GOBIERNO DE ESPAÑA
MINISTERIO DE MEDIO AMBIENTE Y MEDIO RURAL Y MARINO
AEMet Agencia Estatal de Meteorología

Status of Canari in Harmonie.

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30th EWGLAM /15th SRNWP meeting,Oct/2008

Overview.

- Short review about Canari.
- Differences between old Hirlam scheme and Canari.
- Some examples about the performance.
  - Soil Parameters.
  - SST.
- Future plans.

Introduction.

- Canari was included in the Harmonie system from April of 2008.
  - In Harmonie 33h0.
- But it was not implemented for all domains until June of 2008.
  - Harmonie version 33h1.

Introduction.

- The new system is really similar to the Hirlam scheme (called SPAN, Surface Parameters Analysis).

- There are different parts:
  - Analysis of two meter parameters (T2m and H2m).
  - Sea surface temperature.
  - Analysis of the snow depth.
  - Analysis of the soil water content and temperature.
    - For two layers.

- The assimilation method used are optimal interpolation for two meter parameters and for SST.
  - The analysis is mono-variant.
  - The O.I algorithm is:

$$X^A = X^G + \underbrace{BH^T\left(HBH^T + R\right)^{-1}}_{K}\left(Y - HX^G\right)$$

- Surface parameters are calculated using the analyzed value of T 2m and H 2m.
  - For temperature:

$$\Delta T_s = \Delta T_{2m}$$

$$\Delta T_d = \frac{\Delta T_{2m}}{2\pi}$$

- For soil water content:

$$\Delta w_s = \alpha_s^T \Delta T_{2m} + \alpha_s^H \Delta H_{2m}$$

$$\Delta w_d = \alpha_d^T \Delta T_{2m} + \alpha_d^H \Delta H_{2m}$$

- Coefficients α depends on vegetation, local solar time, leaf area index, minimum stomatal resistance and soil texture.

Differences between CANARI and SPAN.

- The main differences between CANARI and SPAN are:
  - The analysis of the snow depth was implemented in SPAN.
    - In Canari it is coded but it is not used.
    - Information about the snow depth analysis in Hirlam, can find in ‘Optimum Interpolation new snow depth analysis in Hirlam, A.Cansado, C.Martin and B. Navascues Hirlam newsletter 45’.

Differences between CANARI and SPAN.

- Canari can turn off of soil moisture analysis depending on the atmospheric condition.
  - For example if the soil is too dry or too wet the soil moisture analysis of the first layer was not calculated.
  - For this conditions there are not any relationship between the atmospherics parameters and the soil ones.

Differences between CANARI and SPAN.

- Shape of the optimal interpolation boxes.
  - For Span the shape of OI boxes is square.
  - For Canari is round.
  - In both cases the size of the boxes depend on the number of observations inside.
    - Have a Max and Min number of observations
- Condition for the differences between orography and observation height:
  - Span 500 m.
  - Canari 1000m.

