EUMETSAT
NWC SAF
SUPPORT TO NOWCASTING AND
VERY SHORT RANGE FORECASTING

AEMet
Agencia Estatal de Meteorología

The Nowcasting SAF (NWC SAF): products and user services. Current Status and future plans.

Pilar Rípodas

2nd European Nowcasting Conference

3 - 5 May 2017

DWD HQ, Offenbach, Germany

Outline

- EUMETSAT SAF Network
- Nowcasting SAF (NWC SAF)
- NWC SAF services
- NWC SAF products.
  - ✓ New NWC SAF SW package GEO v2016
- NWC SAF future plans

EUMETSAT SAF Network

- EUMETSAT European Organization for the Exploitation of Meteorological Satellites
- Purpose: to supply weather and climate-related satellite data, images and products to the National Meteorological Services of its Member and Cooperating States in Europe, and other users worldwide.
- EUMETSAT HQ in Darmstadt, Germany.
- SAFs (Satellite Application Facilities):
  - located at Weather Services in EUMETSAT Member and Co-operating States
  - complement production of standard meteorological products at EUMETSAT central facility

EUMETSAT SAF Network

SAFs are specialized on topics and themes:

- SAF on Climate Monitoring (CM SAF), cm-saf.eumetsat.int
- SAF on Support to Operational Hydrology and Water Management (H SAF), h-saf.eumetsat.int
- SAF on Land Surface Analysis (LSA SAF), lsa-saf.eumetsat.int
- SAF on Numerical Weather Prediction (NWP SAF), nwp-saf.eumetsat.int
- SAF on Atmospheric Chemistry Monitoring (AC SAF), ac-saf.eumetsat.int
- Ocean and Sea Ice (OSI SAF), osi-saf.eumetsat.int
- SAF on Radio Occultation Meteorology, rom-saf.eumetsat.int
- SAF on support to Nowcasting (NWC SAF), nwc-saf.eumetsat.int

NWCSAF concept: objectives

- ✓ The general objective of the NWC SAF is to provide operational services to ensure the optimum use of meteorological satellite data in Nowcasting and Very Short Range Forecasting by targeted users.

- ✓ To achieve this goal , the NWC SAF is responsible for the development and maintenance of appropriate SW Packages (GEO and POLAR Satellites), as well as of all related tasks for user's support.

NWC SAF Software Packages

Geostationary Satellites:

GEO v2016, available since November 2016

Applicable to MSG data, GOES-N (limited to a few products)

Continuous monitoring, space resolution and illumination conditions good for low and middle latitudes

Polar Satelites:

PPS v2014: available to users since October 2014

Process data from the joint polar system (EUMETSAT and NOAA polar satellites)

New version planned for 2018

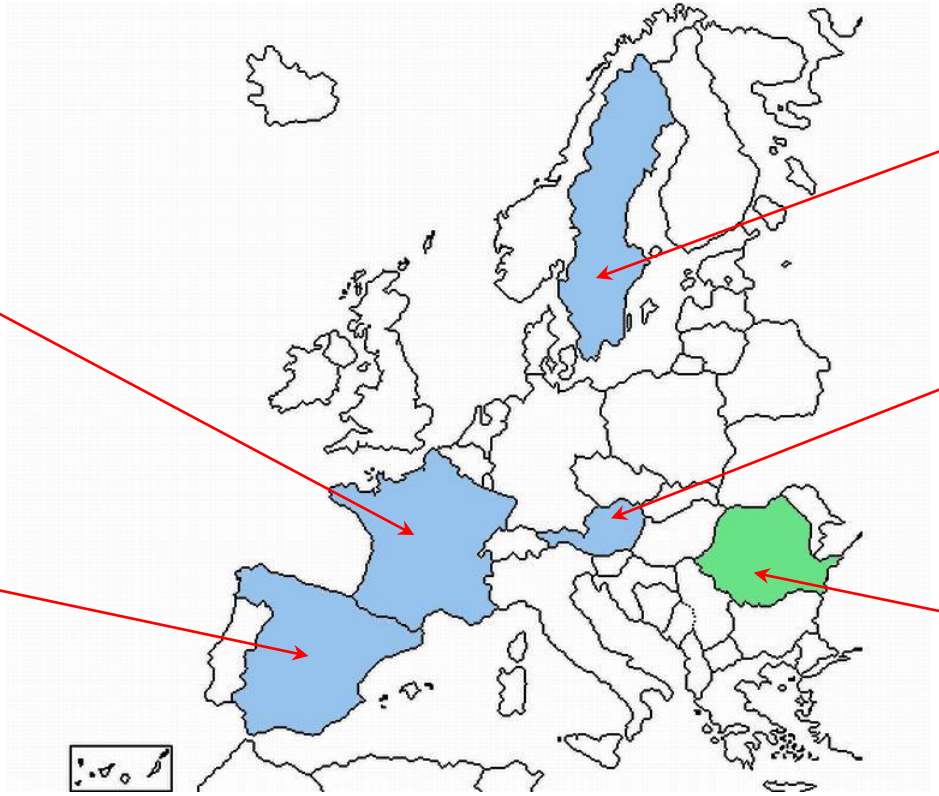
Relatively good coverage for high latitudes

