

# SAFNWC products in the MSG/ATAP Intranet page for the use of forecasters in AEMET: evolution, experience and perspectives

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# SUMMARY

- Objectives, evolution.
- Page entries/visualizations (using SAFNWC), overview, examples, product considerations:
  - Fog/low cloud
  - Icing
  - Convection “new” (preoperational)
  - Dust
  - Snow cover (experimental)
  - Entries using HRW winds
- (Proposals/recommendations: SAFNWC 2010 Users’ Survey)
- Conclusions and future

# Real-time MSG/ATAP Intranet page

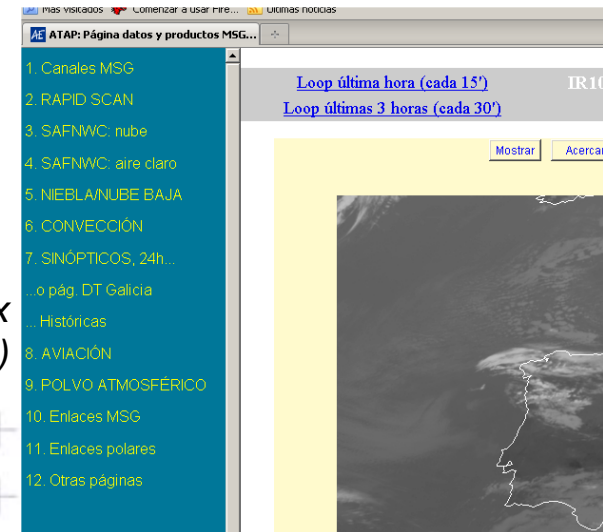
- Objectives: To ease access in AEMET (not only in forecasting centres) to MSG real time data and products. Also useful for case archiving, training and product evaluation.
- First operational version in 2005-2006 (including lists of SAFNWC products, and 2 dedicated entries).
- Development is focused on entries for specific applications or phenomena. Operational entries using SAFNWC products by now are: fog/low cloud, convection, aviation (icing, mountain wave) and dust.
- Activities (page development, evaluation) are helpful to learn on product quality/usefulness, on better use and integration to other data, and work in more friendly page and visualizations or think on problems or limitations.
- Also useful to better understand and fit to required by user or at least, to think on and apply more meteorological approaches in page organization and visualizations (example new page for convection).