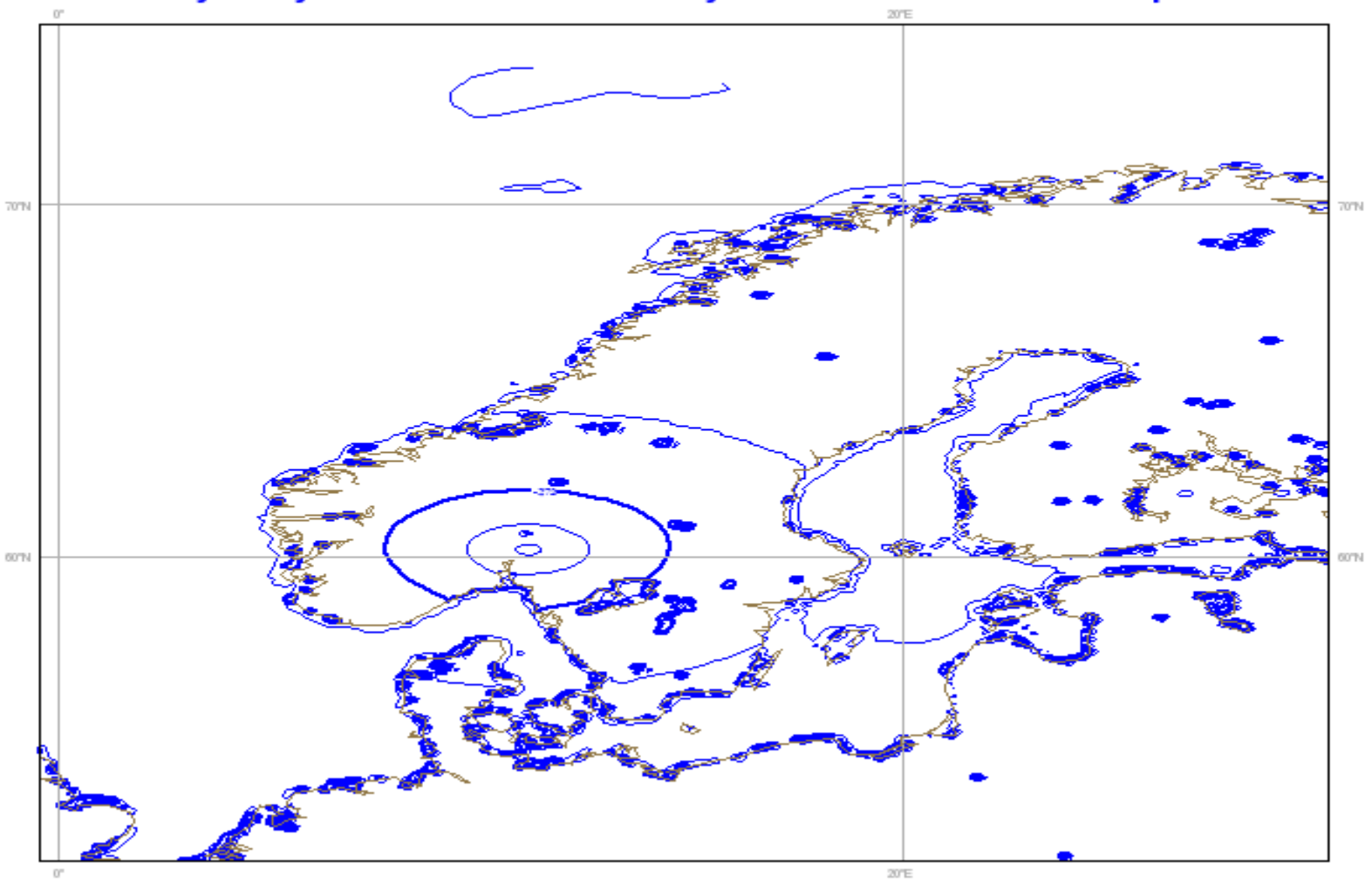
Differences between CANARI and SPAN

- There are different values for the observation and background error between SPAN and CANARI. For example for T2m are:
  - SPAN => σ_o=1 ,σ_B=2
  - CANARI => σ_0=1.4 ,σ_B=1.6
- And for the H2m is:
  - SPAN => σ_o=0.1 ,σ_B=0.15
  - CANARI => σ_0=0.1 ,σ_B=0.18

Single observation experiment.

- Another interesting exercise is to performance a single observation experiment.
- We choose an observation in the Scandinavian domain.
- Can see the way of the propagation of the observation influence.

Single observation experiment.

