• *I recently observed wildly overestimated instability over sea areas like the Adriatic Sea with conspicuous jumps at coastlines (areas around Spain apparently OK; tuning too local?) (ZAMG)* |
| Applications using PGE output(s) | |
| Current applications | • *Forecasting – Nowcasting – Visualisation*<br>• *Monitoring of convective/preconvective environment*<br>• *Aviation meteorology*<br>• *Input for generation of PGE12*<br>• *Research* |
| Planned applications | • *Possible: Input to automatic system for nowcasting and warning*<br>• *Comparison with limited area model outputs* |
| If not used, | |
| | You do not use PGE08 because its outputs do not meet your requirements _____ *1*<br>You do not use PGE08 output because its quality does not meet your requirements _____ *0*<br>You do not yet use PGE08, but you are planning to do _____ *3*<br>Not generated/used because SAFNWC/MSG is not yet running *1*<br>*No answer* *2* |
| Comments: | • *1 user started tests with v1.1 and found incoherent results. Decided to stop. No time to test with v1.2. (HMS).*<br>• *1 user plan to start testing by end of September 2005 (MF)* |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • *To clarify the reasons for the land-sea-discrepancies often can be found in SAI and to overcome it (DWD)*<br>• *Consider inclusion of NWP data in the SAI (but could also be said with respect to other air mass products). (INM)*<br>• *I recently observed wildly overestimated instability over sea areas like the Adriatic Sea with conspicuous jumps at coastlines (areas around Spain apparently OK; tuning too local?) (ZAMG)*<br>• *To include information and details about the lifted index used (HMS)* |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above |
|---|
| *Problems in converting from h5 to gif*<br>*No smoothing except DWD that uses 9x9 average in the output* |

| 6.- Additional |
|---|
| *NN algorithms cause big differences in SAI value over land (lower values) and sea (higher values)- discontinuity.*<br>*In our (Poland) latitude SAI do not indicate extreme instability air conditions (severe thunderstorm, heavy rain) as extreme.*<br>*Algorithm should better diversify SAI in higher latitude (Middle Europe) (Poland)* |

### 3.4.8.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|
| **From User Survey**<br>Some users in the User Survey and during the users' presentations ask for the LI accuracy, in particular for the different accuracy between Central Europe and the Iberian Peninsula.<br><br>**Response:** The developers reported based in the validation report that the problem in Central Europe was a bias over this area. They proposed to review the radiance bias correction between simulated and observed radiances.<br><br>**Implications:** Identify the bias between simulated and observed radiances for each IR band in each pixel (lat,lon) using the reference period (from July 2004 to June 2005). To change the software for v2.0 in the pre-processed and the post-processed steps to include this improved bias correction. This task is common to PGE07 because the pre-process is equal in both products. The majority of the users expressed that it must be assigned the maximum priority. |
| |
| **From User Survey**<br>Some users in the User Survey and during the users' presentations ask for the LI land-sea discrepancies. |

**Response:** In the developers' presentation similar MODIS LI land-sea-discrepancies at nigh time were presented. The necessity of make a more carefully analysis has been detected.

**Implications:** Perform a quantitative comparison with MODIS LI, after distribution of v2.0

**From Workshop**

The option of introduce other indexes as K Index or Sowalter Index with less surface influence for CDOP was suggested by the developers during the workshop discussion on SAI and accepted by the users.

**Implications:** To add a new requirement in the URD. Change the software in the corresponding version (potentially as new PGE) during the CDOP phase.

**The developers** reported that the PGE08 is not useful over desert areas. (Motivation: increase the quality of the parameters in desert areas).

**Implications:** it is proposed to reallocate the manpower associated with the improvement of this product to identify the bias between simulated and observed radiances. After this task will finish, the desert areas problem will be boarded. The users expressed that their priority is Central EUROPE no desert areas.

**From User Survey**

One user in the User Survey asks for the possibility to include NWP in the SAI algorithm.

**Response:** The developers reported that the PGE08 has improved in all last versions; therefore it is adequate to continue with the proposed development line. Moreover, LI trends are useful since version 1.2 and the inclusion of a single NWP field can introduce jumps (depending on the size of the time-step) in the trends behaviour.

**Implications:** No actions to be taken.

### 3.4.9 PGE09 HRW

## Compiled by: INM

#### 3.4.9.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation(1) | *8 (53 %)* |
| | Exploitation(2) | *4 (27 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used | |
| PGE output parameter used: | HRW Wind Output | *3-B 4-D* |
| | HRW Level | *3-B 3-D* |
| | HRW Quality Flag | *2-B 2-D* |
| Processing Areas: | Geographical Areas | |
| | *Central Europe;* | |
| | *Portugal mainland, Azores, Madeira; Spain; Poland; Belgium; & surrounding areas* | |
| NWP model used as input: | *ECMWF* | *5* |
| | *UKMO Global* | *1* |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *0* | *0* |
| Subjectively | *2* | *0* |

Synthesis of results and comments:

- *Generally good; some "crossed" winds, or unexpected calms, appear due to land influence or too uniform cloudiness. (INM)*
- *Wind speed and direction seem realistic. (Belgium)*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *3*<br>No *1*<br>No answer *0* |
| Synthesis of comments: | • *Night-time information is needed for nowcasting activities* (Belgium)<br>• *Starting tests (HMS)* |
| Applications using PGE output(s) | |
| Current applications | • *Forecasting – Nowcasting – Visualisation*<br>• *Mesoscale circulations (particularly in relation to convective/preconvective environment)* |
| Planned applications | • |
| If not used, | |
| | You do not use PGE09 because its outputs do not meet your requirements _____ *0*<br>You do not use PGE09 output because its quality does not meet your requirements _____ *0*<br>You do not yet use PGE09, but you are planning to do _____ *6*<br>You do not have any application using PGE09 output *3*<br>BUFR decoding/visualisation as a prohibitive factor *2*<br>Not generated/used because SAFNWC/MSG is not yet running *1*<br>Missed NWP parameters *1*<br>No answer *0* |
| Comments: | • *1 user plan to start testing by end of September 2005 (MF)*<br>• *Some improvements are mandatory for our PGE09 calculations, because the following parameters are not available in our NWP data set (Poland):*<br>*NWP_PT, at 200 mb , 150, ... 10*<br>*NWP_UW, NWP_VW at 200*<br>• *Our another problem is visualisation of the BUFR format, we need find the way to present BUFR products (Poland)* |

4.- Improvements and modifications to PGE requested/suggested by users

- *Suggestion of an application to convert BUFR to gif or to visualize BUFR products so the product could be easily used. (IM)*
- *Some improvements are mandatory for our's PGE09 calculations, because the following parameters are not available in our NWP data set (Poland):*