NWC SAF Software

The software is distributed freely to registered users of the meteorological community and is used for Nowcasting and as a development and research tool

- **The user runs the SW package and generate the products**
- **Advantage: users can configure the SW to fit their needs (e.g. the user define the area where the products are generated)**
- **Potential problem: users need access to EUMETSAT satellite images and a NWP model output**

NWC SAF Consortium



METEO FRANCE

SMHI

ZAMG

AEMet Agencia Estatal de Meteorología

METEO ROMANIA

Since March 2017!

NWC SAF Consortium responsibilities

- **AEMET:**
  - Leading Entity
  - GEO High Resolution Winds (HRW), Precipitation products and iSHAI (precipitable water and stability analysis)
- **MétéoFrance in Lannion:** GEO Cloud products
- **MétéoFrance in Toulouse:** GEO Convection products
- **ZAMG:** GEO extrapolation imagery products, automatic recognition of meteorological phenomena
- **SMHI:** Cloud and precipitation products for polar satellites
- **NMA:** some tasks related to quality assessment and prototype products for MTG-LI

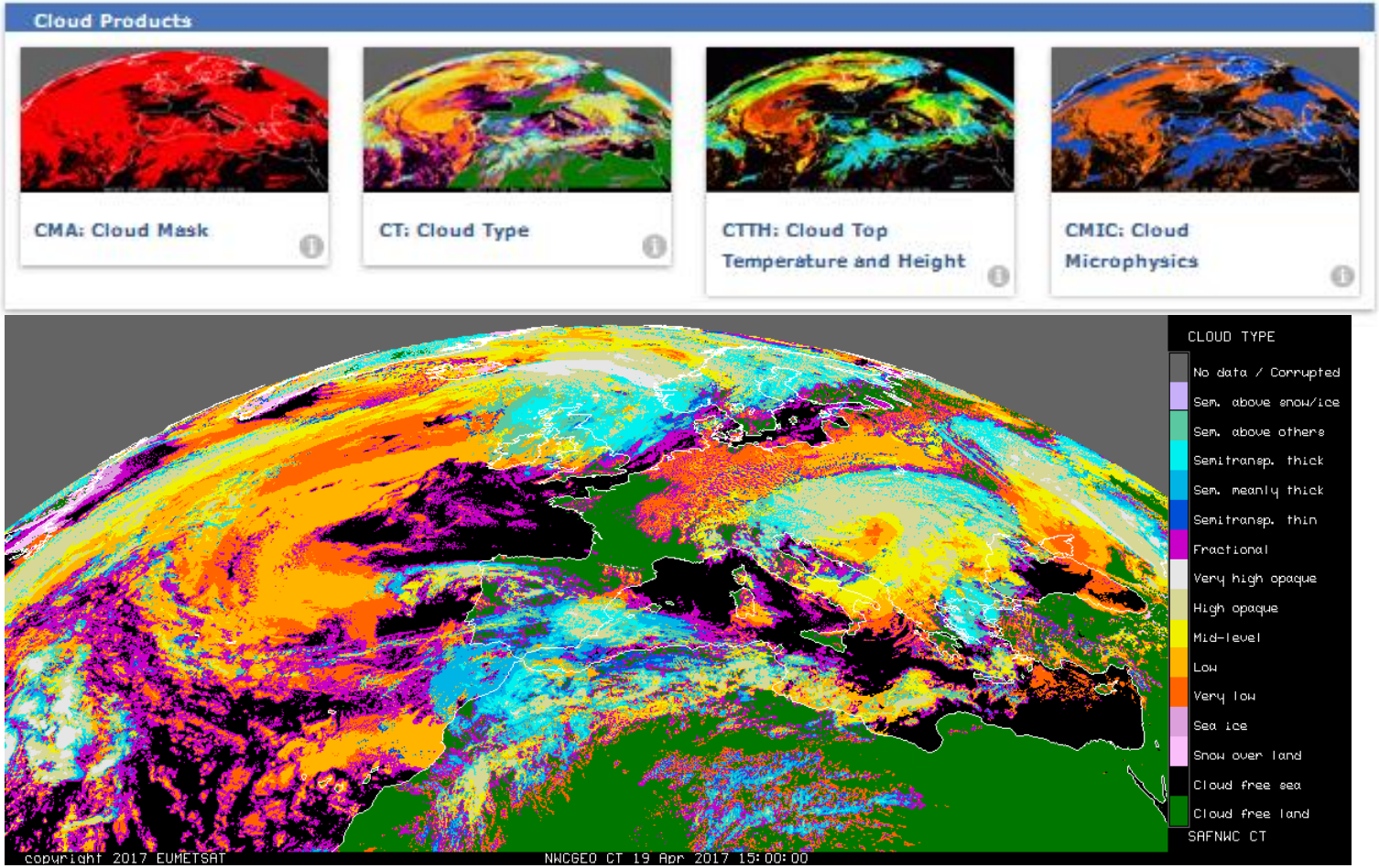
NWC SAF user services
(to registered users)