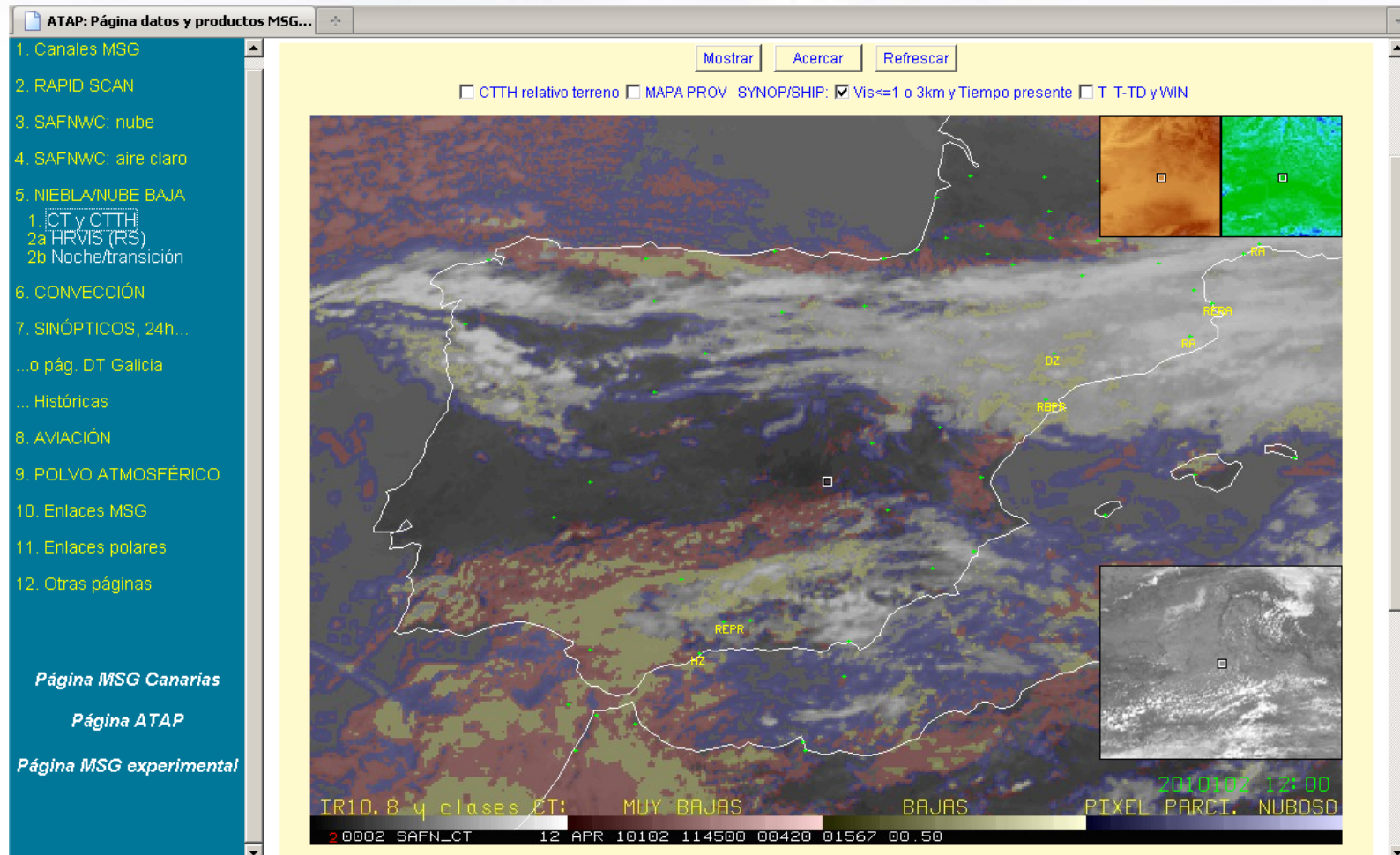
*Page index  
(2005)*



*Page index  
(2010)*

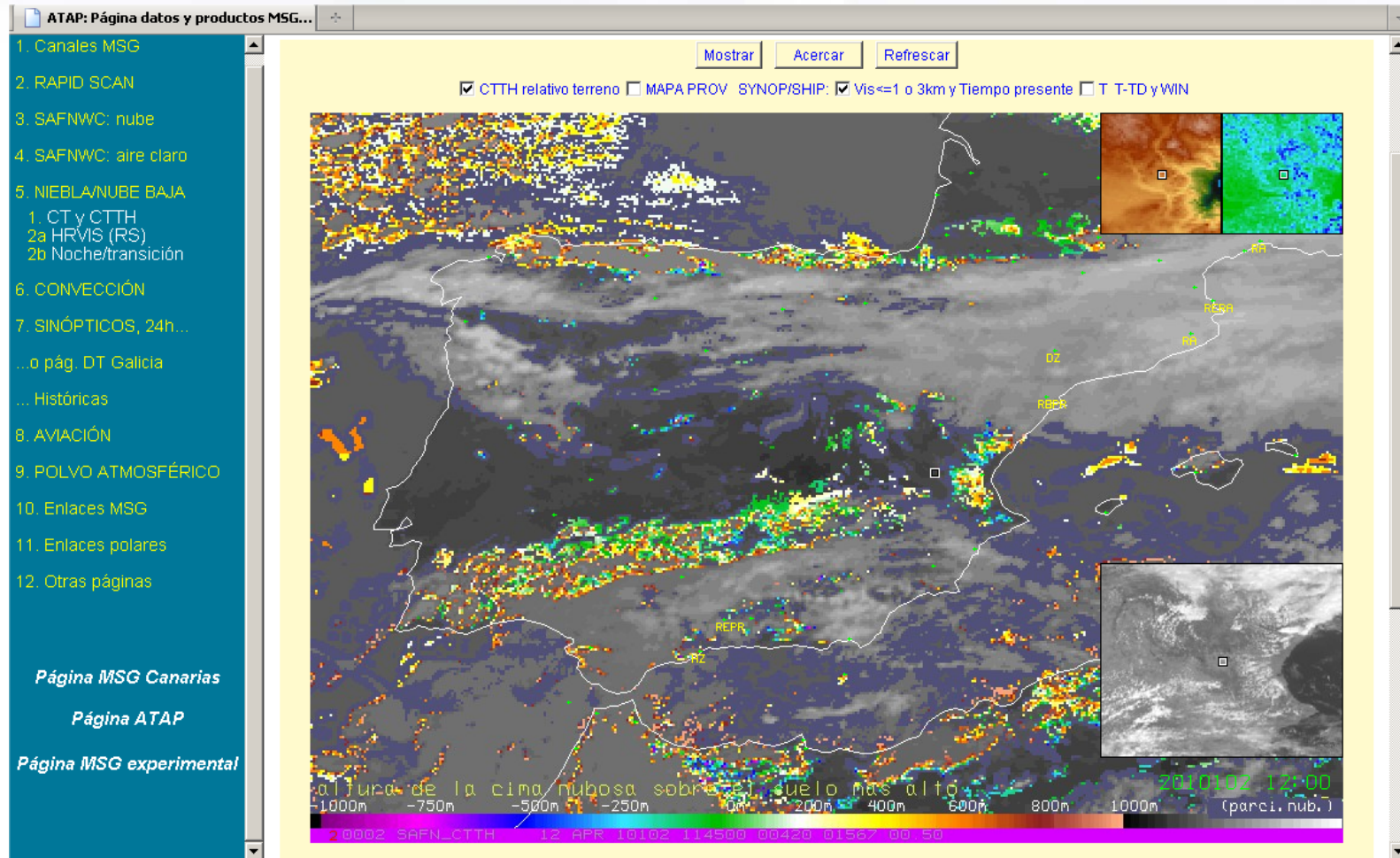


# New (2010) Fog/low cloud entry: basic display/subentry ("CT+IR based")



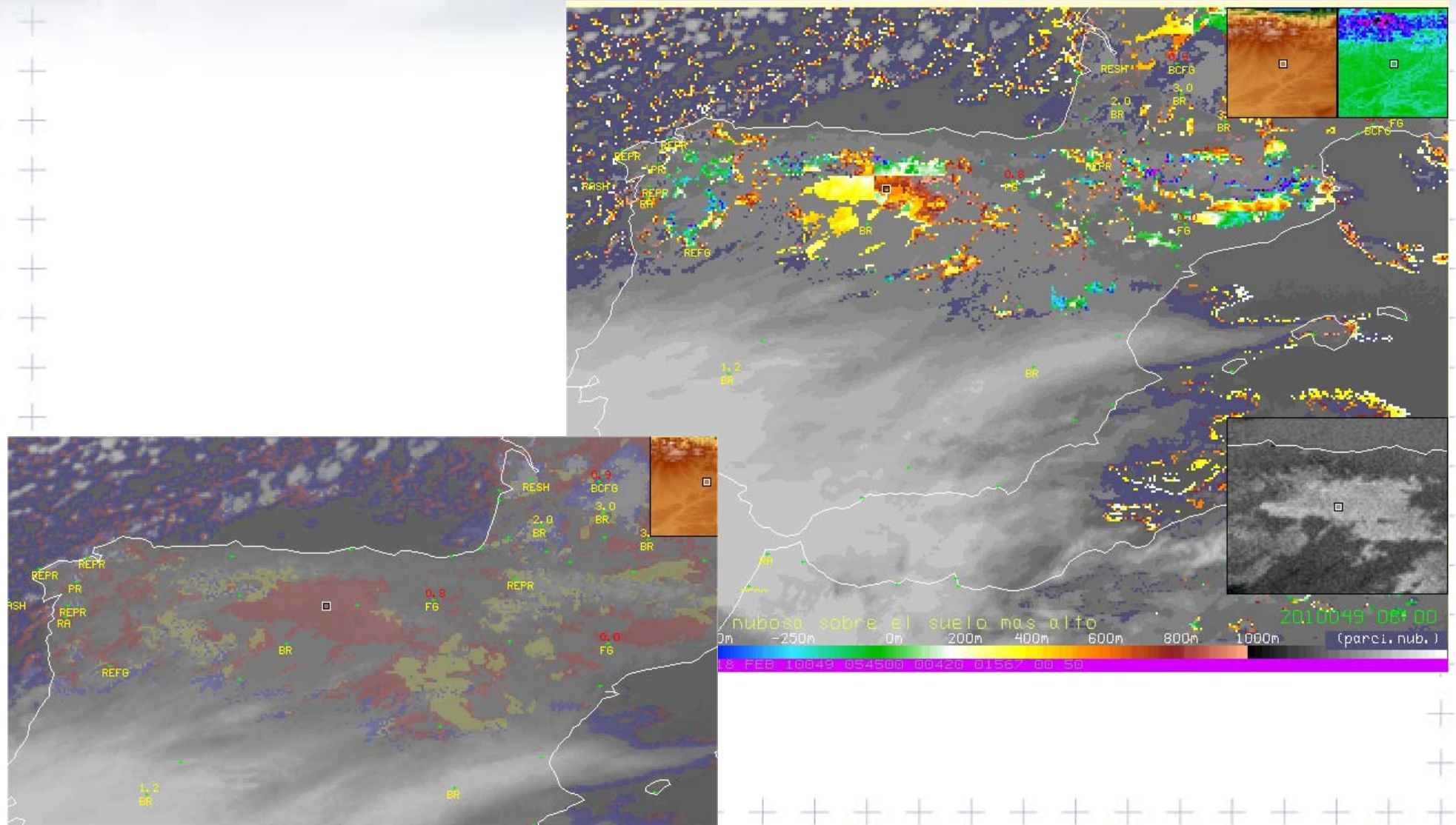


# New (2010) Fog/low cloud entry: overlaid CTTH minus above surface (highest) elevation



*Warm colours: CTTH is above terrain. Cold colours: below or at same level of at least 1/9 of the pixel surface points. Highest elevation value (at MSG resolution) is used, from a 1x1km elevation model. Mean, and lowest minus highest values around the box location, are displayed in the 2 upper small windows.*

# Recent example fog/low cloud entry: 18/02/2010 6z (night-time)





# CT/CTTH Example (preoperational page) with use of topography information

(Poster presentation "Combined use of MSG images, products and other data for operational forecasting at AEMET-Spain: applications to fog and in-flight aviation". The 2008 EUMETSAT Meteorological Satellite Conference).

• Other display features include data timing, overlays of cloud top, cloud top pressure, and CTflow display.

CTTHlow is routinely computed and checked on experimental basis since late spring 2008: looks promising. Note limitations in CTTH: it could reflect processing at segment resolution ("rectangular" aspect somewhere) and (intrinsically) NWP model resolution. Some very low cloud pixels have  $CTTH\_z = 0m$ , so are not color enhanced.

Figure 2: CTflow product for 1/07/08 at 7:45z. IR10.8 image for CT classes separately: very low (reddish tone), low (yellowish), broken (bluish), other.

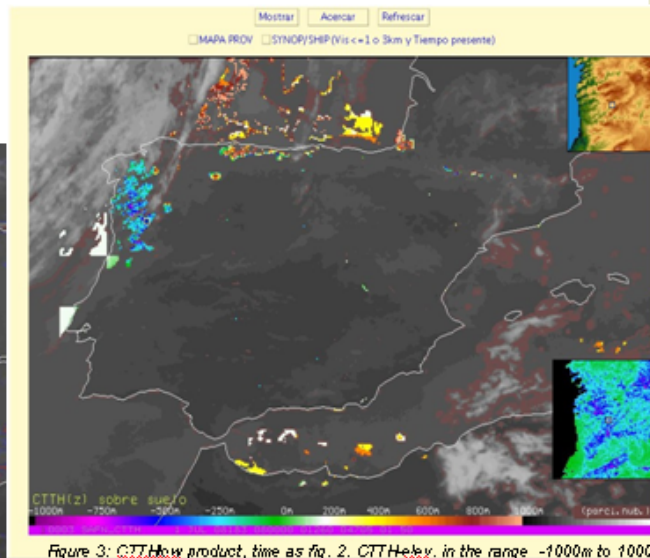
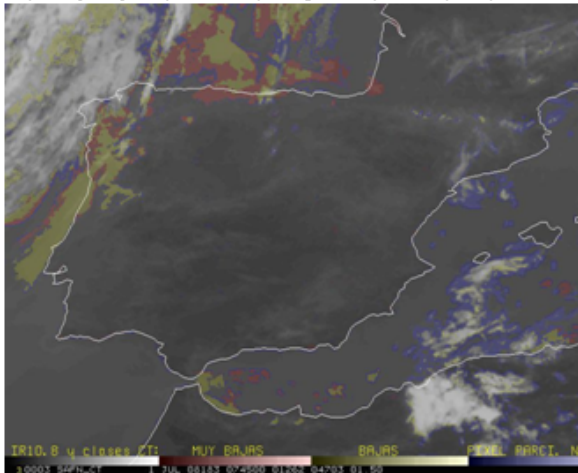


Figure 3: CTTHlow product, time as fig. 2. CTTHelev. in the range -1000m to 1000m (colour scale as indicated) plus broken cloudiness (maroon). IR10.8 otherwise. Small boxes, right side: 3km topography, medium (usual enhancement) and gap (1km maximum-minimum, same colours, 0 or negative, CTTHlow), centred at the location indicated by the small square of empty box in main display. The Intl frame with interactive-option buttons is shown (same interface is used for CTflow and MSGflow.twd displays in the AEMet intranet).

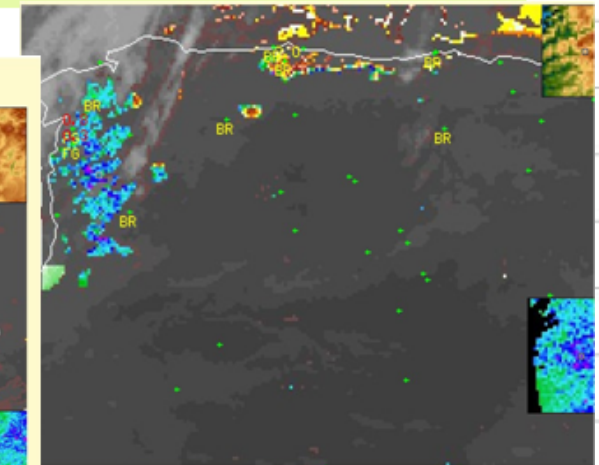


Figure 4: as in fig. 3, buttons zoom ("Acercar") and SYNOPSIS are activated. Observations (most recent SYNOPSIS, 6:00z): availability (green), present weather (yellow) and visibility (in red up to 1km, property fog, in yellow up to 3km).

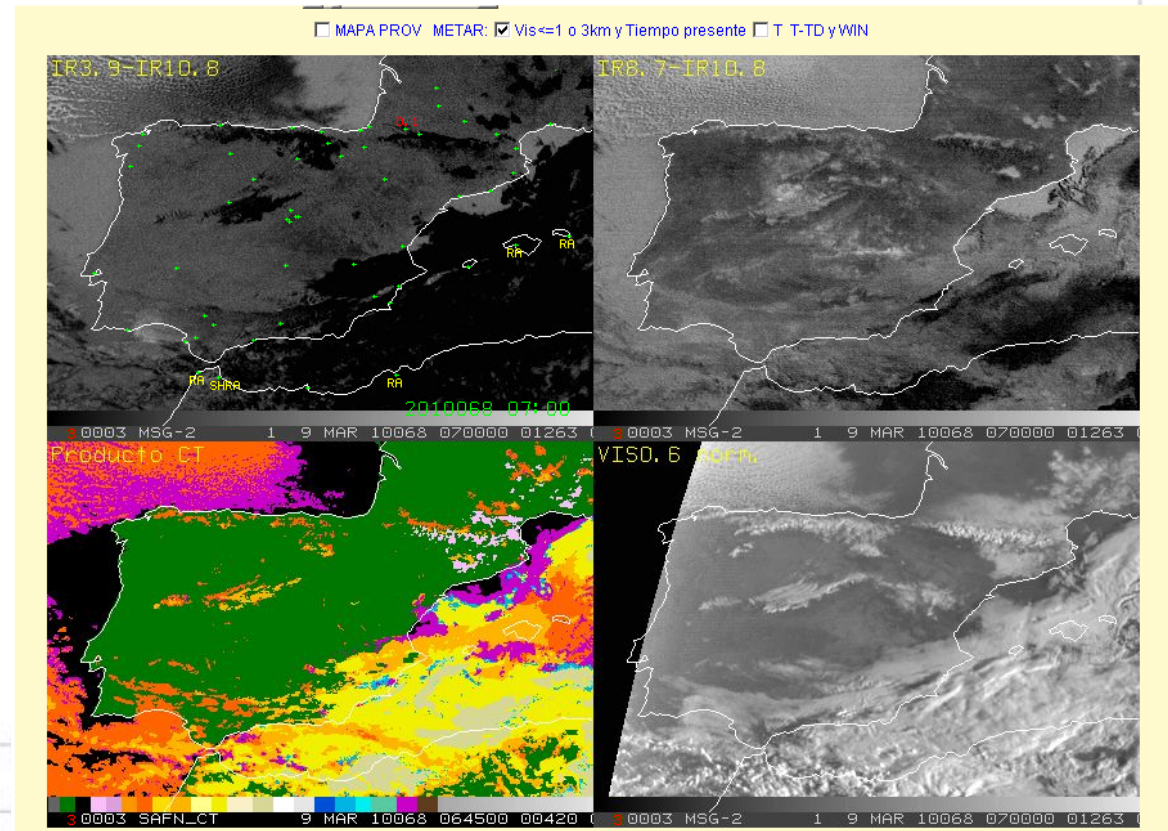
Figures 2 to 4: frontal cloudiness reaching NW corner of the Iberian Peninsula. Low and very low cloudiness, pre-frontal (north coast) or related to the front, is seen in CTflow product, but with not much detail. In CTTHlow, the fog will generally correspond to values close or less than zero, i.e. cloud top slightly above, around or even below elevation maxima; apart local patches in the north, fog is likely to be found in the frontal area cloudiness, in inner valleys (see windows with information from elevation database), and also near the shore in the northern edge, where SYNOPSIS observations (some 2h old anyway) confirmed the fog.