  *NWP_PT, at 200 mb , 150, ... 10*

  *NWP_UW, NWP_VW at 200*
- *Need for locally generated winds with high spatial/temporal resolutions also at night in order to assure some kind of continuity in the operational practices. (INM)*
- *Better coverage (particularly detailed winds and low levels) is desirable.*

  *Desirable to make the quality control more usable, e. g. by tuning the QI threshold wind by wind (currently it is useless, because fixed to a somewhat arbitrary value). (INM)*

5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above

*About the 2 scales and basic and detailed datasets*

*1 user Only use Detailed Scale for visualisation (DWD)*

*Detailed winds do not provide much improvement to basic, or not easy to determine. Used separately. (INM)*

*1 user use both datasets together(Belgium)*

*Which aspects would be more important in Quality estimation*

| | |
|---|---|
| 1, 1, 1, 4, 1, | *Quality related to atmospheric level assignment* |
| 2, 5, 1, 3, | *Quality related to small scale variations, or relatively rapid variations in the output (HRW output dispersion)* |
| 3, 2, 2, | *Quality related to land influence conditions* |
| 2, 5, 4, | *Quality related to precarious illumination conditions* |
| 4, 6, 5 | *Quality related to very slant satellite observation conditions* |
| 3 | *Other Aspects: related to the degree of ambiguity in the tracking procedure and quality in the wind selection and quality indicator (QI) determination* |

6.- Additional

### 3.4.9.2 Workshop Discussion and Outcomes

## Workshop Discussion and Outcomes

### *User comments and requirements from User Survey.*

| *User comments and requirements* | *Analysis* | *Proposal* | *Priority* |
|---|---|---|---|
| Some users are having problems to decode and visualize BUFR Output Files. This is a general problem concerning all products generating BUFR files. It does not depend of PGE09 product. | | | |
| SAFNWC/MSG packages include a BUFR to HDF5 conversion tool. Users have been told to take advantage of it. | A more general solution is required, useful for everybody. | | |
| System Software & Engineering Integrator will be contacted to facilitate users BUFR Exploitation at the next version. | | Next version (2.0) | |
| One user cannot use NWP data for PGE09 Exploitation because some parameters are not available for him (NWP_UW & NWP_VW at 200 hPa, NWP_PT at 200/150/100 hPa). | This includes two different problems: | | |
| If any of NWP_PT is not available, PGE09 Algorithm is obliged to use Climatological temperature profile. | | | |
| Instead, NWP_UW & NWP_VW are not used for Wind calculation and they cannot interfere with Algorithm results. They are used only at Wind guess quality test, to compare the calculated winds with the model winds. The result is simply that Guess test will not be calculated at the missing levels. | PGE09 Algorithm will be changed to keep on using NWP_PT profile if a certain number of temperature levels is available. With this, the user will be able to use NWP temperature data for its wind calculation. | | |
| About NWP_UV&NWP_VW, the decision is to use the product as it is. | | Next version (2.0) | |
| Night time information is demanded for nowcasting activities. | HRW is only available during daytime. | | |
| Users have asked for Wind calculation during the night using Infrared channels. | | An adaptation of PGE09 Algorithm to Infrared channels will be developed. After studying its behaviour, it might be included at PGE09 Algorithm. CDOP phase | |
| A better wind coverage is demanded. Using jointly both sets of winds (basic and detailed) helps users to reach this objective. | | | |
| PAR Workshop PGE09 Validation Presentation showed users how to implement this efficiently. | | To use as it is, taking into account recommendations considered at PAR Workshop. | N/A |
| One user is demanding some control on the Quality index calculation, asking for the possibility to adjust by himself the importance that the different tests are having on the Quality Index. | The weight of the different Quality test at Quality Index calculation is a parameter included at PGE09 Configuration file. Users can change values freely. | | |
| Anyhow this is not explicitly said at Section 2.2.7 of PGE09 User Manual / Scientific part, and users may not know they can adjust values. | | An indication will be included at Section 2.2.7 of PGE09 User Manual / Scientific part, to clarify users they can change Weight values. Next version (2.0) | |
| A validation related to HRW output dispersion is demanded. | This aspect has not been considered at PGE09 Validation Report. A Validation process considering more frequent data (Radar VAD Wind or NWP profiles) is needed for this. | | |
| It will be considered in future Validation processes. | | CDOP phase | |
| A validation related to precarious illumination conditions is demanded. | This aspect has only partly been considered at PGE09 Validation Report, where influence of solar elevation (between 15 and 90 degrees) on Validation parameters has been studied. | | |
| Anyhow, no considerations have been taken considering very low solar elevations. | | To study the effect of very low solar elevations at PGE09 Version 2.0 Validation process, considering a more extensive geographical area. Next version (2.0) | |
| A validation related to low satellite elevation conditions is demanded. | This aspect has not been considered at PGE09 Validation Report. | To include this aspect at PGE09 Version 2.0 Validation process, considering a more extensive geographical area. Next version (2.0) | |

### *User comments and requirements from Workshop Comments.*

| *User comments and requirements* | *Analysis* | *Proposal* | *Priority* |
|---|---|---|---|
| A validation related to atmospheric level assignment is demanded. | | This aspect has | |

not been considered at PGE09 Validation Report (version 0.1 for the PAR Workshop). To include a Section about Quality related to Atmospheric level assignment at version 1.0 of PGE09 Validation Report, to detect where Wind level assignation may be having any problems. Version 1.0 of PGE09 Validation Report.

A validation related to land influence on the different layers is demanded. This aspect has been considered at Section 4.6 of PGE09 Validation Report (version 0.1 for the PAR Workshop).

Anyhow, users have asked for a more explicit study about orographic influence at mid and high levels. The Section about Quality related to Geographical effects at version 1.0 of PGE09 Validation Report will be extended, to include a more explicit study of orographic influence at mid and high levels. Version 1.0 of PGE09 Validation Report.

Accepted. Action to be performed by the Product developer.

Action to be addressed to other centre.

Requirement not accepted. To use as it is.