- **NWC SAF helpdesk (nwc-saf.eumetsat.int):**
  - ✓ SW packages to download
  - ✓ Other tools (provided on a best effort basis)
  - ✓ Documentation (users manuals, products algorithm description, validation reports,…)
  - ✓ Reference System
  - ✓ Contact to NWC SAF developers sending a “ticket” (formerly mailbox)
- **Training events. Recent and coming events:**
  - ✓ WMO WWRP & CAeM Aviation Research Demonstration Project (AvRDP) Training Workshop, 20-22 July 2016, Hong Kong
  - ✓ EUM-ROSH Training event, Moscow, 6-9 June 2017
  - ✓ Autumn School on the use of satellite data on nowcasting high impact weather , Thessaloniki, Greece, 11-15 September 2017
- **Online Workshops**
  - ✓ PPS v2014
    http://www.eumetrain.org/resources/NWCSAF_tutorial_2015.html
  - ✓ GEO v2016
    http://www.eumetrain.org/resources/msg_geo_engineering_ws_v2016.html

New SW package: GEO v2016

- Available since November 2016
- Previous operational version is MSG v2013
- GEO v2016 vs. MSG v2013: main improvements/changes:
  - ✓ Scientific Improvement in some products
  - ✓ New products: (CMIC, CI, ASII-NG,EXIM)
  - ✓ Adaptation of some products to GOES-N satellites
  - ✓ New output format: NetCDF

NWC SAF Cloud Products

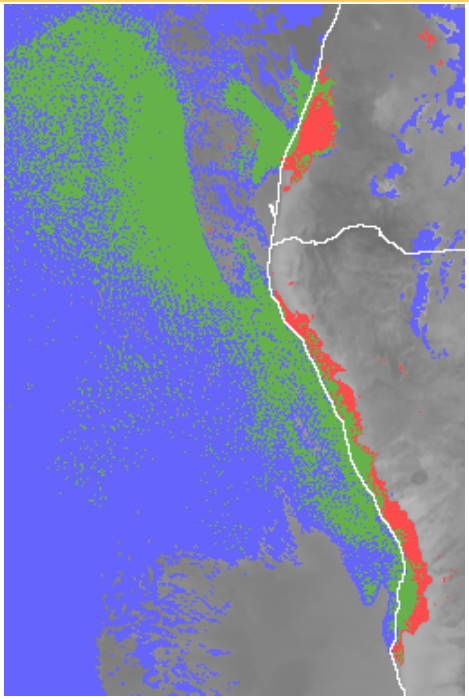


Cloud Type. 20 April 2017 15:00Z

NWC SAF Cloud Products:
Cloud Mask GEO v2016 product improvement

CMA: is based on a multi spectral threshold method, GEO v2016 uses the radiative transfer model RTTOV on line to improve some thresholds and reduce of fire/cloud confusion

Fog RGB



GEO v2016 T8.7-T3.8 thresholding:

Red: pixels those flagged as cloud by the RTTOV-based test of T8.7-T3.8

Green: pixels detected both by GEOv2016 and MSG v2013 versions

Blue: pixels detected by other operational SAFNWC test

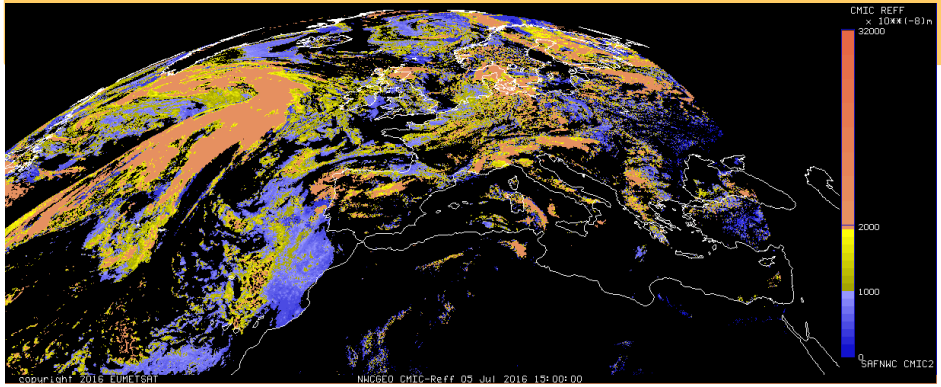
Grey: T3.8 (warm is dark)

Meteosat-10, 2 March 03h00UTC, Namib desert

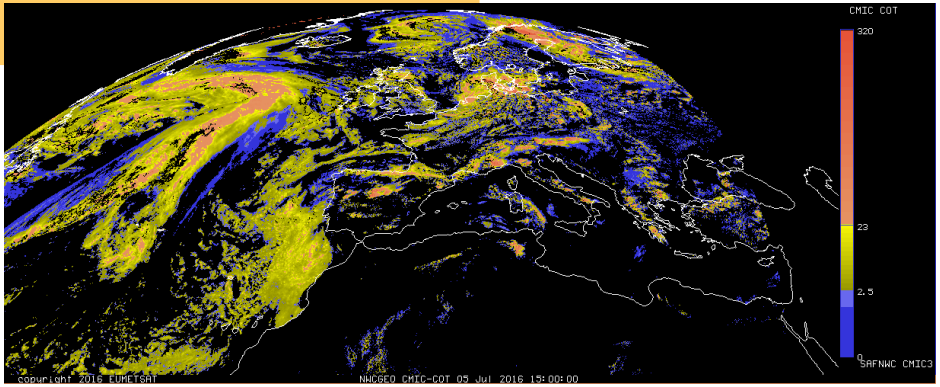
NWC SAF Cloud Products:

New GEO v2016 product CMIC (Cloud Microphysics):

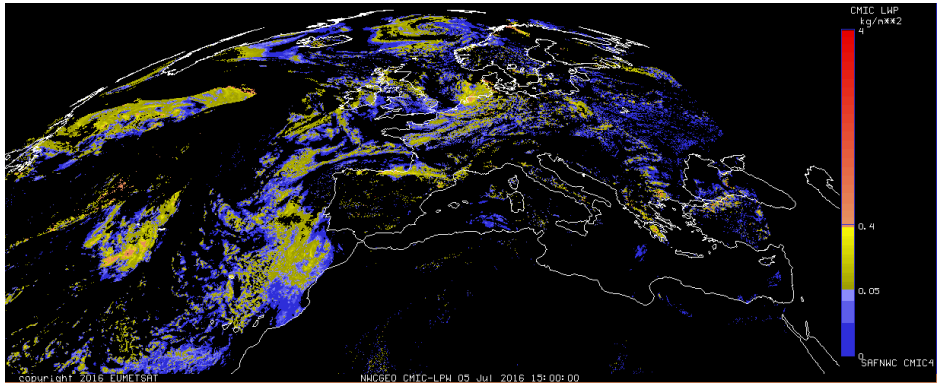
- Cloud Phase
- Day time only: Effective Radius, COT, LWP, IWP