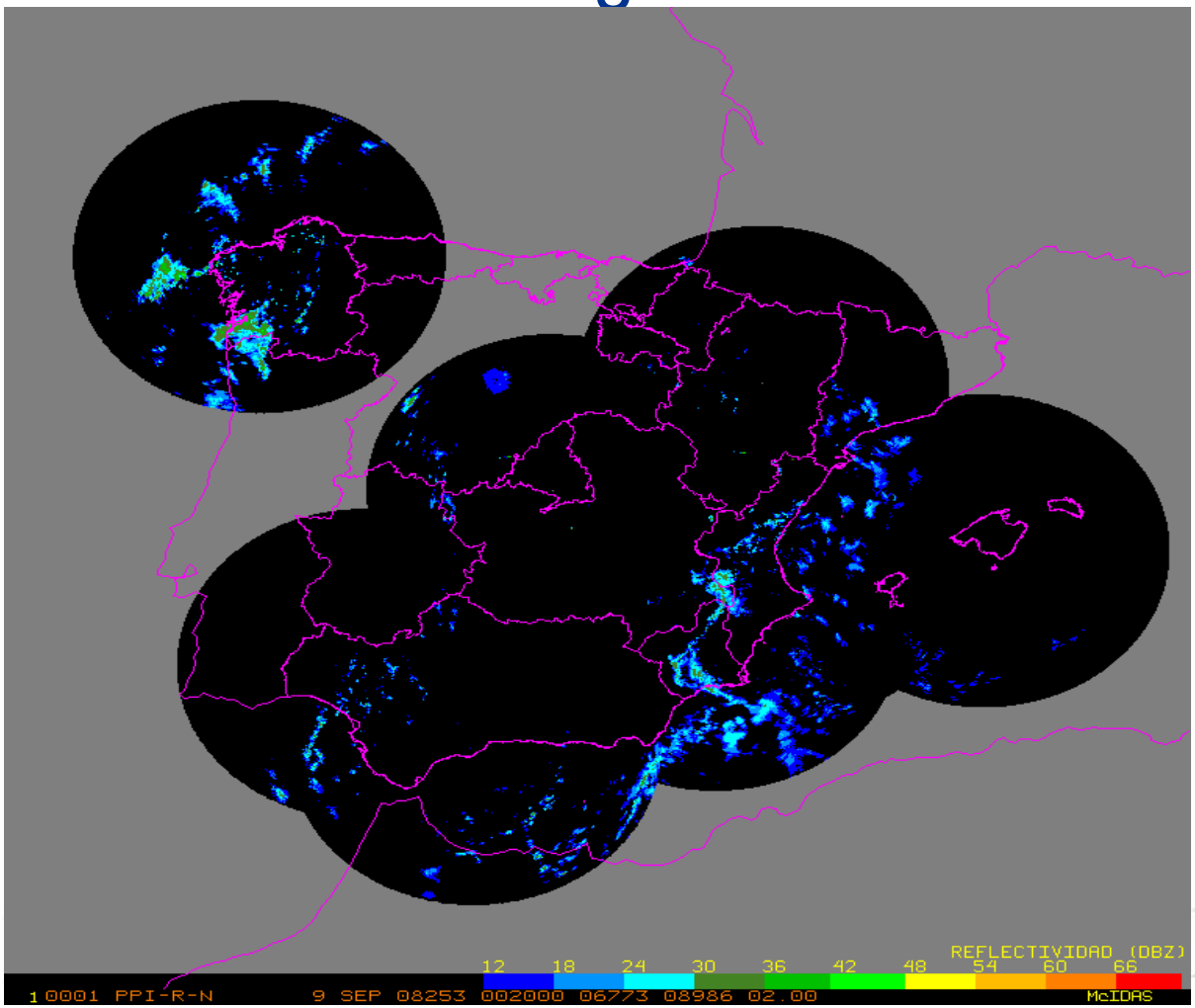


An example.

- Between the days 9th and 10th of September it rained in Spain.
  - After a dry summer.
- We performance two experiments (11 km of resolution, no upper analysis):
  - One of them with the default Canari setting.
  - The other one with one of the Span setting.
    - Observation and first guess errors and the limit for the height differences.

An example.

- We can see radar images.



An example.