## 3.4.10 PGE10 ASII

## Compiled by: *ZAMG*

### 3.4.10.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE10 | | |
|---|---|---|
| Generation & Use: | Generation(1) | *9 (60 %)* |
| | Exploitation(2) | *5 (33 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used | |
| PGE output parameter used: | *ASII* | *5 (33 %)* |
| | *ASIINWP* | *5 (33 %)* |
| | *IR AMV* | *3 (20%)* |
| | *WV AMV* | *3 (20%)* |
| Processing Areas: | Geographical Areas | |
| | *Europe* | |
| NWP model used as input: | *ECMWF (ASII used)* | *4 (27 %)* |
| | *UK met office high res (ASII not yet used)* | *1 (7 %)* |
| | *ECMWF (ASII not yet used)* | *1 (7 %)* |
| | *no answer (ASII used)* | *1 (7 %)* |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *0* | *0* |
| Subjectively | *3* | *1* |

Synthesis of results and comments:

- *MCS mixed up with other small scale cloud features (ASII)*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *4 (29 %)*<br>No *0 (0 %)*<br>No answer *11 (73 %)* |
| Synthesis of comments: *No comments available* | |
| Applications using PGE output(s) | |
| Current applications | • *production of an Automatic SatRep (ZAMG)*<br>• *validation of CRR (Hungary)*<br>• *visualisation for forecaster (additional tool for weather analysis)*<br>• *nowcasting (Belgium)* |
| Planned applications | • *as input data in an automatic software (MEANDER) developed for nowcasting purposes. There is a thunderstorm module in it, and the detection and the development phaseof Cb, MCS, embedded Cb would increase the quality of this module (Hungary)*<br>• *use in automatic alarm dispatch system (Hungary)* |
| If not used, | |
| | You do not have any application using PGE10 output_____*0 (0%*)*<br>You do not use PGE10 output because its quality does not meet your requirements_____*2 (20%*)*<br>You do not yet use PGE10, but you are planning to do_____*5 (50%*)*<br>BUFR decoding is a problem *2 (20%*)*<br>no answer *2 (20%*)*<br><br>* *percentages refer to institutes which do not use PGE10* |
| Comments: | • *Suggestion of an application to convert BUFR to gif or to visualize BUFR products* |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • *use more channel data*<br>• *improvements in wave detection and fibre detection*<br>• *NWP handling (extrapolation to be substituted by an interpolation)* |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above |
|---|
| Could a separate AMV module be useful ?<br><br>Yes_____ *3 (60%*)*<br>no answer *2 (40%*)*<br><br>* *percentages refer to institutes which do use PGE10*<br><br>Can you name conceptual models whose analysis are of particular importance and should therefore be focussed on in future developments (or, if missing in the current release, should be taken on board)?<br><br>• *MCS, Cb, embedded Cb, developing wave, rapid cyclogenesis, cold air cloudiness* |

| 6.- Additional |
|---|
| |

### 3.4.10.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|
| One user remarked in the "Engineering" section: "PGE10 (and 12) use an old version of BUFR. Use the latest definition of BUFR files."<br><br>**Response:** ZAMG has identified the source of the comment (KNMI) and will contact the user for further information on the changes he desires.<br><br>**Implications:** Minor routine change to software in v2.0, if any. |
| |
| One user (not in the User Survey but through personal mailing, and subsequently reported by ZAMG at the PAR workshop) asked if the PGE10 (and 12) software might be re-written such that it (optionally) accepts 3-hourly NWP data.<br><br>**Response:** ZAMG expects that this enhancement can be implemented in v2.0 |

| |
|---|
| **Implications:** Review of NWP handling logic and software modifications required. Covered by WP25/53.10. |
| |
| **The developers** moreover reported that they intend to replace the current NWP data extrapolation with atmospheric motion vectors (in order to have these data at time slots not covered by the NWP) by some sort of interpolation scheme. (Motivation: Extrapolation stops in case of too long satellite data outages and resumes only at the next NWP forecast date, thereby causing excessive product outages).<br><br>**Implications:** None at the time being. Development task to be handles in CDOP |
| |
| Handling of BUFR output and the BUFR-to-HDF conversion routine was an issue in all affected PGE. Developers and also some users finally conceded that a visualization satisfying all or at least a majority of users is outside the scope of the NWCSAF and the required enormous resources are better spent on products' developments<br><br>**Implications:** None at the time being. ZAMG in this context wishes to draw attention to the webpages http://www.zamg.ac.at/satweb/SAF/SAF2/ASII.htm (reference product site of the last delivered SAFNWC/MSG version) and http://www.zamg.ac.at/satweb/SAF/SAF2/main.html (GIF images based on the latest ZAMG-internal version of PGE10) |
| |
| The option of an "Atmospheric Motion Vector" package (enhanced, separated from PGE10) was welcomed by all users answering this particular question in the user survey. However, during the discussion, a parallelism was identified as users also asked for a nighttime module in PGE09 (HRV winds).<br><br>**Response:** ZAMG intends to propose an AMV package for CDOP (potentially as PGE13), however with the reservation that no duplication with PGE09 developments shall take place.<br><br>**Implications:** Since this activity is to be shifted into the next phase (also imposed by slips in the MSG time schedule → insufficient time left for the cycle of proposal, steering group agreement etc.), foreseen manpower is released from WP25/53.10. It is proposed to reallocate this manpower to a complete refurbishment of the airmass classification product of PGE12. The user response on the AMV issue may constitute a new User Requirement to be manifested in the NWCSAF URD. |

### 3.4.11 PGE11 RDT

## Compiled by: Météo-France (MF-DPR)

#### 3.4.11.1 User Survey Synthesis

| Number of filled forms | 15 |
|---|---|

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| "%*" referred to institutes which do exploit PGE11<br>"%**" referred to institutes which doesn't exploit PGE11 | | |
| Generation & Use: | Generation(1)<br>Exploitation(2)<br>(1) PGE is generated by the application<br>(2) PGE output(s) is(are) used | *10 (66 %)*<br>*8 (53%)* |
| Input fields: | *Lightning*<br>*PGE03 (CTTH)* | *5 (62 %*)*<br>*7 (87 %*)* |
| Processing Areas: | Geographical Areas<br>*Europe (4)*<br>*Central Europe (1)*<br>*Spain (1); Poland (1); Belgium (1)* | |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *1 (local manager)* | *1* |
| Subjectively | *6* | *0* |

Synthesis of results and comments:

*The quality of the product has been assessed subjectively by users. There is no report estimating the rate between misses and false alarms observed. The quality was estimated as good with some disappointing cases: Ci; Cs classified as convective and on the other hand severe thunderstorm not identified.*

*The Hungarian quality overview seems to be close to the objective estimation realized by local manager. They observe a weakness in discrimination results and some cases of instability on development phase time series. The discrimination was not efficient during winter period. The detection precocity was poor, and it was preferable to use RDT with lightning data.*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *6*<br>No *0*<br>No answer *0* |
| Synthesis of comments: | The scale of interest varies among users. 4 users prefer matching the top of convective tower against 2 for matching the convective system scale. Maybe the question was not clear enough. After reading user reports, the proposal by Ralf Becker (Deutscher Wetterdienst), namely to explicitly address both scales, seems to be the most comprehensive strategy for this application. Furthermore, some users try to integrate the product as an input to an assimilation scheme. |
| Applications using PGE output(s) | |
| Current applications | • Use by forecaster for nowcasting (7)<br>• CRR validation (1)<br>• Investigate automatic station under convective clouds (1) |
| Planned applications | • Input data for weather warning system (2)<br>• Combined with RADAR data (2 with Switzerland)<br>• Extend Radar coverage (1)<br>• Scientific research: convective system over tropical African (2)<br>• Input for mesoscale model assimilation scheme (2) |
| If not used, | |
| | You do not have any application using PGE11 output_____*2 (33%**)*<br>You do not use PGE11 output because its quality does not meet your requirements_____*0*<br>You do not yet use PGE11, but you are planning to do_____*2 (33%**)*<br>BUFR decoding (visualisation problem) 3 (42.8%**)<br>General technical problem *1*<br>No answer *1* |
| Comments: | This part was not detailed by users to conclude |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • *Improve discrimination and precocity:*<br>*- Use HVR data*<br>*- Use others PGE input* |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above |
|---|
| *Users do make use of a number of RDT output parameters. For the main ones:*<br>- *nature of cloud: 6 (75%*)*<br>- *phase of life: 7 (87%*)*<br>- *direction of move: 7 (87%*)*<br>- *speed of move: 7 (87%*)*<br>- *contour of cloud system: 6 (75%*)*<br>- *cooling rate: 7 (87%*)*<br>- *No answer: 1*<br><br>*RDT BUFR provides additional information: expansion, flashes counts, some time-series, quality flag…*<br>*Access to exhaustive parameter list seems to be appreciated by users. Furthermore, the web page visualisation in three levels is relevant.* |