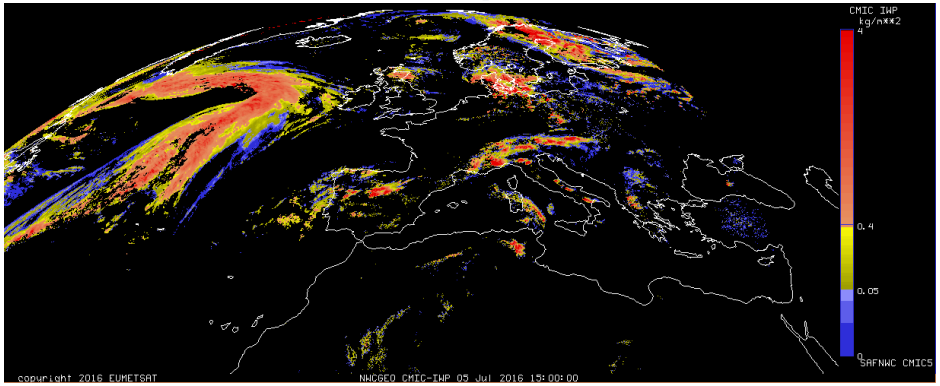
Effective Radius



Cloud Optical Thickness



Liquid Water Path

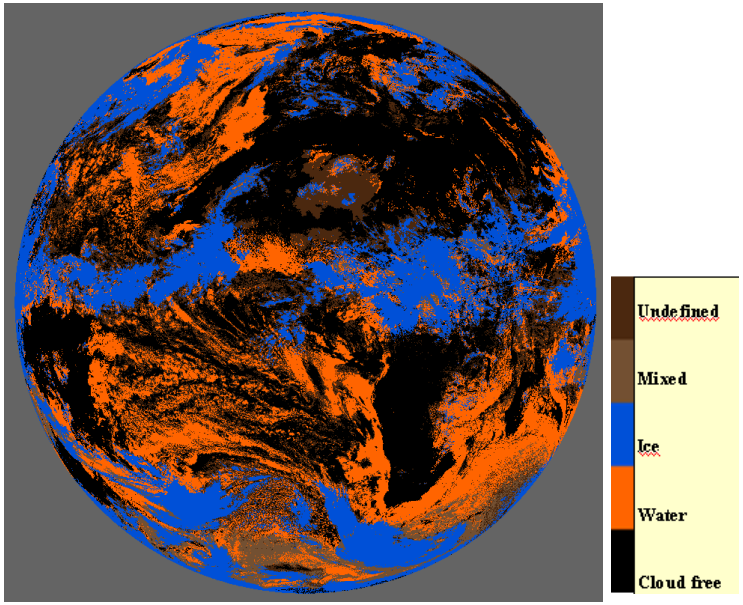


Ice Water Path

5 July 2016 15:00 UTC

NWC SAF Cloud Products:

GEO v2016: Validation of the SEVIRI cloud products over the full disk



Cloud phase: 28 June 2010 12:00 UTZ

Cloud Mask: Comparison with Surface observations (SYNOP,SHIP)

Cloud Top Height: comparison with space born radar (CPR on cloudsat)

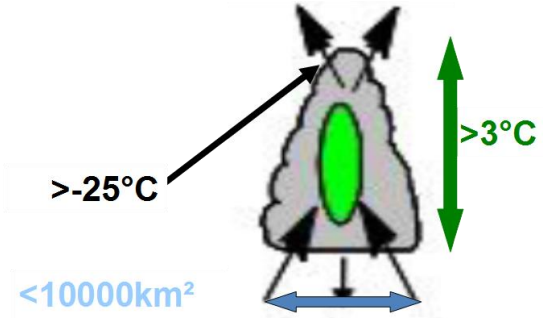
Cloud Microphysics. Cloud phase: comparison with space born lidar (caliop) and LWP: comparison with microwave imagery (AMSR-E)

NWC SAF Convection products

New GEO v2016 product Convection Initiation CI: Probability of a warm cloud to become a thunderstorm in the near future.

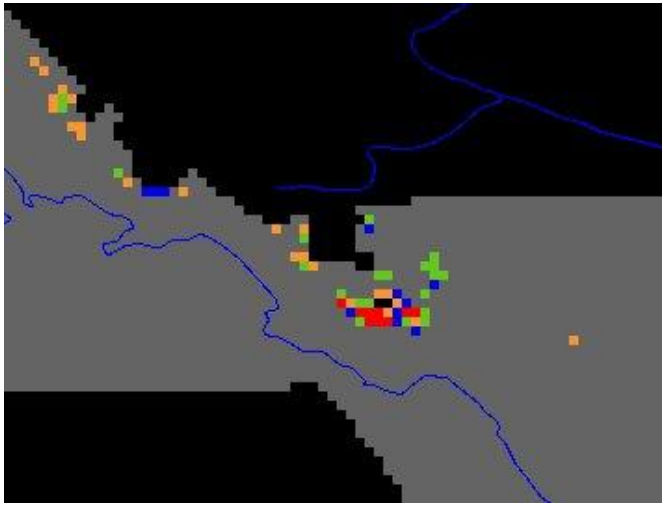
Detects which clouds will provide “radar precipitation echo intensities of at least 30–40 dBZ in 30 minutes” (in first version)