[\(See other examples\)](#)

# Considerations on CT and CTTH. Dawn-Dusk channel-based display example: 9/03/2010

- Significant products improvement in recent versions.
- CT: very little degradation in dawn/dusk (except in case of moving upper layer in multilayer cloudiness? See next slide)
- CTTH: still “rectangular” aspect. CTTH\_z around 0m not displayed?

*Of course, main satellite limitation: only cloud-top is seen!*





# Another application of CT and CTTH: Cloud-top icing Flight Level

## Downcasting) of icing

### Cloud Top

techniques (Met).

to MSG. For the

CT

ss. clouds, then

or

is in an MSG and GOES overlapping region over the Atlantic. As PIRREP observations

Figure 9: 16/07/08 at 8:45. Basic display of MSG Ice product on flight-levels (colour scale as indicated) plus too cold clouds (<-29°) in grey.

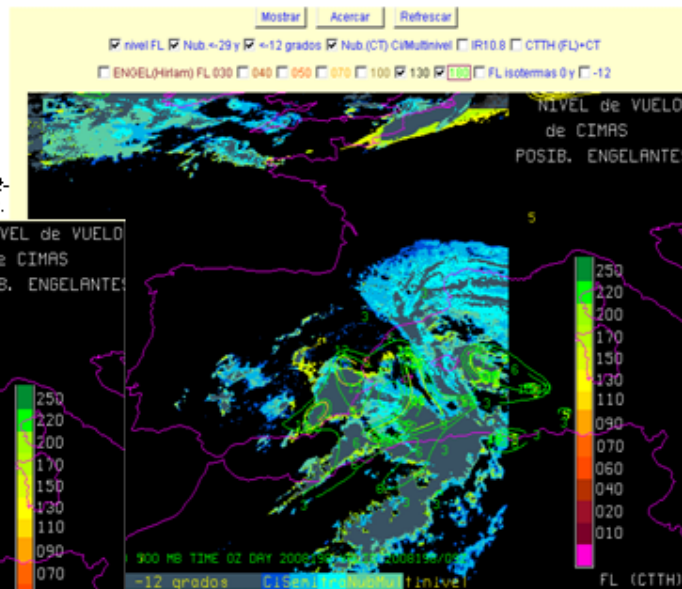
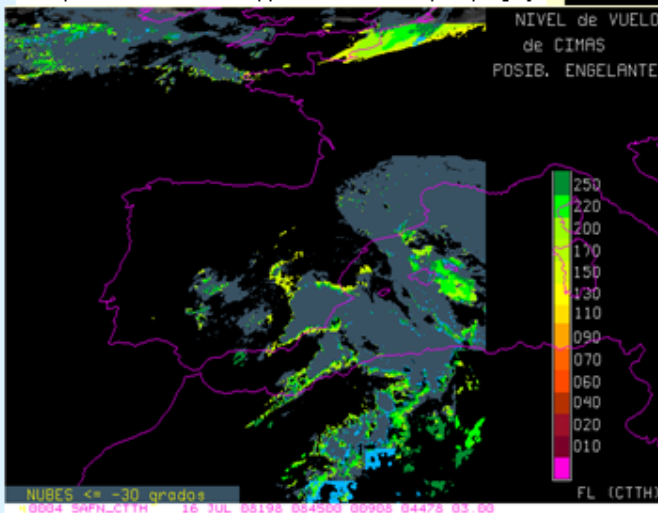


Figure 10: as in fig. 9, but button-interface is shown and some options activated: cloud tops colder than -12° (in grey, masking and extending <-29° in fig. 9) plus CT semi transparent cloudiness (3 classes, blue, the darker the more transparent, and daytime ☉ with other lower layers, turquoise) partly masking the former. Isolines of MNP icing product at flight-level 130 (yellow) and 180 (green), HIRLAM model, 0:00z run valid at 9:00z.

**In fig 9, icing (MSG Ice) certainly extends below parts of the <-29° large hiding cloudiness. Not in the structure S of France to Gulf of Lion, that looks as being very high semi transparent Ci, as fig. 10 confirms and also for spots in Spain and inner Africa. MNP fields support icing over the Mediterranean, not in Africa nor in the upper image bands, where its presence is still a possibility. In theory, MSG Ice tops masked by <-12° (e.g. N of France) are not much significant (top cloud reaching colder temperatures, with important presence of ice nuclei known to reduce super-cooled content). Multilevel cloudiness (e.g. left-upper corner), is similar to opaque, but only known daytime. 0° and -12° isotherms (not shown) could provide some information on icing thickness.**

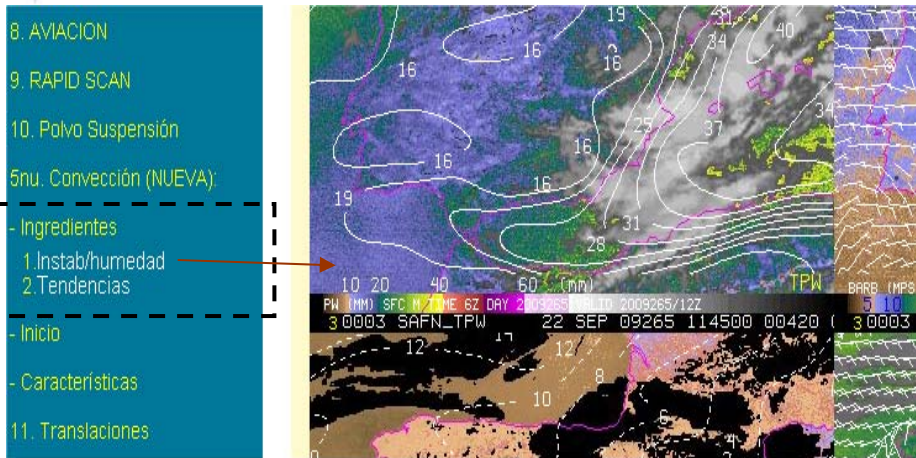
("Combined use of MSG images, products and other data for operational forecasting at AEMET-Spain: applications to fog and in-flight aviation". The 2008 EUMETSAT Meteorological Satellite Conference).

# NEW SCHEME IN THE MSG PAGE FOR ACCESSING EACH "ASPECT" OF THE CONVECTION (I). INGREDIENTS

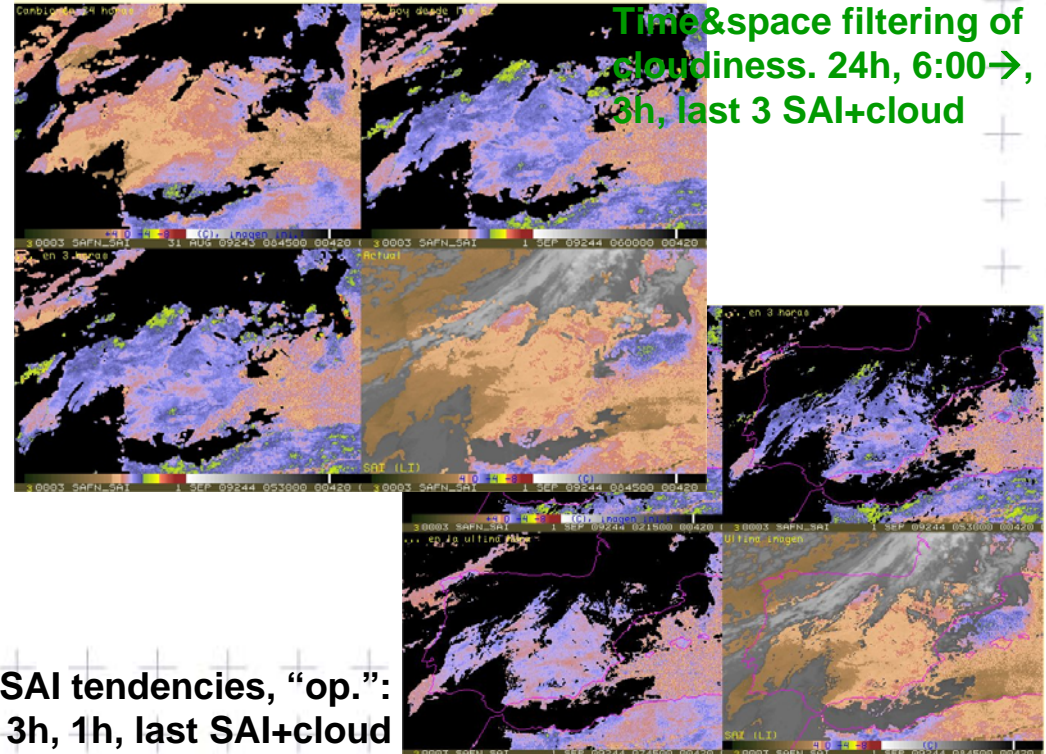
*(examples presented at ConvectionWG 2009 Workshop)*

- More meteorological approach is developed & checked: 3 sub-entries for a-priori conditions, initiation, and characterization, in the Convection entry (the still operational being more product-based approach).
- Advantages: access purpose-oriented, eased to the forecaster. Scheme more suited to integrate to/with other data. Better for identification of limitations.