| 6.- Additional |
|---|
| *MF-DPr provides some proposals in the evaluation report in order to improve this application.* |

### 3.4.11.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|
| The PAR User Survey points out the great interest for the RDT. The identification of convective clouds, their tracking and the set of characteristics depicted by RDT meet user's requirements and allow to use RDT for several applications: from research to nowcasting application.<br><br>The main scale of interest varies among users between convective tower scale and whole convective system scale. This point has not raised any new formal user's requirements but some talks. The separation between this two scales is not clear. Indeed, the diagnostic of shield-emerging convective tower is useful for forecasters in order to attract their interest on more severe thunderstorms inside a whole convective system. On the other hand, the diagnostics computed on the whole extent of convective systems are necessary for depicting the situation. Furthermore, it is useful for several applications such as climatology or assimilation scheme. |

The quality of RDT discrimination is not bad but some weaknesses are observed by users. Some disappointing cases have been shown by the Hungarian. Meteorological Service. The cases shown were a low stratus discriminated as convective and one cloud system without interest labelled as convective during a long period. Furthermore, the precocity is quite late compared with lightning flashes occurrence. The main user's requirement is the improvement of the discrimination and the precocity skill of RDT.

At last, users report some concerns on the demonstration web page of Meteo-France, when using it for checking their own visualization. Indeed, the RDT displayed on this site benefits from lightning data and is computed in a technical framework slightly different form the SAF one. So, users cannot really check their process against it.

The local manager has formulated a number of proposals in order to improve the quality of RDT. He defines three main short term improvement paths:

- population definition;
- various ground truth for the convective nature of the clouds;
- discrimination scheme.

The use of other products of SAF Nowcasting or other channels of MSG (IR and/or HRVIS), as proposed by users, is addressed further below, in the longer term paragraph.

Indeed, the objective validation undertaken by the development team points out some weakness in population definition leading to a lack of homogeneity inside the learning convective dataset:

- a mix between secondary temperature minima of mature systems and developing thunderstorm;
- a mix between convective and non convective cloud linked to uncertainties in the pairing of clouds with lightning data.

The local manager proposes to separate convective clouds in two populations, mature and developing thunderstorms, based on a physically-based threshold for the cloud cell detection brightness temperature value. For clouds colder than the threshold brightness, the convective nature will be inherited and the clouds will be only depicted and tracked. The discrimination will be performed only below this limit. This improvement will allow to focus more on the initial purpose of RDT.

Moreover, the examination of an alternate ground truth could improve the homogeneity of the convective population inside learning data set. The use of a ground truth issued from satellite data, such as a cooling rate and/or a given vertical development, may provide an efficient tuning on wide areas without reliable ground observation network.

Furthermore, the objective validation has shown an over-discrimination of the method on the learning dataset. This issue is the main priority before the use of new promising discrimination parameters.

Still, in the short term, but outside committed development tasks, the local manager considers improving Meteo-France's demonstration website in order to provide a reference visualization. An explanatory section will be added to clarify the comparison method between two SAF RDT process results and to depict the post-processing of Meteo-France.

For the longer term, Météo-France DPr proposals were to :

- better use, and improve consistency with, the Cloud products for an improved early detection of convective clouds; this is pending on the improvement of the Cloud products on the low levels and the sub-pixel clouds. This option seems preferable than designing new combinations of other channels.
- improve further the discrimination by re-considering the use of other sources of diagnostics for the atmospheric instability, the low-level moisture supply and the forcing mechanisms, either through SAF-NWC products or, rather, using NWP data, assuming that users will provide high-quality LAM NWP inputs to the SAF-NWC system
- Test the RDT algorithm for Upper Level Dynamics monitoring, by tracking dry cores in WV images, and/or high value cores in O3 product; this could eventually lead to introduce a new , 13$^{th}$ , SAF-NWC product, which proposed acronym is MULDO (Monitoring Upper Level Dynamics in an Object-orientated way)

These proposals were not much discussed during the PAR workshop, mainly due to lack of time.

## 3.4.12 PGE12 AMA

## Compiled by: *ZAMG*

### 3.4.12.1 User Survey Synthesis

| | |
|---|---|
| Number of filled forms | 15 |

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation(1) | *10 (67 %)* |
| | Exploitation(2) | *7 (47 %)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used | |
| PGE output parameter used: | Air mass classification HDF5 output | *6 (40%)* |
| | *WV dark stripe* | *3 (20 %)* |
| | *ridge line* | *3 (20 %)* |
| | *gradient zone* | *3 (20 %)* |
| Processing Areas: | Geographical Areas | |
| | *own country plus surrounding* | |
| | *Europe* | |
| NWP model used as input: | *ECMWF* | *7 (47 %)* |
| | *GME* | *1 (7 %)* |
| | *UK met office high resolution* | *1 (7 %)* |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *1* | *0* |
| Subjectively | *6* | *1* |

Synthesis of results and comments:

- *disappointing results (BGIO)*
- *differences between AMA and experiences found: over sea at night, above Iberian Peninsula during day, above North Africa most of the time (BTIM)*
- *Very close areas may be classified with totally different air mass types.(Belgium)*