1st step : Warm cell detection
2nd Step : Displacement field (and then trends can be calculated)
3rd step : Succession of filters and probability assessment for pixels



Tuning and validation : RDT, lightning data, radar

NWC SAF Convection products
New GEO v2016 product CI



Visualization as a field of probabilities:

- No convection initiation

Probability of convection for pixels:

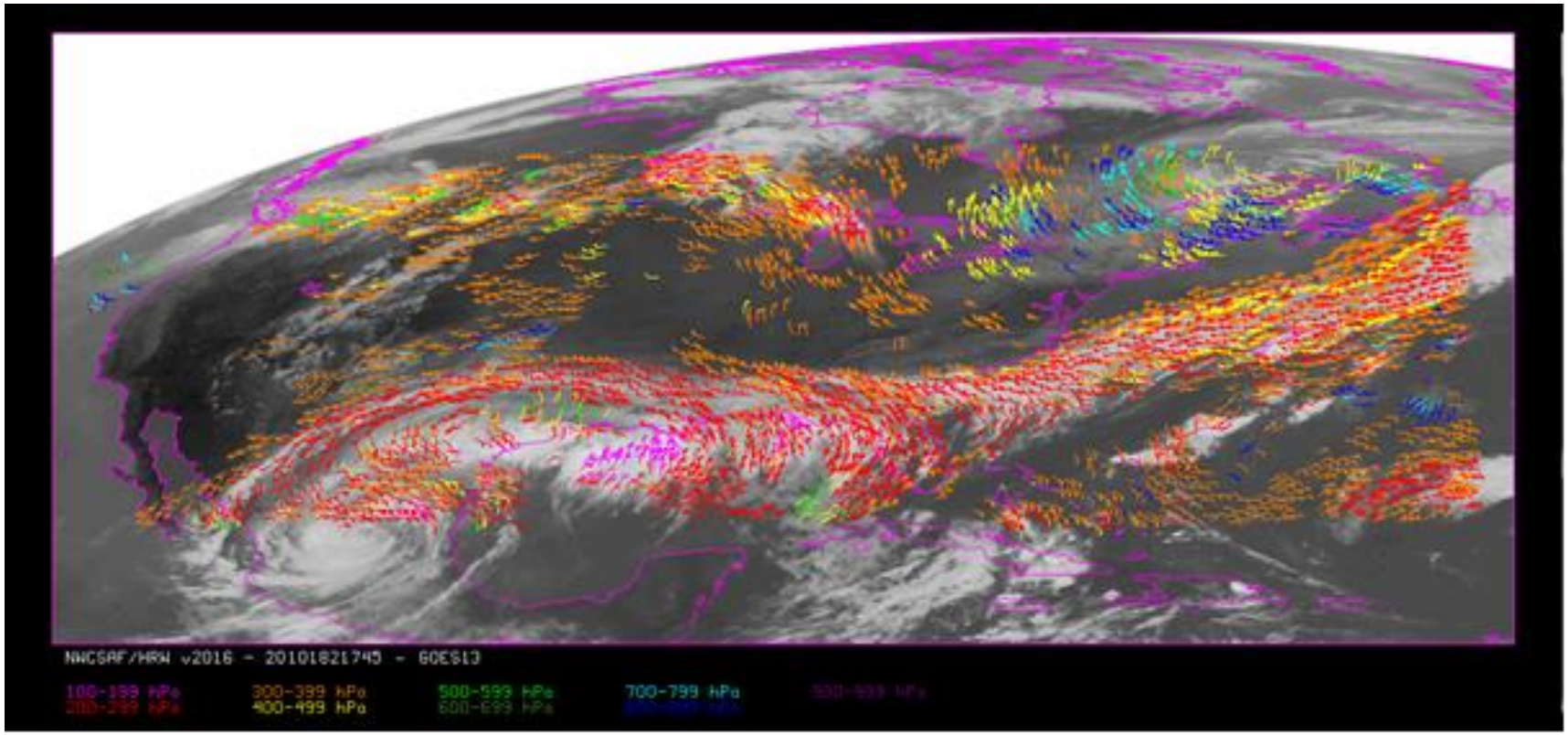
- 0-25%
- 25-50%
- 50-75%
- >75%

Delivered as a demonstrational product in GEO v2016.