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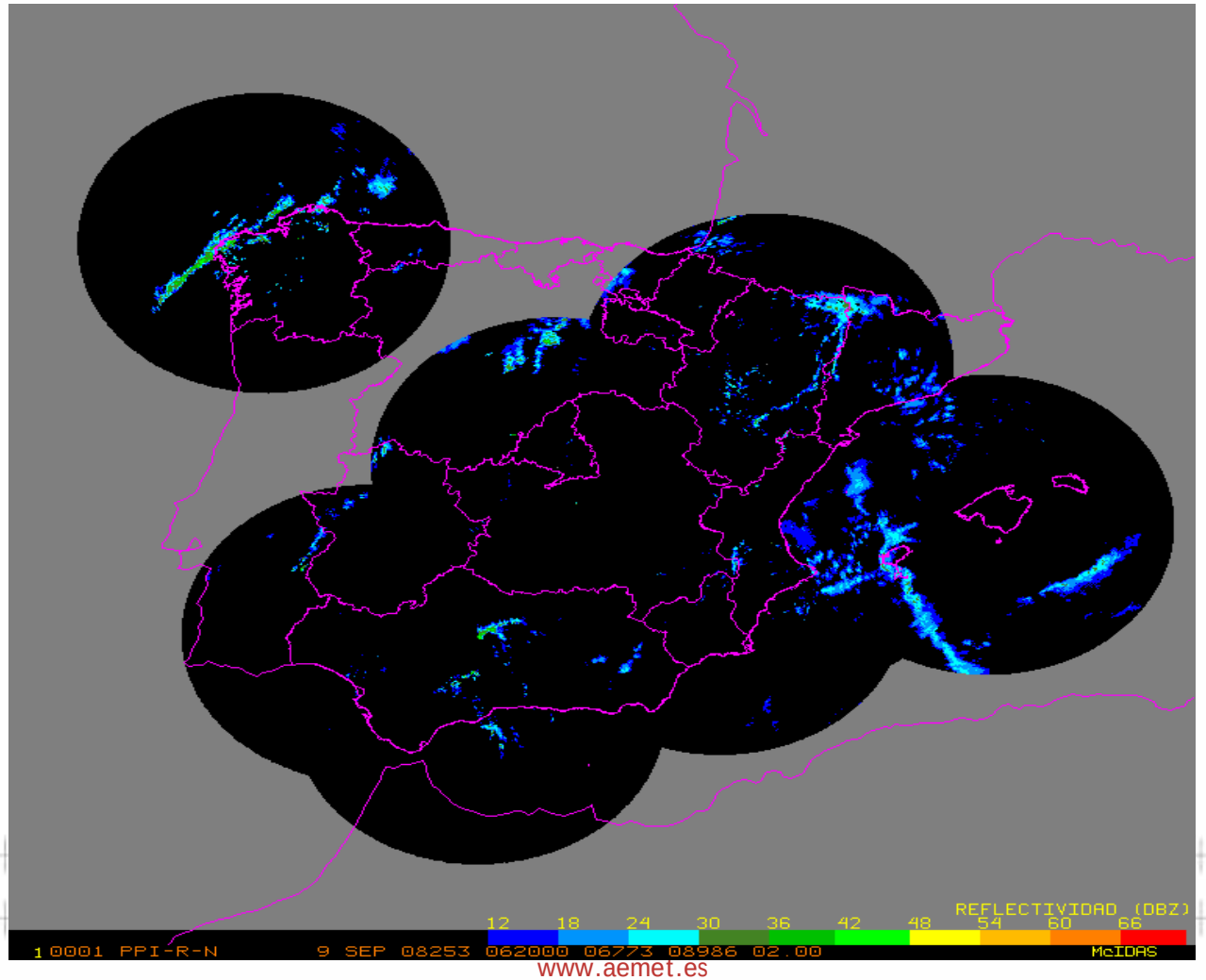