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *3 (20 %)*<br>No *2 (13 %)*<br>No answer *10 (67 %)* |
| Synthesis of comments: | |
| Applications using PGE output(s) | |
| Current applications | • *operational forecasts*<br>• *nowcasting: analysis of the air mass. Delimitation of area with higher probability of convection.*<br>• *research (Romania)* |
| Planned applications | • *visualize together with with pot.. vorticity, WV image (dark stripes) to find model errors (Hungary)* |
| If not used, | |
| | You do not have any application using PGE12 output_____ *0 (0%*)*<br>You do not use PGE12 output because its quality does not meet your requirements_____ *2 (25%*)*<br>You do not yet use PGE12, but you are planning to do_____ *3(38%*)*<br>You do not use because of problems with BUFR decoding *1 (12%*)*<br>*no answers* *3 (38%*)*<br><br>* *percentage refers to institutes which do not use PGE12* |
| Comments: | • *The use of the image-like subproduct is pending on a better knowledge of characteristics of the products input to PGE12.* |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| • *surface temperature in air mass classification has to be replaced by another concept*<br>• *it is desirable to provide a way for having information on cloud contaminated area.* |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above |
|---|
| At the first user's workshop, a remark was made on a potential reduction of the number of classes. Literature is inhomogeneous with weather services using between 4 and 19 air mass classes. Do you have a specific standpoint on this issue?<br><br>*In the Portuguese Met.Office air masses are separated in 4 main categories (artic, polar, tropical, equatorial). An additional separation in moist (maritime) and dry (continental) is considered for polar and tropical. Therefore, resulting in 6 categories. Separation in moist and dry may also be used for artic and equatorial, therefore resulting in 8 categories.* |

| 6.- Additional |
|---|
| |

### 3.4.12.2 Workshop Discussion and Outcomes

| Workshop Discussion and Outcomes |
|---|
| **User survey** remarks, presentations, and discussions chiefly dealt with the quality of the air mass classification sub-product of PGE12.<br><br>**Response:** The developers intend to substitute the surface temperature (originally implemented following a proposal from reviewed literature) by a more suitable quantity. Ideas exist; based on difference channels 8-9 and 5-6. (Note: Land surface temperature from the Land-SAF was brought up during the discussion by the auditorium. A possible use of NWP input emerged as idea during discussions, but likewise needs to be further assessed in more detail)<br><br>**Implications:** ZAMG considers this to be the most urgent improvement needed by one of its products. It is therefore intended to devote most of the manpower foreseen in WP25/53.10 to the renovation of the air mass classification product. |
| |
| **Response** to the user comment "*it is desirable to provide a way for having information on* |

| |
|---|
| *cloud contaminated area"*: ZAMG considers this to be a difficult problem, with all other NWCSAF air mass parameters (input to AMA) also not being derived in cloudy areas and all MSG channels being considerably different between cloudy and cloud free areas. There is a certain chance that the concepts to remedy the above-mentioned surface temperature problem may also show a way to reasonably extend air mass classifications into cloud-contaminated areas.<br><br>**Implications:** None at the time being. May be proposed as a (challenging) package for CDOP |
| |
| The response from the Portuguese Met. Service about a different classification scheme was presented (see also section 5 in the user survey synthesis on PGE12), and no objection was received. In fact, one additional user expressed his support for a reduced number of classes.<br><br>**Response:** ZAMG will implement the corresponding changes a.s.a.p. Stability (SAI) input will become an (only) optional one from v2.0 on (roughly halving the classes on demand). The introduction of designations "maritime" and "continental" instead of "dry", "moist", "normal" shall take place after an evaluation of TPW thresholds found in literature (so far thresholds were only found for polar and tropical air masses; for these two types, an implementation already in v2.0 is likely)<br><br>**Implications:** Can be covered in the frame of WP25/53.10. Fine-tuning of thresholds (if required) possibly also under WP26/54.10. The outcome of the PAR workshop seems to justify a reformulation of UR-7.12.2.2. in the NWCSAF URD. |
| |
| **One user** remarked in the "Engineering" section: "PGE12 (and 10) use an old version of BUFR. Use the latest definition of BUFR files."<br><br>**Response:** ZAMG has identified the source of the comment (KNMI) and will contact the user for further information on the changes he desires<br><br>**Implications:** Minor routine change to software in v2.0, if any. |
| |
| **One user** (not in the User Survey but through personal mailing, and subsequently reported by ZAMG at the PAR workshop) asked if the PGE12 (and 10) software might be re-written such that it (optionally) accepts 3-hourly NWP data.<br><br>**Response:** ZAMG expects that this enhancement can be implemented in v2.0<br><br>**Implications:** Review of NWP handling logic and software modifications required. Covered by WP25/53.10. |
| |
| **The developers** moreover reported that they intend to replace the current NWP data extrapolation with atmospheric motion vectors (in order to have these data at time slots not covered by the NWP) by some sort of interpolation scheme. (Motivation: Extrapolation stops in case of too long satellite data outages and resumes only at the next NWP forecast date, thereby causing excessive product outages).<br><br>**Implications:** None at the time being. Development task to be handled in CDOP |
| |

Handling of BUFR output and the BUFR-to-HDF conversion routine was an issue in all affected PGE. Developers and also some users finally conceded that a visualization satisfying all or at least a majority of users is outside the scope of the NWCSAF and the required enormous resources are better spent on products' developments

**Implications:** None at the time being. ZAMG in this context wishes to draw attention to the webpage http://www.zamg.ac.at/satweb/SAF/SAF2/ASII.htm, a reference product site of the last delivered SAFNWC/MSG version.

## 3.5 NWCSAF/PPS PGES

### 3.5.1 PGE01 CMa

## Compiled by: SMHI

#### 3.5.1.1 User Survey Synthesis

| Number of filled forms | 6 |
|---|---|

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation(1) | *6 (100%)* |
| | Exploitation(2) | *4 (67%)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used (not only as input for generation of other PGEs) | |
| PGE output parameter used: | *CMa main output* | *4 (67%)* |
| | *CMa quality flags* | *2 (33%)* |
| | *CMa test flags* | *0 (0%)* |
| Processing Areas: | Geographical Areas | |
| | CM-SAF baseline area | |
| | Danmark | |
| | North Atlantic (OSISAF areas) | |
| | Germany, North sea | |
| | Skandinavia, Northern Europe | |
| NOAA Satellites used: | *All available* | *6 (100%)* |
| | Comment: 'all'=2, plus 15-18=3, 15-17 used by smhi at time of reporting, now also 15-18 used | |
| NWP model used as input: | *GME/DWD* | *2 (33%)* |
| | *HIRLAM* | *3 (50%)* |
| | *ECMWF, 12 hours* | *1 (17%)* |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *1* | *1* |
| Subjectively | *3* | *0* |

Synthesis of results and comments:

- There has been some few cases where low clouds are seen as cloud free areas and low thin clouds have been seen as transparent clouds. (DMI)

## 3.- PGE Applicability assessment

| | |
|---|---|
| Meets expected Requirements? | Yes *4 (67%)*<br>No *0 (0%)*<br>Not applicable *2 (33%)* |
| Synthesis of comments: | *Positively evaluated of all users of output* |

### Applications using PGE output(s)

| | |
|---|---|
| Current applications | • Slippery road model (DMI)<br>• OSISAF masking of cloudy areas for SST and flux products (DMI)<br>• Browser presentation for forecasters (DMI)<br>• Generation of daily/monthly means of the cloud mask (CMSAF) |
| Planned applications | - |