A major improvement is expected in GEO v2018, due to new tuning, use of microphysics, improvement of tracking.

NWC SAF High Resolution Winds (HRW)

HRW adapted to GOES-N: new in GEO v2016!



NWC/GEO High Resolution Winds v2016 AMV output example in the Continental United States region (1 July 2010 1745Z, GOES13 satellite),

Javier García Pereda, AEMET

NWC SAF Automatic Satellite Image Interpretation – Next Generation

New GEO v2016 product ASII-NG

Product intended to be used in aviation meteorology.

ASII-NG plans comprise two products:

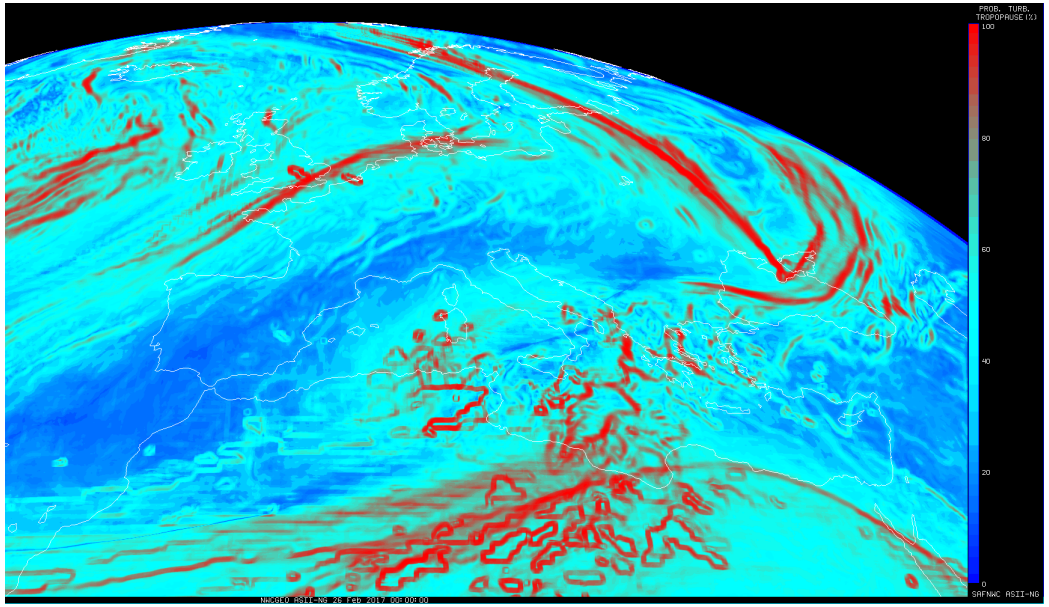
- **a turbulence detection module (lee waves, tropopause folding and jet streaks)**
- **an in-flight icing potential (IP) module.**

GEO v2016 ASII-NG first delivery:
Image output with probability of tropopause folding, associated to turbulence.

NWC SAF Automatic Satellite Image Interpretation – Next Generation

New GEO v2016 product ASII-NG.

Delivered as demonstrational product. Feedback of users is very welcome.