**(Part of) experim. page with "new" conv. sub-entries**



**SAI tendencies, "new":  
Time & space filtering of  
cloudiness. 24h, 6:00 →,  
3h, last 3 SAI+cloud**



**SAI tendencies, "op.":  
(6h), 3h, 1h, last SAI+cloud**

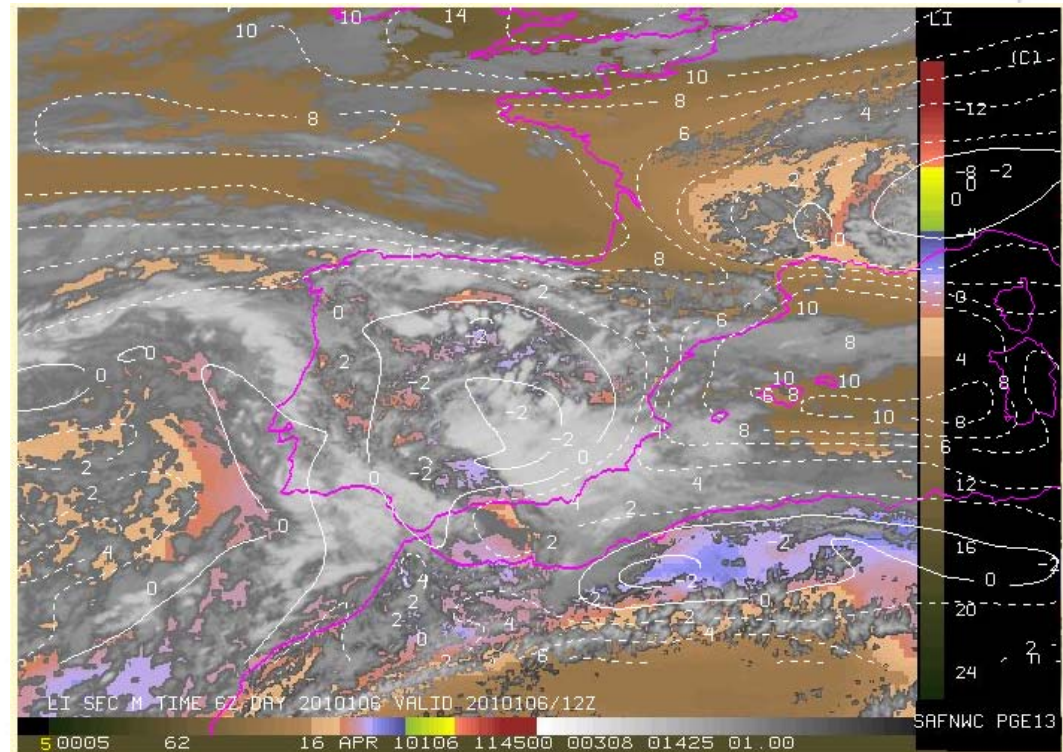
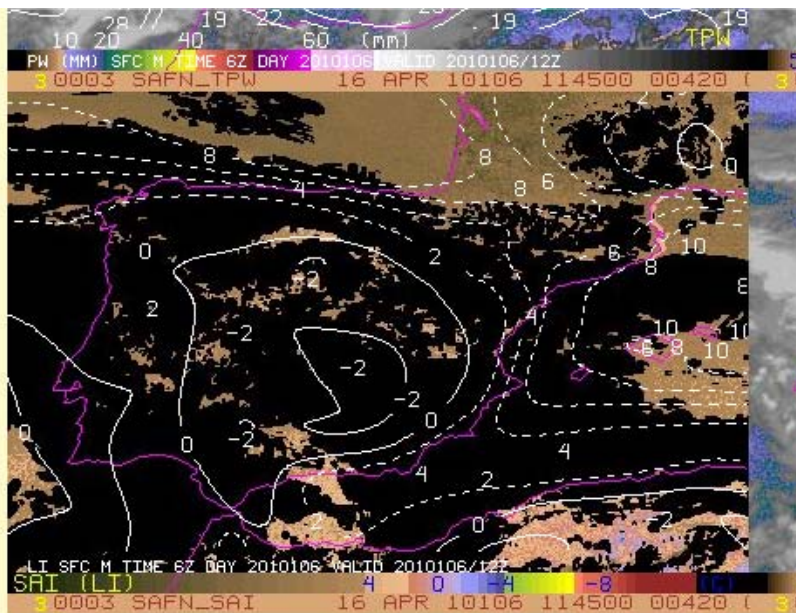
**- Inicio**  
1. HRVis y vto. bajo

**- Características**  
1. Multiproducto  
2. Vigilancia SCM  
3. HRVis y vto. alto



## About new PGE13 - SPhR (SAF2010) products and its application

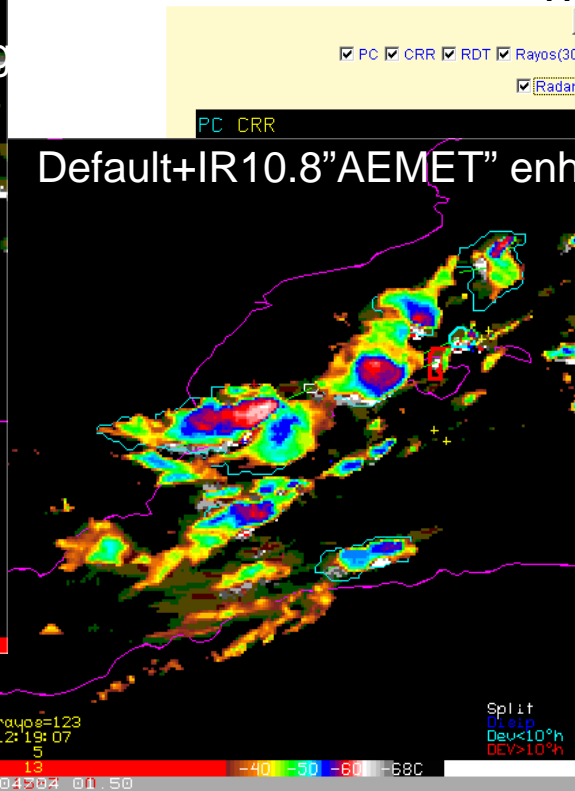
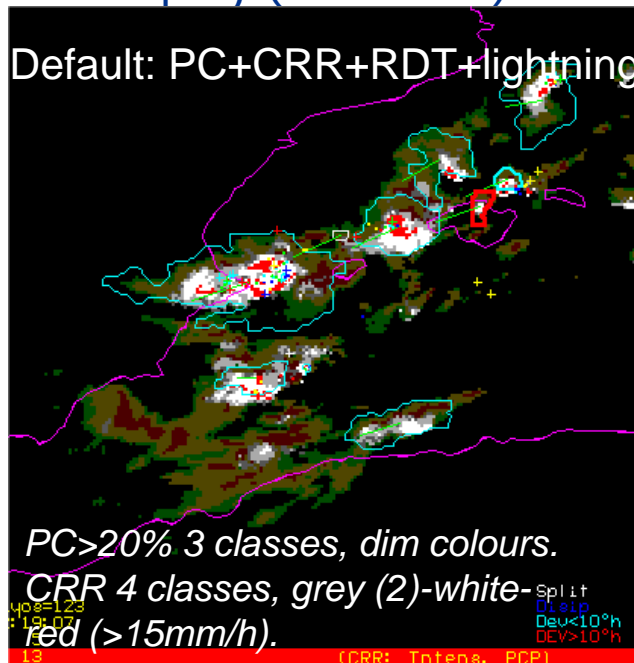
- Some experimental products from SPhR - Physical Retrieval , including improved SAI/TPW/LPW-like, now available at AEMET for testing. By now only basic product display tested. Looks promising (smoothed products and changes, SAI/LI computed for a mixed starting layer reducing diurnal variability...).
- SAI/TPW/LPW-like products could easily replace prior PGE06-07-08(-12) in applications. Other products already provided for test: TT and guess-relative product differences. Anyone profile-derived is in principle possible.
- Initial idea: PGE13 being physically based, product difference (to guess or prior slots), should be easier to interpret (T/RH difference/change at any level), finally more useful.





## NEW CONVECTION SCHEME (II): "MULTIPRODUCT" DISPLAY FOR CHARACTERIZATION OF EXISTING CONVECTION

- Quick summary of satellite information + reference data (other sources).
- Integrates: NWCSAF products on convection and precipitation, channel enhancements and combinations, radar and lightning information.
- All data are switch on/off overlays, wide number of combinations possible. Last + last hour (15min interval).
- Easy to use but still a few problems e.g. temporal&spatial differences on data, display (ANIS-Java) limitations.



### Window interface

Mostrar Acercar Refrescar

PC  CRR  RDT  Rayos(30min)  WV6.2-IR10.8Pix.calidos  IR10.8 realces usual  ... y ComWVG

Radar Ecotop  ... PPI ... ?e YRADAR?  Mapa prov

Default+EchoTop

Split  
12:19:07 T.range=123  
07:12:19:07<12:19:07  
10 4 12 5 14 16

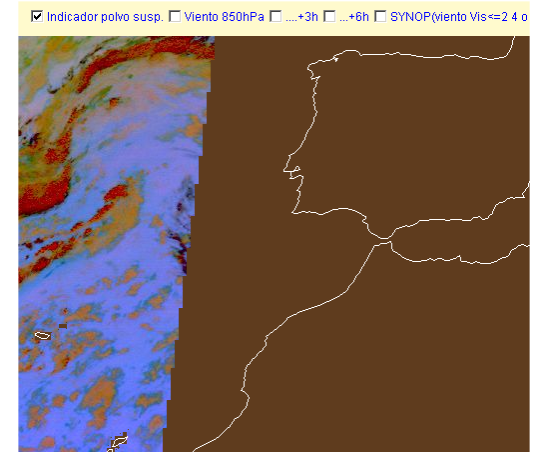
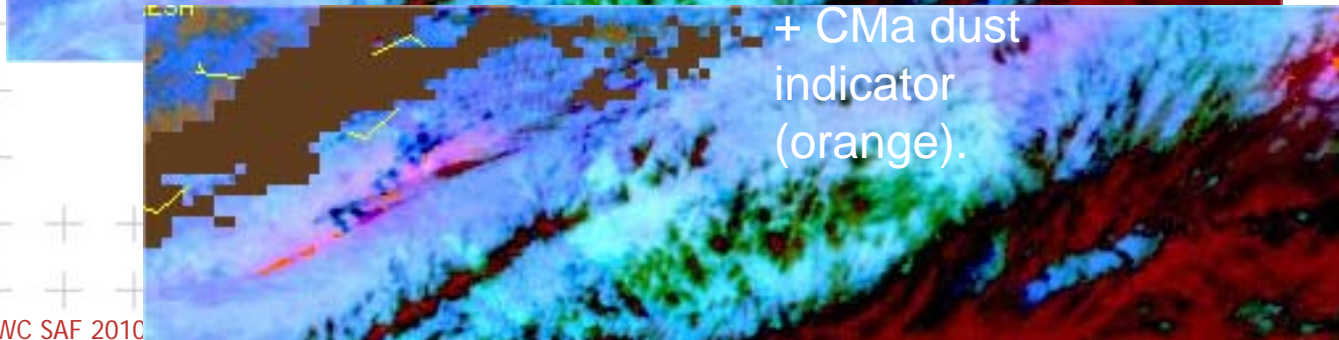
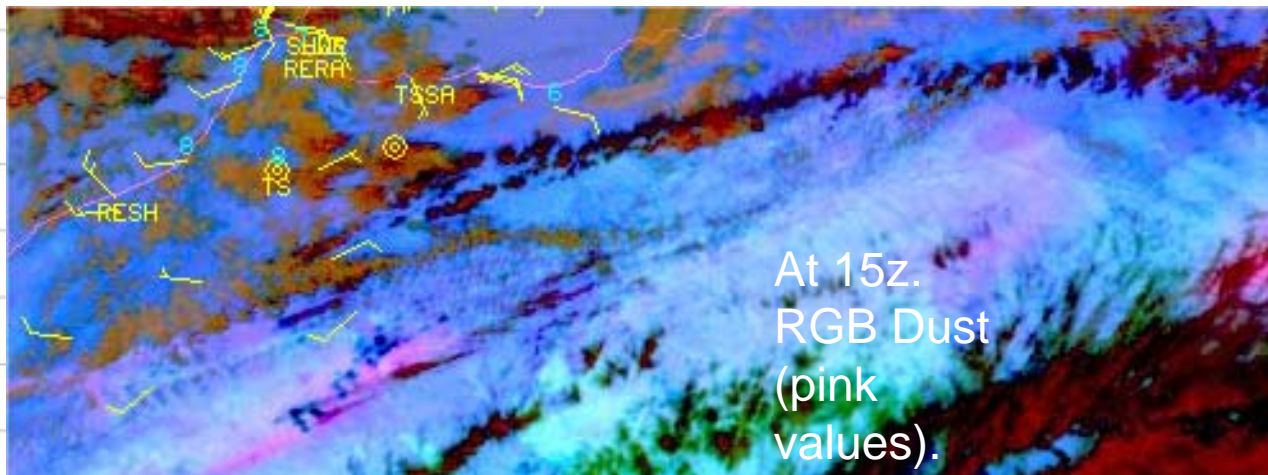
13 (CRR: Intens. PCP)