### If not used,

| | |
|---|---|
| | You do not have any application using PGE01output *N.A.*<br>You do not use PGE01output because its quality does not meet your requirements *N.A.*<br>You do not yet use PGE01 but you are planning to do *1 (17 %)* |
| Comments: | • |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| ▪ Cloud mask and semi-transparent clouds are difficult to handle. (DMI)<br>▪ OSISAF: Better ice/cloud separation (DMI)<br>▪ Large differences in cloud mask over land and sea (CMSAF)<br>▪ Too many partially cloudy pixels with no further indication about the cloud type (CMSAF)<br>▪ Problems still exist in low sun angles, and sometimes in situations with thin High clouds (Swedish Air Force) |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above |
|---|
| |

| 6.- Additional |
|---|
| *Climate SAF raised possible requirement to process from IR channels only to avoid differences stemming from Day/Night/Twilight processing* |

### 3.5.1.2 Workshop Discussion and Outcomes

| Workshop and US Discussions and proposed Development |
|---|
| Generally good performance.<br><br>Problems identified:<br>1) A general underestimation of cloud cover over land: Occasional missing fractional clouds, low clouds, thin cirrus.<br>2) Underestimation of cloud cover in twilight<br>3) Cloudy false alarms in areas of sunglint<br>4) Poorer performance over coast<br>5) Poorer over snow/ice covered surfaces and near the ice-edge<br>6) Accuracy and skill degrades with increasing latitude: Worst performance in the Arctic<br>7) Poorer performance over cold surfaces and situations with low level inversions<br>8) Shadows on clouds sometimes become cloud free. Shadows on snow/ice may become clear but snow/ice free.<br><br>Below we present the suggested improvements to each one of the problems listed above. There is, however, a considerable overlap between many of the problems, and thus also the suggested improvements/solutions below are strongly interconnected, and there is a fair amount of repletion.<br><br>To each of the problems we indicate where in the NWCSAF project (IOP or next phase=CDOP) we expect to be able to implement the suggested algorithm improvement. However, for each of the suggestions, the actual algorithm development and validation activity will have to prove whether an actual implementation is possible or not.<br><br>A possible new user requirement is discussed in CMSAF regarding a pure IR algorithm for cloud detection. This point was raised from user side at the CMSAF user workshop in Nuremberg. Rational for this possible requirement would be to minimize artificial |

day/night differences in analized cloud cover.

However SMHI team thinks that the degradation of performance of the algorithm would not be acceptable, since for AVHRR only 2 channels would be useable in a pure IR algorithm without day/night differences.

Missing clouds over land – suggested improvements:

1. Better advertisement of Quality flag: User should make use of this information!
    a. Improve user documentation
2. Improve tuning for thin cirrus detection over land
3. Improve tuning for cloud detection over mountains and coast
4. Use temporal information – earlier NOAA/MetOp overpass (e.g. use a time-window of 1 hour) in order to attempt to improve cloud detection over land at high latitudes in general

Items 1 to 3 will be attempted before end of IOP: PPS version 2.x

Item 4 is expected for CDOP.

Missing clouds in twilight

1. Better advertisement of Quality flag: User should make use of this information! Improve user documentation
2. Use temporal information – earlier NOAA/MetOp overpass at high latitudes (e.g. use a time-window of 1 hour) in order to attempt to improve cloud detection in twilight and sunglint

Item 1 will be attempted before end of IOP: PPS version 2.x

Item 2 is expected for CDOP.

Sunglint problems

1. Better advertisement of Quality flag: User should make use of this information!
    a. Improve user documentation
2. Use temporal information – earlier NOAA/MetOp overpass (e.g. use a time-window of 1 hour) in order to attempt to improve cloud detection at high latitudes

Item 1 can be done before end of IOP.

Item 2 may be attempted during CDOP.

Problems over coast

1. Better advertisement of Quality flag: User should make use of this information!
    a. Improve user documentation
2. Urge the user to use a suitable size of the coastal zone
    a. Improve user documentation

Can be done before end of IOP.

Problems over snow/ice covered surfaces and near the ice-edge

1. Use temporal information – earlier NOAA/MetOp overpass at high latitudes (e.g. use a time-window of 1 hour) in order to attempt to improve cloud detection at high latitudes

2. Use sea ice products (sea-ice edge and sea-ice cover) from OSISAF (e.g. raise flags when over ice cover or near the ice edge and change thresholds near the ice edge):
3. Use of daily snow cover map from Land SAF (raise flags when over areas possibly covered by snow)

May be attempted during CDOP.

General lower skill in the Arctic:

Use temporal information – earlier NOAA/MetOp overpass at high latitudes (e.g. use a time-window of 1 hour).

May be attempted during CDOP.

Problems over cold surfaces and situations with low level inversions

Use temporal information – earlier NOAA/MetOp overpass at high latitudes (e.g. use a time-window of 1 hour).

May be attempted during CDOP.

Shadows on clouds or on snow/ice

Use temporal information – earlier NOAA/MetOp overpass at high latitudes (e.g. use a time-window of 1 hour).

May be attempted during CDOP.

A suggested development effort for the CDOP in order to improve cloud detection and the use of the cloud mask product in general over specific problematic areas

Relax thresholding approach and introduce probabilistic methods for specific problematic areas: Over snow/ice and near sea-ice edge.

- More use of auxiliary data (e.g. daily OSISAF ice products)
- Build Probability Density distribution Functions (PDFs) for cloudy, cloudfree, and snow/ice cover from interactive targets
- Develop post-processing module in order to "reclassify" cloudy and cloudfree pixels only over specific surfaces
- Provide probability for pixel being cloud contaminated as (extra) output.
- Correct categorical cloud mask output or provide probabilities as an extra product.

This approach may be considered as a first feasibility study for the possible future development of a cloud mask algorithm based on *optimum estimation* (OE) methods.