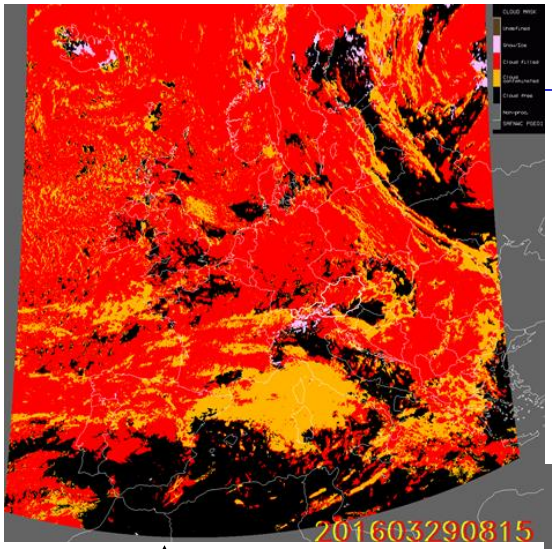
Case of observed Turbulence reported

Area of Black Sea and Caspian Sea
26 February 2017
00:00UTC

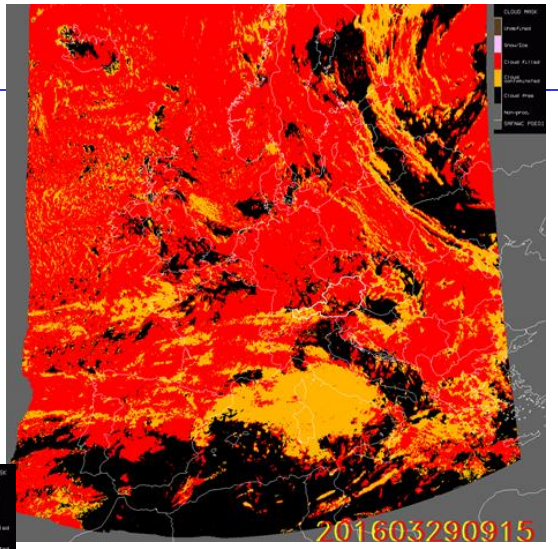
New Extrapolated Imagery (EXIM):

extrapolation of MSG images and NWC SAF products using the NWC SAF HRW winds

ZAMG

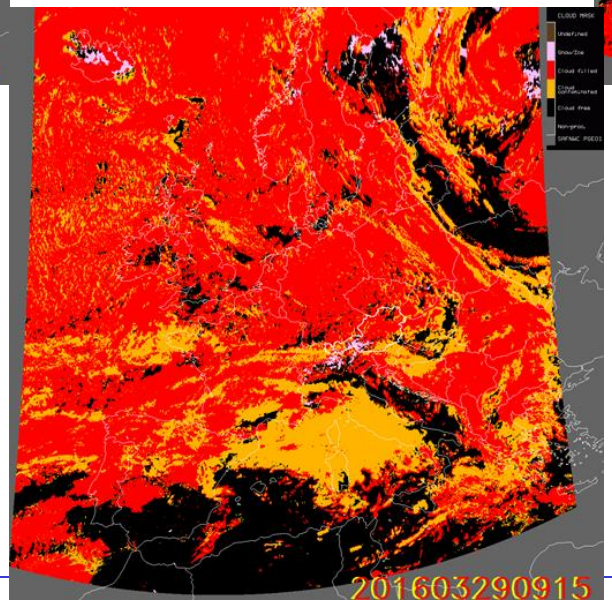


Extrapolated product
08:15 → 09:15



CMa 08:15

CMa 09:15



To be delivered during 2017
(patch to GEO v2016)

EUMETSAT NWC SAF AEMet Agencia Estatal de Meteorología

NWC SAF Future plans:

Adaptation of NWC SAF products to enhanced instruments in the new era satellites

MTG-FCI and MTG-LI on board of MTG-I:

General improvement of products due to better spatial and temporal resolution (particular importance for detection and tracking of convection).

New channels will improve quality of Cloud microphysical products.

LI data will contribute to improve convection and precipitation products.

METimage on board of EPS-SG a:

Additional channels and a better spatial resolution Improvement of PPS Cloud products

NWC SAF Future plans:

Adaptation of NWC SAF products to other satellites (not EUMETSAT)

- Adaptation of NWC SAF GEO products to Himawari and GOES-R/S. AHI and ABI sensors are similar to MTG-FCI radiometer

- Adaptation of NWC SAF PPS products to Chinese satellites in the Fung Yun 3 series, carrying the MERSI-2. This will considerably improve data coverage at high latitudes.

NWC SAF Future plans: New products from New instruments

- **MTG-LI on board of MTG-I :** Proposed products are (but not limited to): LI tracking, Flash rate tendency, Flash area and Flash energy

- **MTG-IRS on board of MTG-S:** It will provide unprecedented information on horizontally, vertically, and temporally (4-dimensional) resolved water vapour and temperature structures of the atmosphere

  New products: qIRS, sSHAI_ES, sSHAI

- **MWI/ICI on board of EPS-SG B:** precipitation and cloud imaging , ice cloud and snowfall imaging

  New products: LWP, IWP, PR

Thank you very much for your attention!

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nwc-saf.eumetsat.int