ECHO DEV>10°h

[\(See recent example\)](#)

# Entry for atmospheric dust, land example (over Africa) 16/04/2010

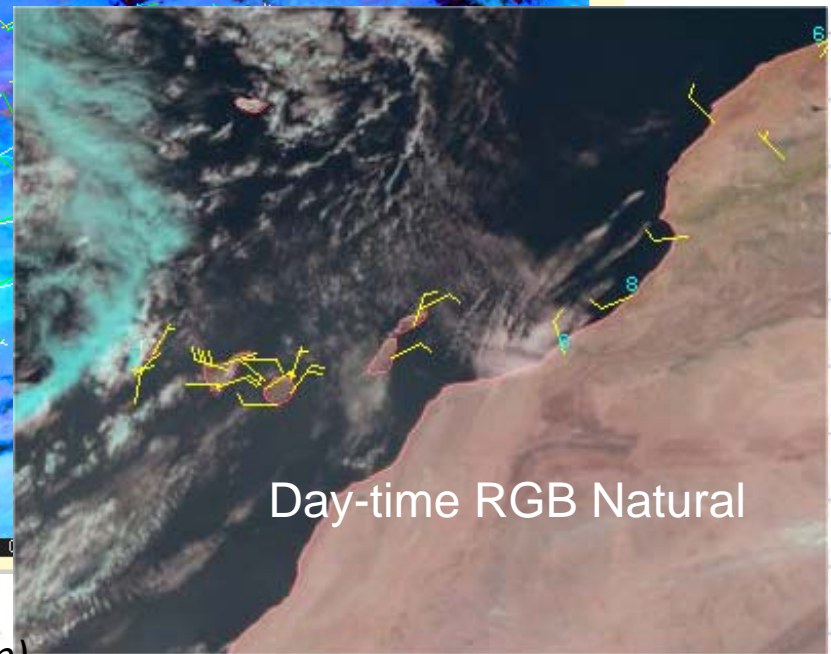
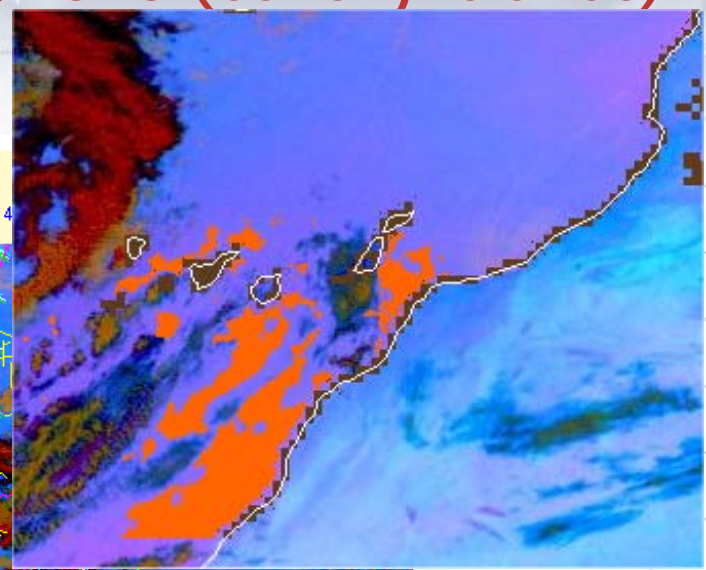
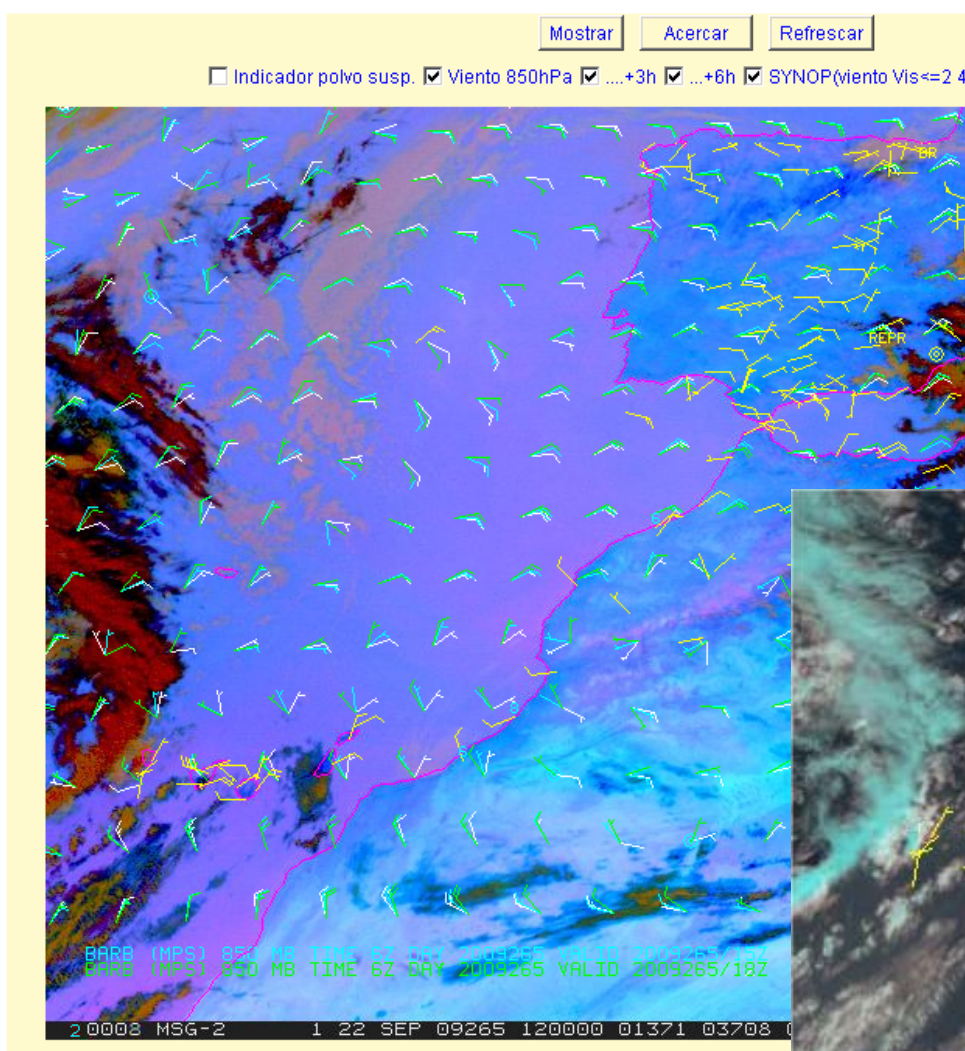
- Limitations in SAFNWC Dust indicator (CMA product): only qualitative, not computed in coastal/high ground, nor nighttime over land or at twilight...
- ... But it is objective information on the phenomena and probably the most complete from MSG, generally successful to depict the affected areas, though not its actual extent. It is overlaid to channel /channel combination displays (RGB Dust, Natural, HRV or HRV+VIS0.6).





# Dust entry: Offshore example 22/09/2010 (Canary Islands)

- 1. Canales MSG
  - 2. RAPID SCAN
  - 3. SAFNWC: nube
  - 4. SAFNWC: aire claro
  - 5. NIEBLA/NUBE BAJA
  - 6. CONVECCIÓN
  - 7. SINÓPTICOS, 24h...
  - ...o pág. DT Galicia
  - 8. AVIACIÓN
  - 9. POLVO ATMOSFÉRICO
    - 1. RGB Dust
    - 2. RGB Natural
    - 3. HRV+indicador
  - 10. Enlaces MSG
  - 11. Enlaces polares
  - 12. Otras páginas
- Página MSG Canarias
- Página ATAP