### 3.5.2 PGE02 CTy

## Compiled by: SMHI

#### 3.5.2.1 User Survey Synthesis

| Number of filled forms | 6 |
|---|---|

| 1.- Generation and Exploitation of the PGE | | | |
|---|---|---|---|
| Generation & Use: | Generation(1) | *6 (100%)* | |
| | Exploitation(2) | *6 (100%)* | |
| | (1) PGE is generated by the application | | |
| | (2) PGE output(s) is(are) used (not only as input for generation of other PGEs) | | |
| PGE output parameter used: | *CT Main output (twenty-one cateogires)* | *6* | *(100%)* |
| | *CT quality flags* | *2 (33%)* | |
| | *CT test flags* | *0 (0%)* | |
| Processing Areas: | See PGE01 | | |
| NOAA Satellites used: | See PGE01 | | |
| NWP model used as input: | See PGE01 | | |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *2* | *1* |
| Subjectively | *4* | *1* |

Synthesis of results and comments:

- I wonder about the completely independent retrieval of cloud type and cloud-top parameters. However, there was no time to investigate e.g. systematic differences and problematic cases. (CMSAF)
- Superior to our old SCANDIA scheme (SMHI)
- The quality seems to be fine. Most problematic is fractional cloud cover where there is not indication of cloud type (DMI)
- Report available only in Swedish. The quality has improved very much compared to the former cloud classification, SCANDIA. It is a sophisticated analysis which do very well. Still there sometimes are problems during low satellite and sun angles , spec winter (Swedish Air Force)

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *4 (66%)*<br>No *1 (17%)*<br>partly *1(17%)*<br>Not applicable - |
| Synthesis of comments: | *Generally positive evaluation except for reasons listed below:*<br>*Reason for only partly met requirement:*<br>Systematically low cloudcover ~ 10 >. Especially during winter and low sun elevation (SMHI, application mesoscale analysis)<br>*Reason for not meeting requirement:*<br>I wonder about the completely independent retrieval of cloud type and cloud-top parameters. However, there was no time to investigate e.g. systematic differences and problematic cases. (CMSAF) |
| Applications using PGE output(s) | |
| Current applications | • weather analysis by forecasters (BGIO)<br>• Generation of daily/monthly means of the cloud mask (CMSAF)<br>• OSISAF flux module (DMI)<br>• Nowcasting, snow mapping (DWD)<br>• Mesoscale analysis of cloud cover and cloud base (SMHI)<br>• The CT image for Nowcasting, and for MESAN (the automatic analysis) (Swedish Air Force) |
| Planned applications | - Snow cover and snow depth analysis (DMI) |
| If not used, | |
| | You do not have any application using PGE02output*N.A.*<br>You do not use PGE02output because its quality does not meet your requirements_____*N.A.*<br>You do not yet use PGE02 but you are planning to do_____*N.A* |
| Comments: | |

4.- Improvements and modifications to PGE requested/suggested by users

- Mandatory: avoid misclassifications of clouds over mountaineous areas as snow.(DWD)
- maybe a clearer definition of "fractional clouds" (Air Force)

5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above

For your applications, is the separation between stratiform and cumuliform clouds?

| | |
|---|---|
| Mandatory | 2 (33%) |
| Desirable | 3 (50%) |
| Not needed | 1 (17%) |

- all single layer clouds (DWD)
- Could be helpful in the cloud base analysis (SMHI)
- ST + Fog, Cu, CB, and a more clear definition of the high clouds (where is the limit between high and very high..?(Air Force)

For your applications, would an improved (based more directly on cloud microphysics) cloud phase flag be useful?

| | |
|---|---|
| Yes | 3 (50%) |
| No | 3 (50%) |

- Application: For CM-SAF needs (CMSAF)
- a satellite based icing risk product (DWD)
- Probably useful for detecting risk for iceing on aeroplanes, and also to forecast if there will be snow or rain

6.- Additional

*Climate SAF raised possible requirement to process from IR channels only to avoid differences stemming from Day/Night/Twilight processing*

### 3.5.2.2 Workshop Discussion and Outcomes

Workshop and US Discussions and proposed Development

Generally good performance.

Main problems and needs identified:

1. Discontinuity between cirrus categories over land and sea: Thin cirrus over sea may become thick when over land.
2. Mixing of mid level and high opaque clouds and cirrus over low/mid level clouds.

3. Problems of mixing the categories cirrus and broken water clouds (fractional clouds)
4. Cloud Type and CTTH possibly inconsistent.
5. Wish for cumiliform-stratiform separation.
6. Wish for cloud phase flag based on microphysics.

Discontinuity between cirrus categories over land and sea

Improved tuning. To be attempted before end of IOP.

Otherwise no suggestions.

Mixing of mid level and high opaque clouds and cirrus over low/mid level clouds

No ideas.

Better separation of fractional clouds and thin cirrus

Use CTTH result (where available) to provide probability for "broken low (water) clouds". Separate post-processing module run after PGE03 to improve product output already generated by PGE02.

May be attempted during CDOP.

Stratiform-cumuliform separation

Contact users again and ask if this separation is needed for input to NWP model or other objective (Nowcasting) tool. If not, we will not put effort on this. Otherwise:

- Test the use of texture features day and night + perhaps also VIS/NIR channels (daytime)

May be attempted during CDOP.

Cloud Phase flag based on microphysics:

1) Propose a new development for CDOP for daytime (first priority) using AVHRR
2) Propose a new development for CDOP for a future nighttime algorithm using VIRS (NPP/NOPESS)

May be attempted during CDOP.

### 3.5.3 PGE03 CTTH

## Compiled by: SMHI

#### 3.5.3.1 User Survey Synthesis

| Number of filled forms | 6 |
|---|---|

| 1.- Generation and Exploitation of the PGE | | |
|---|---|---|
| Generation & Use: | Generation[1] | *6 (100%)* |
| | Exploitation[2] | *6 (100%)* |
| | (1) PGE is generated by the application | |
| | (2) PGE output(s) is(are) used (not only as input for generation of other PGEs) | |
| PGE output parameter used: | CTTH cloud top pressure (hPa) | *1 (17%)* |
| | CTTH cloud top height (meters) | *5 (83%)* |
| | CTTH cloud top temperature (Kelvin) | *4 (66%)* |
| | CTTH quality flag | *2 (33%)* |
| Processing Areas: | See PGE01 | |
| NOAA Satellites used: | See PGE01 | |
| NWP model used as input: | See PGE01 | |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *1* | *0* |
| Subjectively | *4* | *1* |

Synthesis of results and comments:

- This application seems to be of good quality (DMI)
- Report will become available soon. Product Looking promising compared to our old scheme (SMHI, application mesoscale Analysis)
- Report in Swedish Good quality. Some problems in welll known situations (low sun/sat angles) and also with thin high clouds. Cold winter situations has been improved with the higher vertical resolution in HIRLAM, but still problems sometimes.

