Experience on use of SAFNWC products at INM

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Activities

2002-2003: Detailed study of SAFNWC products documentation. A priori determination of both channels and products usefulness, and criteria for utilization.

Started 2003: Development of tools for data exploitation in the operational working environment (McIDAS). User documentation.

2004-2005: Training courses at INM with emphasis on operational forecasters, assuming a phenomenological approach (convection, fog, dust, cloud and precipitation, etc.) to the use of products and channels. Poster on use for convection presented at the 2004 ECSS Conference.

Started 2004: Intranet real-time page for MSG and SAFNWC.

2005: Evaluation of products behaviour on day-by-day basis, and selection of cases for deepen study of products characteristics.

Real-time Intranet page

- Started as a friendly environment, to practice in the training courses with real-time data and products.
- This is being enhanced, as the use of a page (compared to more clasical environment as McIDAS) allow more users, not needing wide interactive capabilities, to access to a wide set of data.
- Development of the page is oriented to phenomena or fields of application: already created entries for fog/low cloud and convection; aviation to follow soon, others (e.g. dust, precipitation) are studied.
- The page is available to forecasters. But a better knowledge of products behaviour is desirable to refine use strategies and reach a fully operational status.

Application to fog

Monitoring of fog coverage (observations as background) :

- Product used: CT (Cloud Type, PGE02).
  - Low / very low / broken CT classes combined with IR10.8. Quality is good, but:
  - Problems: Low cloudiness (false) in cold air (examples: 8 march, 3 oct.). Clouds "vanishing" at dawn/dusk (24 aug.).
- Display of channels / channel-differences as complement (24 aug., 3 oct.).
- Use is planned of CTTH (Cloud Top Temperature and Height, PGE03): more accurate than CT; information on fog thickness or relative top height.

Application to Convection

Products used:

- Air mass monitoring: SAI (Stability Analysis Imagery, PGE08), TPW (Total Precipitable Water, PGE06), LPW (Layer precipitable Water, PGE06).
- Winds: HRW (High Resolution Winds, PGE09)
- Convection monitoring: CRR (Convective Rainfall Rate, PGE05), RDT (Rapid Developing Thunderstorms, PGE11).

The MSG page for convection also includes channels and NWP data as reference: nowcasting of convection must take into account diverse ingredients or factors as synoptic-scale / mesoscale environment, air mass and winds at local scale, convection already present, prior cloudiness, etc.

Convection: air mass products (I)

SAI:

- It is of course the first regarded when convection is expected.
- For convection over land, it often identifies the rather large-scale area affected, but some errors in the details / actual locations (depending on case, 1 june, 20-23june, 6-8jul.). Better over sea (e.g. Mediterranean, 5set.).
- Usually more instable than model forecast LI, daytime (but: SAI simulated LI is not the same than the one used from the model !).
- Problems: land/sea differences specially nighttime, tendency to "stabilise" over land after midday (14&16set.), some dependence of integrated air mass properties (SAI features reproducing PW e.g. LPW Mean Layer) and of SST (30ago).

Convection: air mass products (II)

PW products:

- LPW ML (Mean Layer) of most interest, high values often related to daytime convection over the Iberian Peninsula (20-23june).
- LPW LL (Low Layer) time-differences also indicative of low-level moisture advection in some cases (25set.).
- Spatial distribution of totals (TPW, LPW TL) roughly in agreement with forecast PW.
- Problems: (PW products): Land/sea boundaries, in the TPW but also in the LPW ML daytime (14&16set.). Reduced variability in the TPW.

Convection: air mass products (and III)

Other considerations for air mass products (TPW, LPW, SAI):

- Dependence on cloudiness (in the CMa product): products not available (25set., but also 31may) or false alarms (14-15jun.).
- Interest of time differences at different intervals -not only for LPW Low Layer (25set.). But even more sensible to cloudiness.
- Model forecast fields of PW and LI are also displayed as background.
- And, recall: to have in mind these products with other data (4july)

Convection: Winds

HRW:

- Winds are displayed (plotted), on air mass products and on HRV images, as a complement for the interpretation of the synoptic to mesoscale circulations at different levels (20-23june high levels, 16set. low), for the vertical structure (25set.), and for relatively rapid changes (31may).
- Problems: Coverage, and also continuity, are irregular, with reduced information in the vertical; some erroneous winds appear (accepted because enough QI). Detailed winds (interesting for its resolution) are the most affected.

Monitoring of convection

RDT ("enhanced" level 1) and CRR (4 classes) are displayed, with radar echotop as reference, and the other products (lightning data not yet included but totals for RDT convective cells).

These products provide objective detection and some quantification of convection, and inform on traslation or propagation. But:

•Problems: Onset / early stages (the most important) often missed, particularly by RDT. CRR: Day-night discontinuity with some nighttime errors, and rather low values. RDT: some tracking discontinuities, non convective (Ci/Cs) or too large structures.

PC product: earlier detection, but not tuned for convection.

(Example, 1set. 11:30 and 13:15UTC).

Other applications considered

Dust: Use of dust indicator CMa (Cloud Mask, PGE01) is studied (still few evaluated for version1.2).

Aviation: Planned use for aviation CT + CTTH: flight levels at the top of opaque cloudiness.

Precipitation/convection: PC (Precipitating Clouds, PGE04):

- Its use is studied (accumulations / total area, combined rain products).
- Problems: Underestimations (dawn/dusk for % and coverage, night for %). Varying thresholds (%) for "actual" precipitation.
- Snow: CT snow cover (26jan.)

Some further ideas (I)

- MSG and SAFNWC should be integrated to other data for nowcasting purposes. Simultaneous display of different products with related or reference (radar, observations, and NWP), is a sort of integration but quite elementary and incomplete.

- For some products, a good way could be to actually merge with reference data, to highlight the value added of products, or of each type of data: that is the purpose of combined rain/convection products, based on radar with the introduction of SAFNWC products).

- Other products, having NWP as best reference, could be analysed to grids with a forecast as guess. HRW is a good example: it is an observation-like product, wind grids will then serve to derive other fields, it admits a procedure in principle simple, as follows:

    - At synoptic hours, basic HRW winds are analysed at 3 or 4 layers (recent forecast as guess), providing the guess for the detailed HRW winds analysis.

    - Later, a prior analysis (at each scale) is the new guess, and so on.

Some further ideas (and II)

- Merging with NWP data is also advisable for the use of clear air products: as there are few profiling channels on SEVIRI (particularly for temperature), an air mass dependence has been suspected, at least in SAI, that could be minimised using a NWP guess. But here, procedure is not so easy.
- Instead, NWP could be part of the generation itself (at least for SAI), adding "selected" forecast information as input data. (Likely in the long term, when models will properly assimilate MSG data, the clear air product development could perhaps be focused on rapid changes, and small scales).
- Precipitation products could also improve by including other data (MSG is sensitive to just cloudiness). For example, to provide as part of the PC product, thresholds (%) for practical use of the PC, tuned from data of the PPS PC product (that uses microwave).
- To be noted , a a similar threshold is already part of the HRW for the wind quality (QI), but it is by now fixed (it should also in the future be tuned).

Conclusions

- An important work has been done (started) at INM to get benefit of the SAFNWC products.
- By applications and for representative cases, positive aspects, and those where improvement is convenient, have been shown and discussed.
- Some ideas for the future have been expressed, emphasising the need of data integration for nowcasting. In some products it have been suggested that developers should investigate if it could be part of the product generation itself.