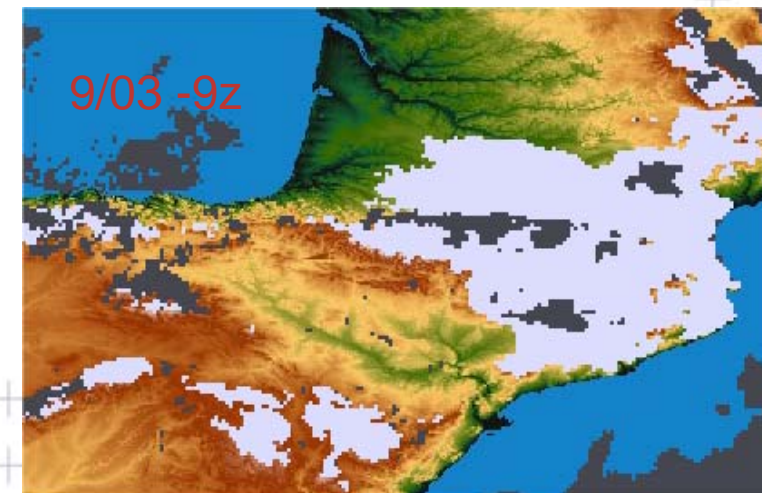
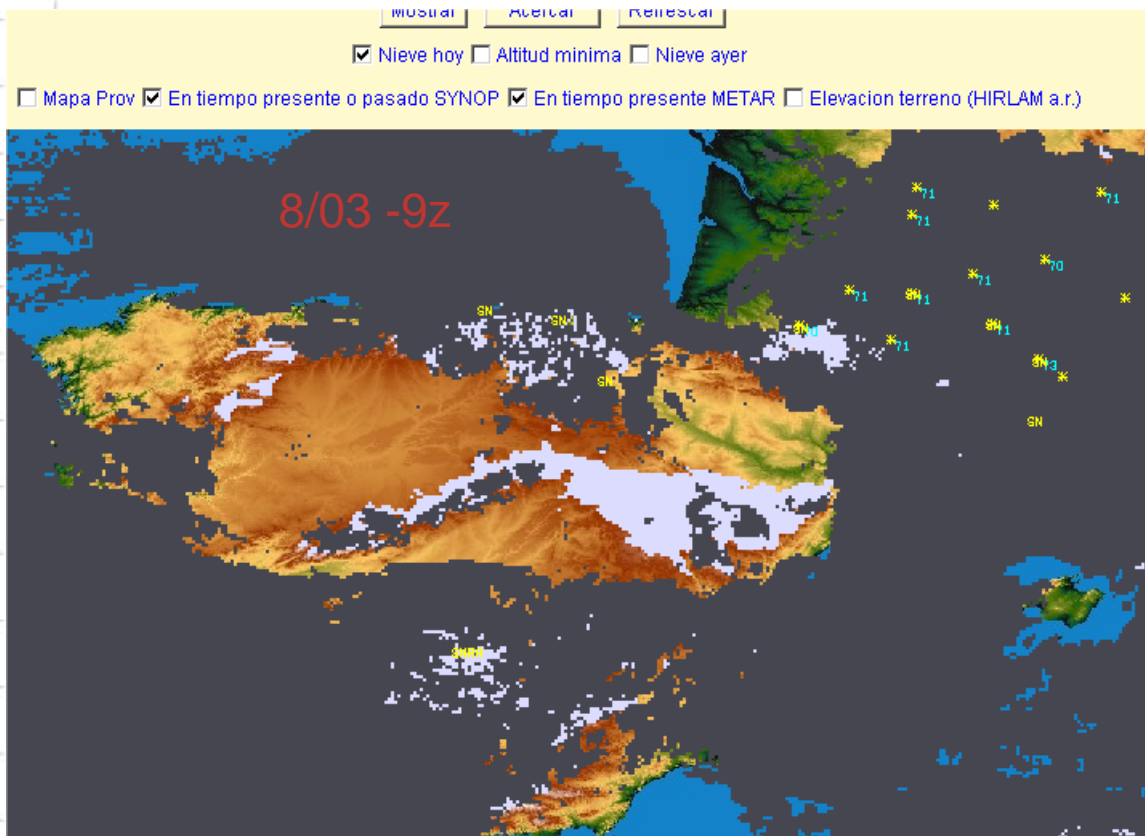


*For these RGB-based displays 6h at 1h interval loops available (for continuity, in general in the page, 1h at 15min)*



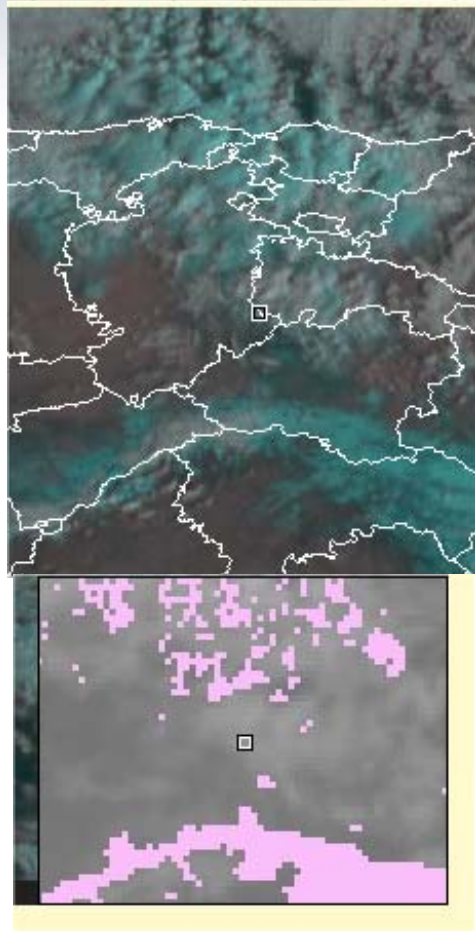
# Snow cover experimental entry. Example 8-9/03/2010 (I)

- Intention: to cumulate CMA snow-covered ground pixels (daytime) during the day until present time. To also show persisting cloud-filled / contaminated pixels. To include ground-elevation data, and observations. (To help the diagnostics, another subentry to last image / last hour detailed information : RGB HRV-HRV-NIR1.6).



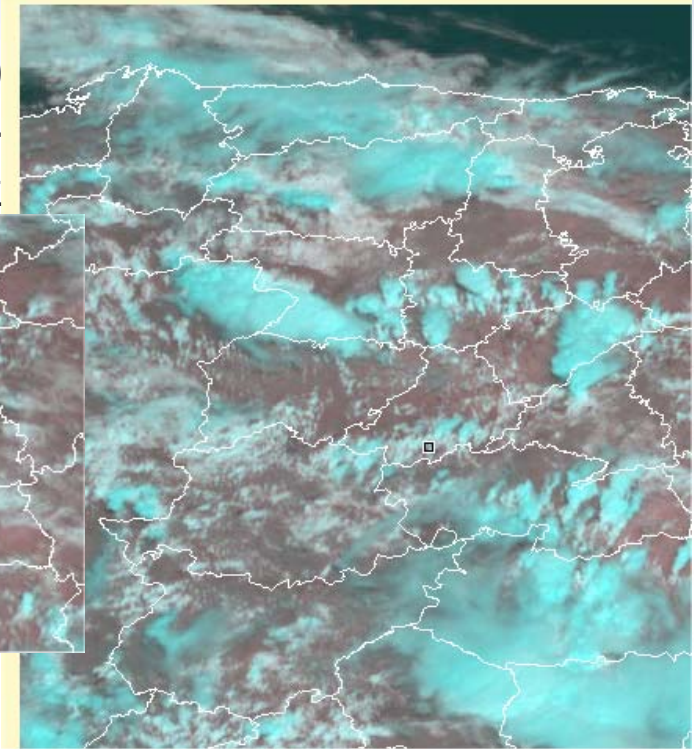
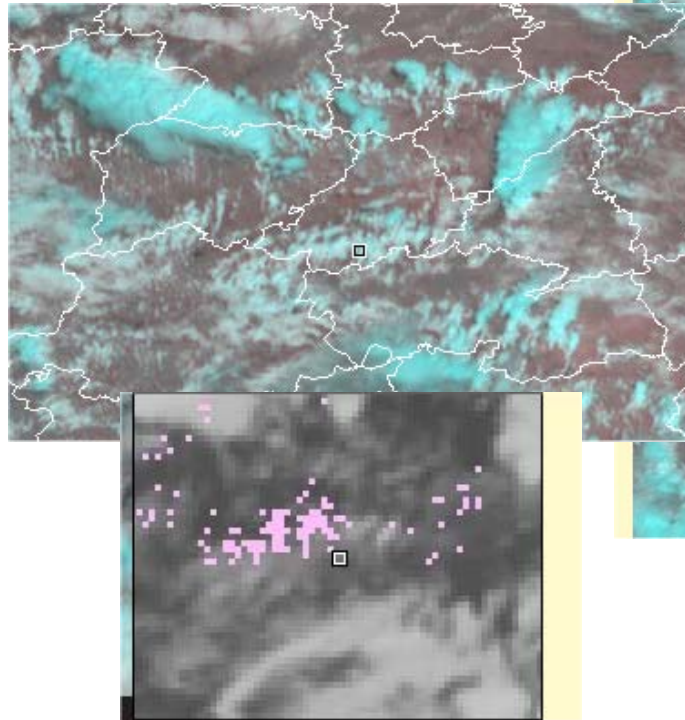
# Snow: false alarms?. + RGB HRV, NIR1.6. Example 16/04/2010.

## Conclusions



8/03/10 -12z

16/04/2010  
10:45-  
11:15z

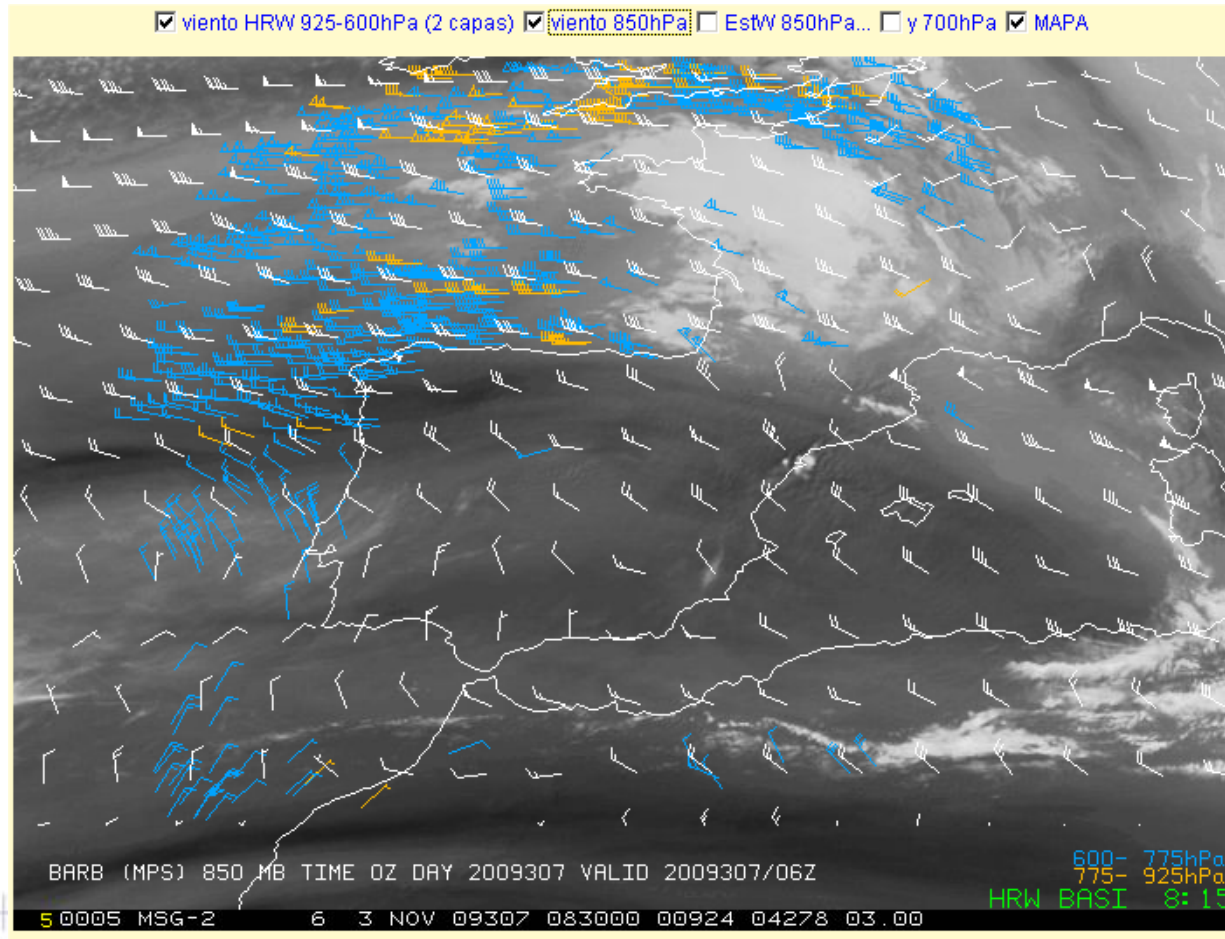


- *(Few!) false alarms are likely to occur (maybe for side-illuminated Cu cloud?), that will persist in the day display...*
- *→ so it is desirable/needed to add some information (to be studied) to the last accumulated image in the entry, summary of temporal analysis of prior data.*