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *3 (50%)*<br>No *1 (17%)*<br>Partly *2 (33%)*<br>Not applicable - |
| Synthesis of comments: | *Mixed comments given from very positive (see quality analysis part) to not –or only partly meeting requirements:*<br>*Reason given for not meeting requirements:*<br>• Cloud type and cloud-top height parameters are derived independently and are not always consistent (CMSAF)<br>*Reasons given for only partly meeting requirements:*<br>• It is not always safe, but together with other observation data it is useful and could be very useful if some of these known problems will be solved (Swedish Air Force)<br>• Looking promising compared to old scheme (SMHI, application mesoscale analysis) |
| Applications using PGE output(s) | |
| Current applications | • weather analysis by forecasters (BGIO)<br>• Generation of daily/monthly means of the cloud mask (CMSAF)<br>• Road condition model, NWP model (DMI)<br>• Nowcasting, severe weather case studies (DWD)<br>• Mesoscal cloud top analysis (SMHI)<br>• Nowcasting, and In the automatic analysis MESAN…(Air Force) |
| Planned applications | - |
| If not used, | |
| | You do not have any application using PGE03 output_____*N.A.*<br>You do not use PGE03 output because its quality does not meet your requirements_____*N.A.*<br>You do not yet use PGE03, but you are planning to do_____*N.A* |
| Comments: | |

4.- Improvements and modifications to PGE requested/suggested by users

The results of the semitransparency correction are subject to high fluctuations in quality. Most scenes can be characterised by a lack of valid data in areas covered by high clouds (DWD)

Thin clouds, Higher resolution (more intervals) especially for the lower clouds (Swedish Air Force)

5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above

Is the (relatively heavy) processing time for the semi-transparent clouds a problem?

| | |
|---|---|
| Yes | 0 |
| No | 6 (100%) |

Would you be interested in improvements to the semi-transparent clouds product if it is to the cost of processing time (say double that of todays)?

| | |
|---|---|
| Yes | 3 (50%) |
| No | 3 (50%) |

6.- Additional

### 3.5.3.2 Workshop Discussion and Outcomes

Workshop and US Discussions and proposed Development

Main problems identified:

1) Many non-processed cloud contaminated pixels
2) Fluctuations in quality for semi-transparent clouds

Many non-processed pixels

1) Use moving windows for histogram technique (will increase number of results and probably also increase quality, but at the cost of increased processing time).
2) Propose a new development for CDOP for a combined use of AVHRR and IASI (MetOp)

3) Propose a new development for CDOP preparing for the use of VIRS and CrIS (NPP/NOPESS)

All three bullets above may be addressed during CDOP.

Fluctuations in quality for semi-transparent clouds

No ideas.

### 3.5.4 PGE04 PC

## Compiled by: SMHI

#### 3.5.4.1 User Survey Synthesis

| Number of filled forms | 6 |
|---|---|

| 1.- Generation and Exploitation of the PGE | |
|---|---|
| Generation & Use: | Generation[1] *5 (83%)*<br>Exploitation[2] *4(66%)*<br>(1) PGE is generated by the application<br>(2) PGE output(s) is(are) used (not only as input for generation of other PGEs) |
| PGE output parameter used: | Main output: Precipitation1, Precipitation2, Precipitation3 (likelihood of precipitation in different intensity classes) 4(66%)<br>Processing flag 0<br>AVHRR flag 0<br>AMSU_flag 0 |
| Processing Areas: | See PGE01 |
| NOAA Satellites used: | See PGE01 |
| NWP model used as input: | See PGE01 |

## 2.- PGE Quality Analysis (by the users)

| Type of analysis | Number | Reports |
|---|---|---|
| Objectively | *1* | *0* |
| Subjectively | *4* | *1* |

Synthesis of results and comments:

*Comment applying to use without AMSU, since configuration was reported not to be changed this means night algorithm with*

*only IR channels used:*

The quality is very poor. There is a big day/night variation and heavy precipitation is underestimated. Until now only information of no or light precipitation are used (DMI)

Report available in Swedish. Good quality generally. The product is very useful over the sea where radar does not reach . Some problems when snow from SC (Snow Cover) (Swed. Air Force)

| 3.- PGE Applicability assessment | |
|---|---|
| Meets expected Requirements? | Yes *3(50%)*<br>No *1(17%)*<br>Not applicable *2(33%)* |
| Synthesis of comments: | *For users using AMSU/AVHRR algorithm the quality requirements are met. However this is not the case when using AVHRR only algorithm with nighttime configuration:*<br>The quality is not good enough (DMI) *(applies to use without AMSU)* |
| Applications using PGE output(s) | |
| Current applications | • weather analysis by forecasters (BGIO)<br>• Road condition model, NWP (HIRLAM) (DMI)<br>• case studies (DWD)<br>• Nowcasting using the image (Swedish Air Force) |
| Planned applications | - |
| If not used, | |
| | You do not have any application using PGE04output *1(17%)*<br>You do not use PGE04output because its quality does not meet your requirements *N.A.*<br>You do not yet use PGE04 but you are planning to do *1(17%)* |
| Comments: | |

| 4.- Improvements and modifications to PGE requested/suggested by users |
|---|
| More tuning of the application (DMI, no AMSU mode)<br>If possible to solve the light snow cases and there are also sometimes problems with sleet (Swedish air Force)<br>The product is very useful over the sea where radar does not reach. An improvement would be an geographical extension (Air force, concerns area distributed by SMHI) |

| 5.- Specific Aspects for this PGE, collected from the User Survey, but not covered above |
|---|
| Do you use AMSU data:<br>Yes 4 (66%)<br>No 1 (17%)<br><br>Did you modify PGE04 configuration:<br>Yes 0<br>No 5 (73%) |

| 6.- Additional |
|---|
| |

### 3.5.4.2 Workshop Discussion and Outcomes

| Workshop and US Discussions and proposed Development |
|---|
| Main problems identified by users:<br><br>1) Quality not sufficient for AVHRR only algorithm<br>2) Occasional false precipitation signals over snow/ice<br><br>Identified by developers:<br>3) NOAA18: sometimes precipitation intensity and likelihood overestimated<br>4) "scale" problem: estimate from AMSU refers to much courser scale than Precipitating Clouds output and thus underestimates intensity<br>**Quality of AVHRR only algorithm**:<br>No scope to substantially improve quality with AVHRR. Current configuration that night time algorithm is used is used was chosen with thought in mind that AVHRR is used as a mere QC for AMSU.<br>• Improve documentation to encourage use of AMSU and use of day algorithm in case AMSU is not used (IOP).<br>• Improve day algorithm for Viirs to use more NIR channels ( CDOP)<br><br>**False precipitation signals over snow/ice for AMSU estimate:**<br>No good ideas for IOP. Masking of AMSU use with NWP snowmask would lead to overall decrease of algorithm performance.<br>CDOP development: a more careful QC of AMSU estimate could be attempted making |

use of more spectral information from VIIRS. Has to be studied in more detail to determine whether this approach is realistic. Can be attempted together with addressing the precipitation scale problem. Possibly use Landsaf snow mask as an optional input.

**AMSU/MHS tuning for NOAA18/Metop:**

Will be performed during IOP.

**Scale problem and inconsistencies between AVHRR and AMSU:**

These problems are best addressed if a multivariate retrieval is performed using all available input (AVHRR/VIIRS and AMSU/MHS) at the same time. This will also add to solving remaining QC problems and may provide quality measures needed for using a precipitation product in models. Might involve a new definition of product output to take into consideration different requirements of forecasters and of models. For example some output similar to current output might always be generated for visualisation for Nowcasting, while models might require input such as high quality no rain estimate from VIS/IR and a rain estimate at larger scales in mm/h from combined MW/IR/VIS with respective quality flags. (proposal for CDOP).