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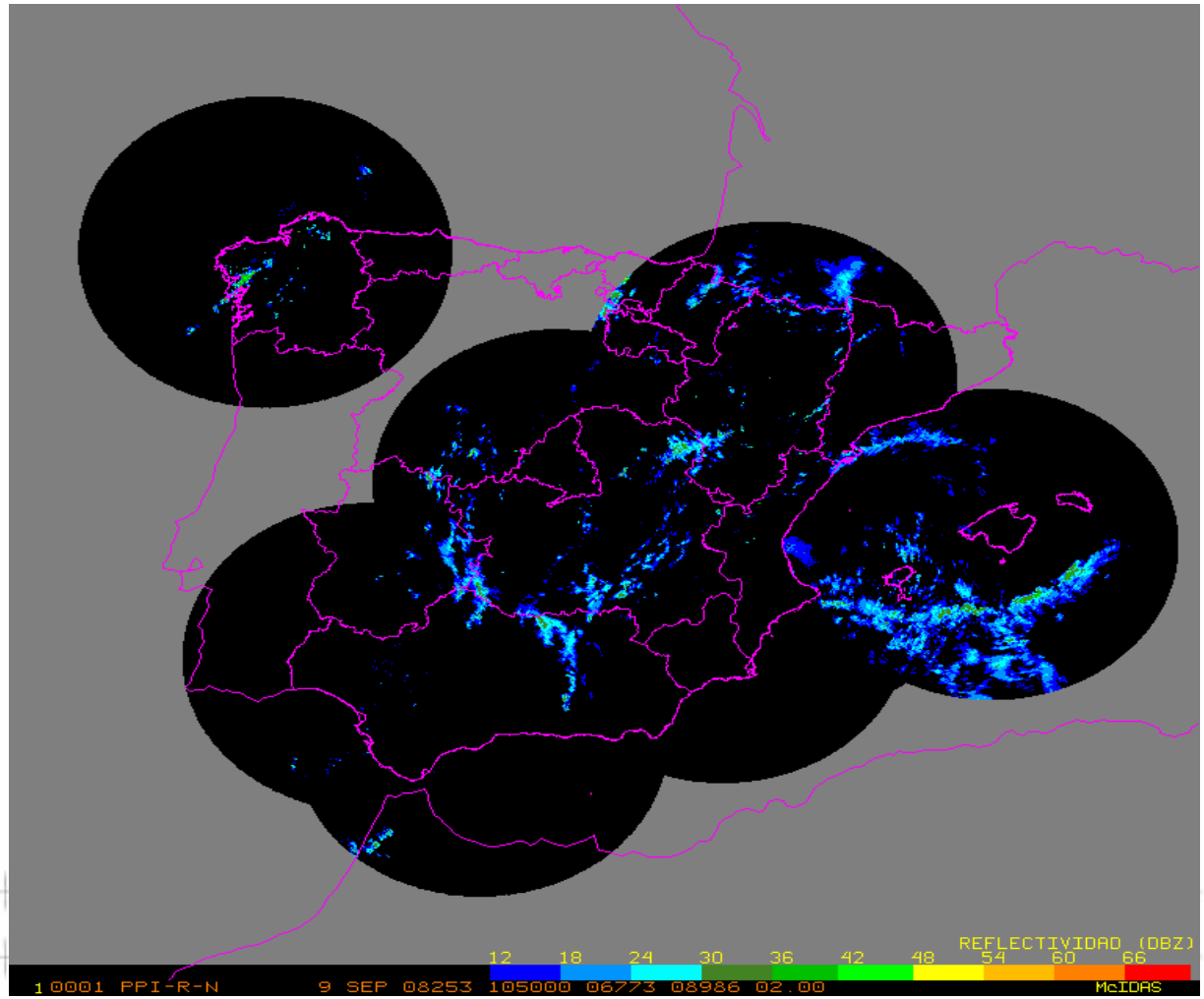