## HRW winds used in Page applications (I)

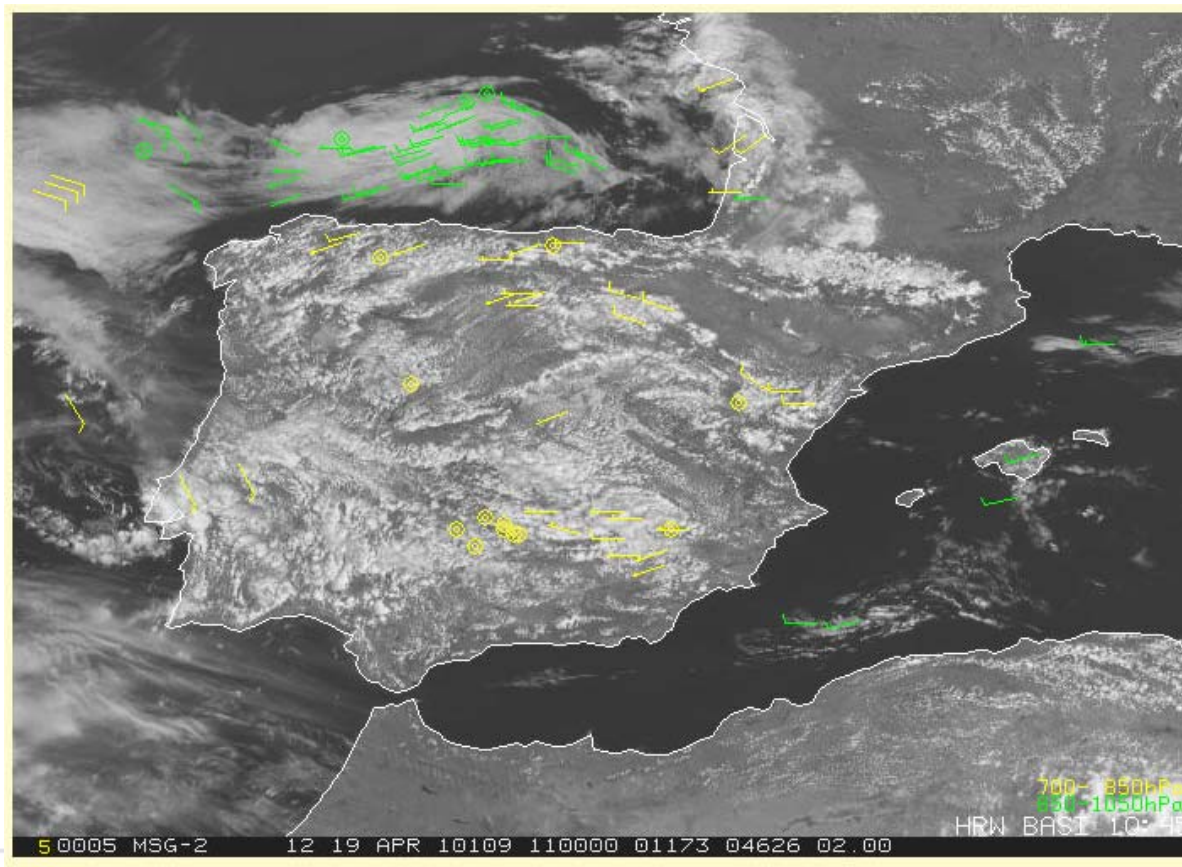
- Aviation entry → Mountain wave: HRW winds (upstream!), for layers centered at 850 and 700hPa shown, displayed on WV7.3 image.





## HRW winds used in Page applications (II)

- Convection entry (new) → C. initiation: HRW winds for layers low (700-850hPa) and very low (>850hPa), indicators on convergence, humidity advection, etc., related to “growing Cu” patterns found in (background) HRV (rapid-scan cycle) image. But HRW wind information is by now insufficient.

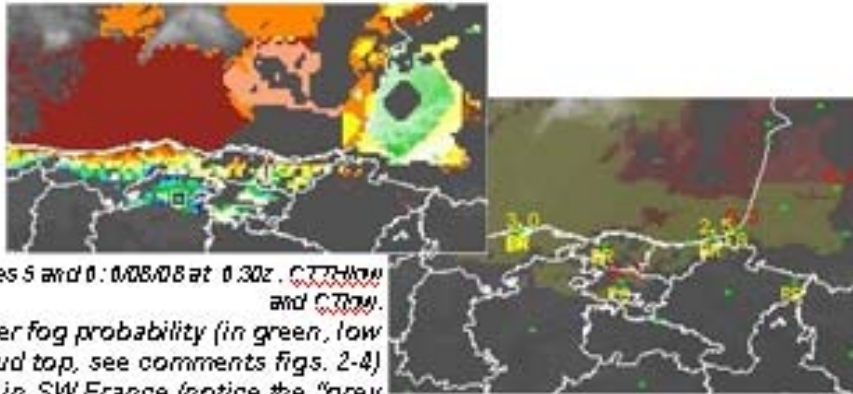


- Medium/high winds also displayed (Convection new → Characterisation).

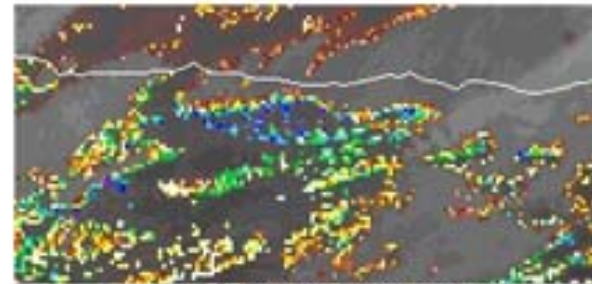
## Conclusions and future

- It has been tried to explain that products could always be useful, if well understood and adequate accessing tools (friendly, complete, adapted to needs) are available.
- Another foreseen entry/application: precipitation.
- Of course if/when possible, the other existing entries will continue to be upgraded (e.g. Convection adapted to PGE13)...
- ... And enhanced (e.g. PGE13 to provide new parameters, as ingredients to Convection and even Fog/low clouds entries).
- It has also been shown that development of these pages/entries is useful to better understand needs/limitations.
- And all this work for the MSG page will certainly result very useful when configurating the (parallel) NinJo system of meteorological workstations, to be deployed in AEMET forecasting centres in next years.

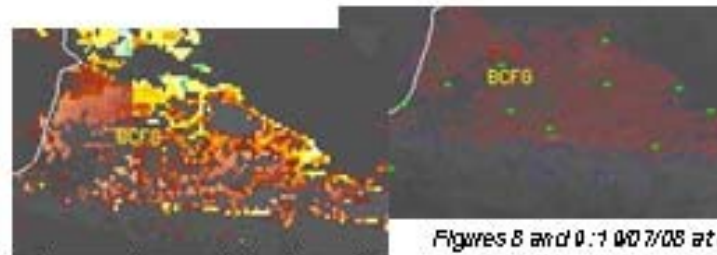
*CTTH (CT) examples (CTTH<sub>z=0m</sub>, Cu cloudiness, dissipating Fog/St) (preoperational page, presentation "Combined use of MSG images, products and other data for operational forecasting at AEMET-Spain: applications to fog and in-flight aviation" .The 2008 EUMETSAT Meteorological Satellite Conference).*



*Figures 5 and 6: 01/05/08 at 0.30z. CTTH<sub>low</sub> and CT<sub>low</sub>. Higher fog probability (in green, low cloud top, see comments figs. 2-4) in SW France (notice the "grey hole" due to bad CTTH assignment = 0m) and inner Spain (High valley of Ebro). Less probable in coastal areas and over sea (warm colours, higher cloud top).*



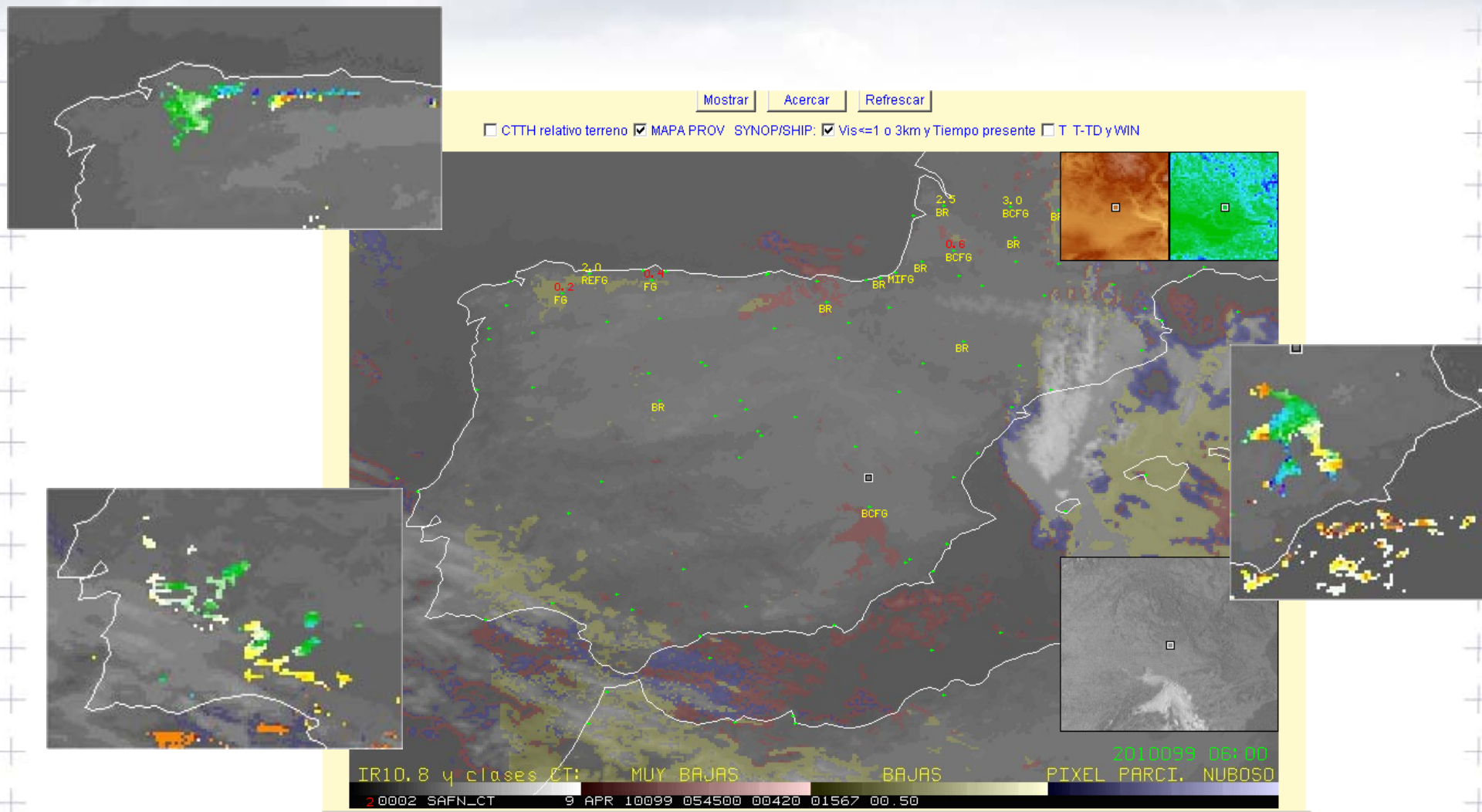
*Figure 7: 12/05/08 at 0.45z. CTTH<sub>low</sub>. Cu-type cloudiness ("noisy" aspect) and the edges of frontal bands should not be mistaking, but in any case, the other data to be consulted, mainly HRV channel, will help confirming.*