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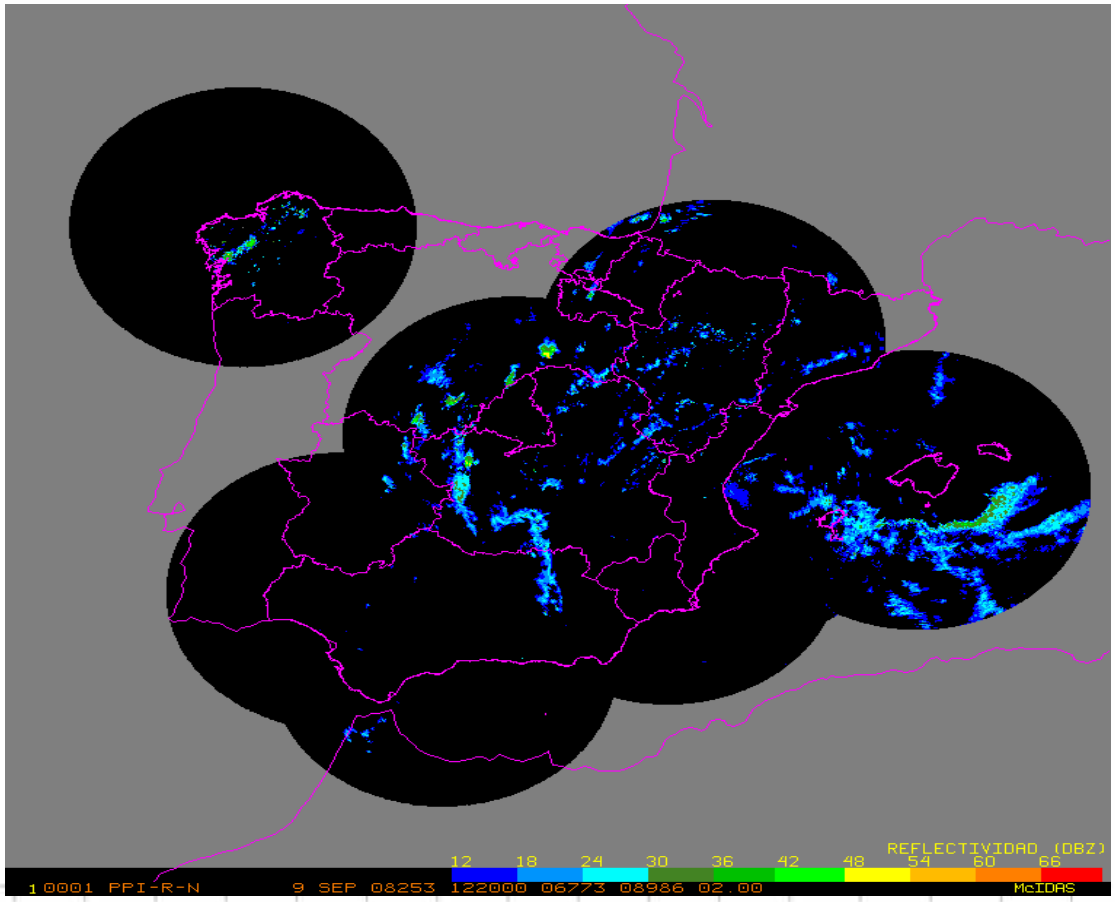
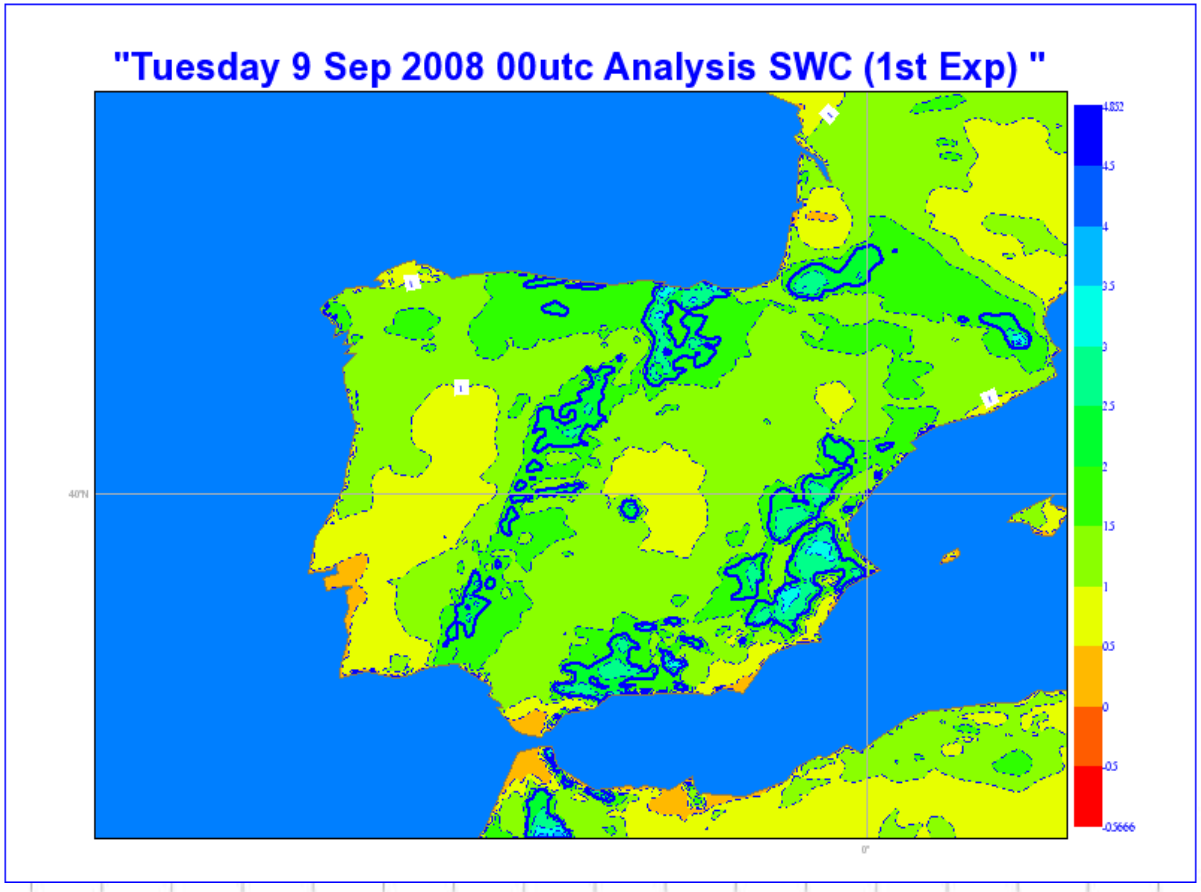


An example.

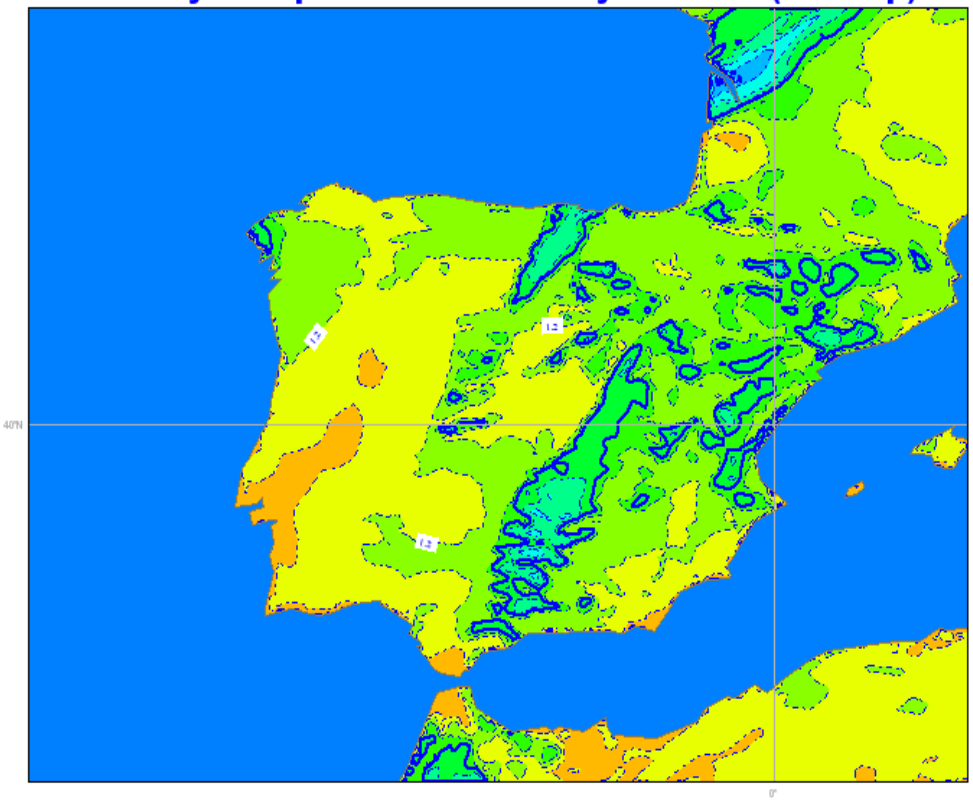
- We can see the evolution of soil moisture for these raining days.