*Figures 8 and 9: 01/07/08 at 8.00z. CTTH<sub>low</sub> and CT<sub>low</sub>. Despite the (2h old) observation, and the broad very low-level CT cloudiness, the holes and the CTTH<sub>low</sub> aspect rather suggest an elevated, dissipating pattern of (maybe) earlier fog, or St layer.*



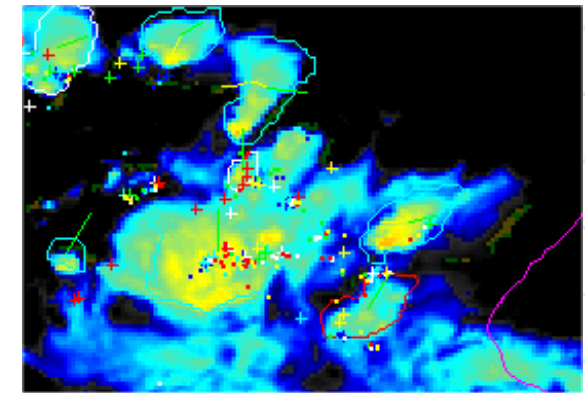
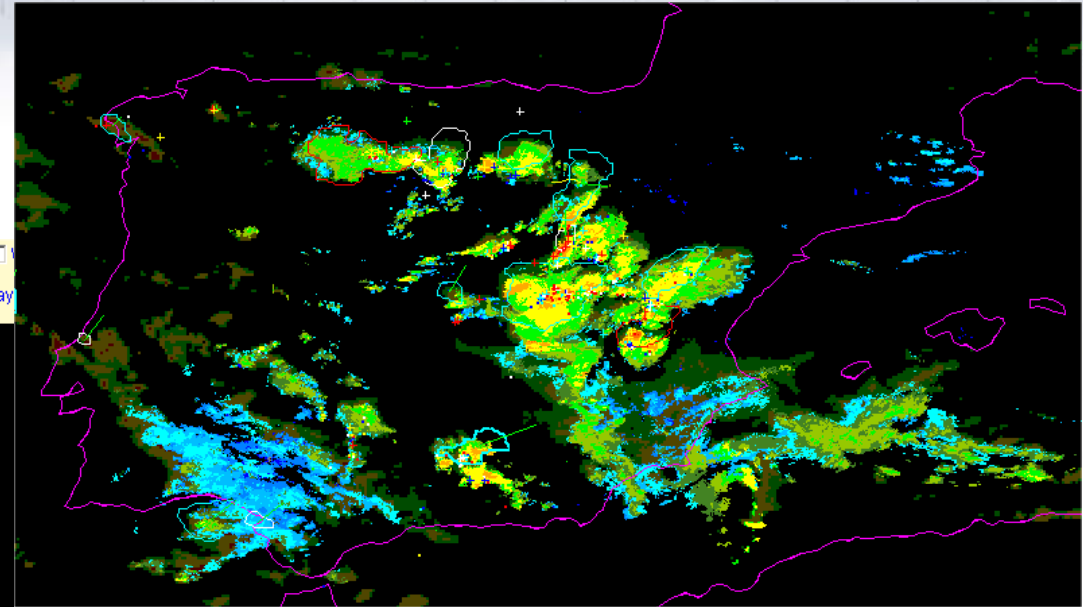
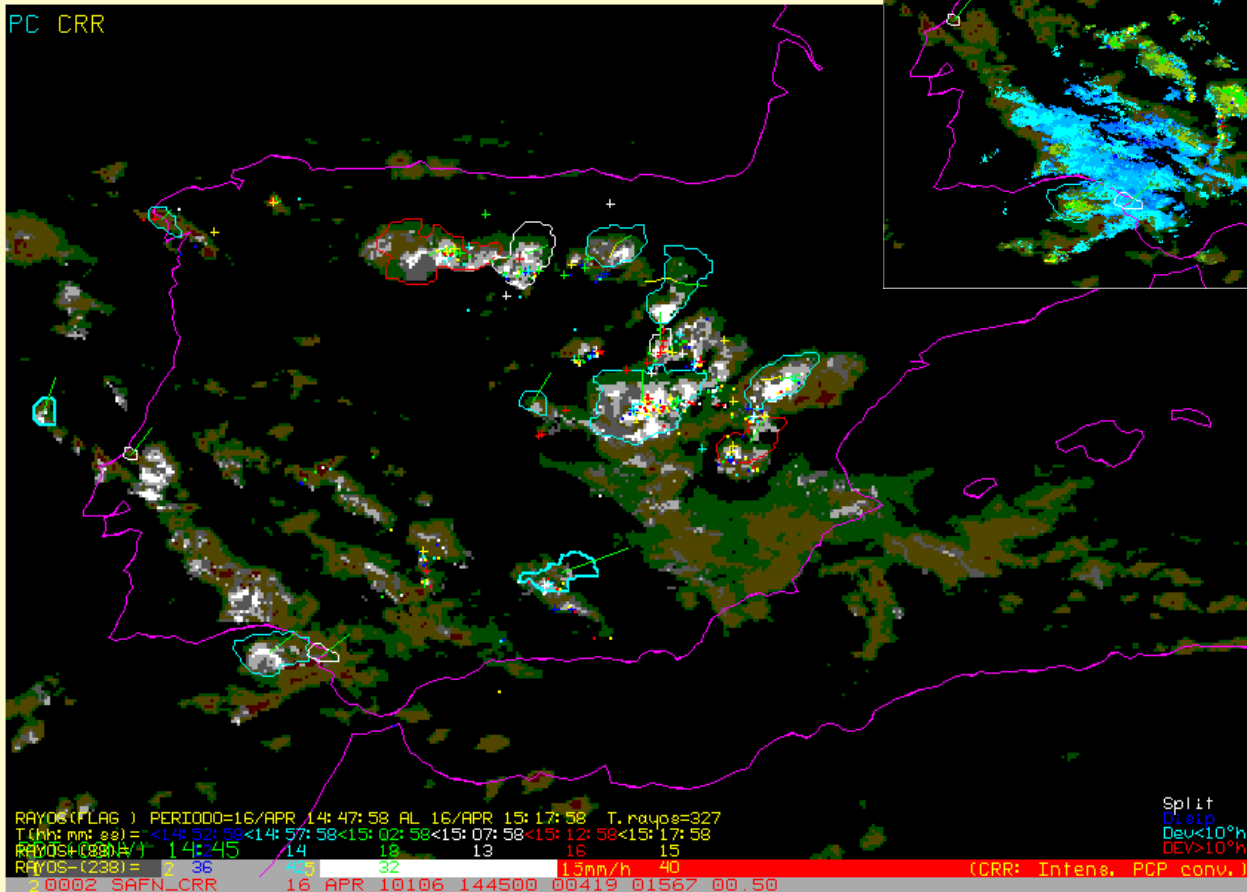
# Recent example: 9/03/2010 6z (day-time).



# Recent example of multiproduct display: 16/04/2010 15z (basic, +Echotop, IR10.8 with ConvWG enhancement)

PC  CRR  IR10.8-elegir realce:  Previmet  o ConvectionWorkingGroup   
 Radar Ecotop  ... PPI ... ?e YRADAR?  Mapa prov  RDT  Ray

PC CRR





## Proposals/recommendations: products

- Remarkable effort in objective validation. But, usefulness? “Usability indicator” could be added to appended Q.I. in accordance to “meteorological conditions” (e.g. re-evaluate criteria for final weighted QI for HRW winds).
- More cloud properties: liquid/solid, Reff, liquid path/content (→ icing and convection characteristics)
- “Broken cloudiness” CT class : improve properties determination from use of HRV. Focus computation of “detailed” HRW wind in that class or allow it for specific CT classes.
- Include “Convection Initiation” or “Ligthning initiation” products, or its elements in existing e.g. RDT.
- Continuing the (quite successful) experience on temporal analysis in cloud products at twilight: consider rapid-scan to improve cloud analysis (basic for most products), and HRW computations.
- Many more specific product by product remarks (2010 Users’ Survey).

## Proposals/recommendations: general

- To ensure a soft transition MSG to MTP (e.g. PGE13 or cloud products).
- To revisit the whole SAFNWC strategy: based on too specific products. Revise cooperation and data integration (PPS/MSG, SAFNWC/MPEF, SAFNWC/other SAFs as NWPSAF). Objective: complete “analyzing system” ...
- ... And focal point or excellence centre on use of satellite for use of satellite (and other) data on weather watch and support to nowcasting...
- ... With wider implication of users (it is, as previous points, matter to be discussed).



## Conclusions and future

- It has been tried to explain that products could always be useful, if well understood and adequate accessing tools (friendly, complete, adapted to needs) are available.
- Another foreseen entry/application: precipitation.
- Of course if/when possible, the other existing entries will continue to be upgraded (e.g. Convection adapted to PGE13)...
- ... And enhanced (e.g. PGE13 to provide new parameters, as ingredients to Convection and even Fog/low clouds entries).
- It has also been shown that development of these pages/entries is useful to better understand needs/limitations.
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