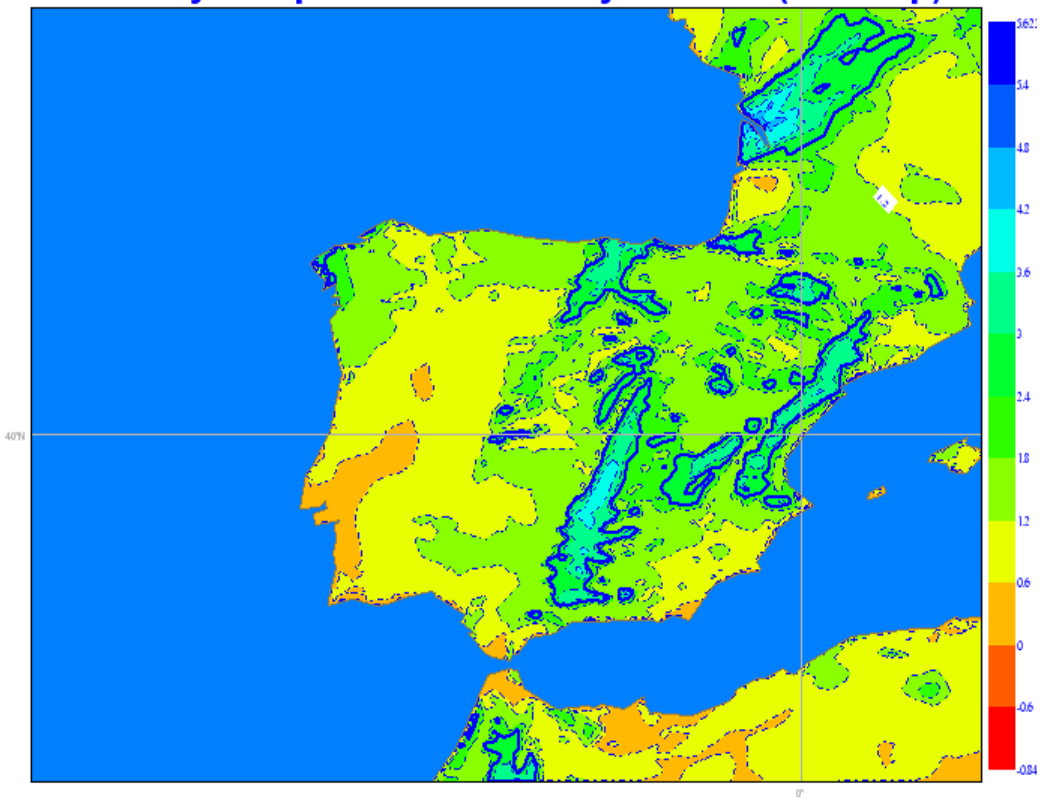
An example.

- We can see the evolution of soil moisture for these raining days.

"Tuesday 9 Sep 2008 12utc Analysis SWC (1st Exp) "

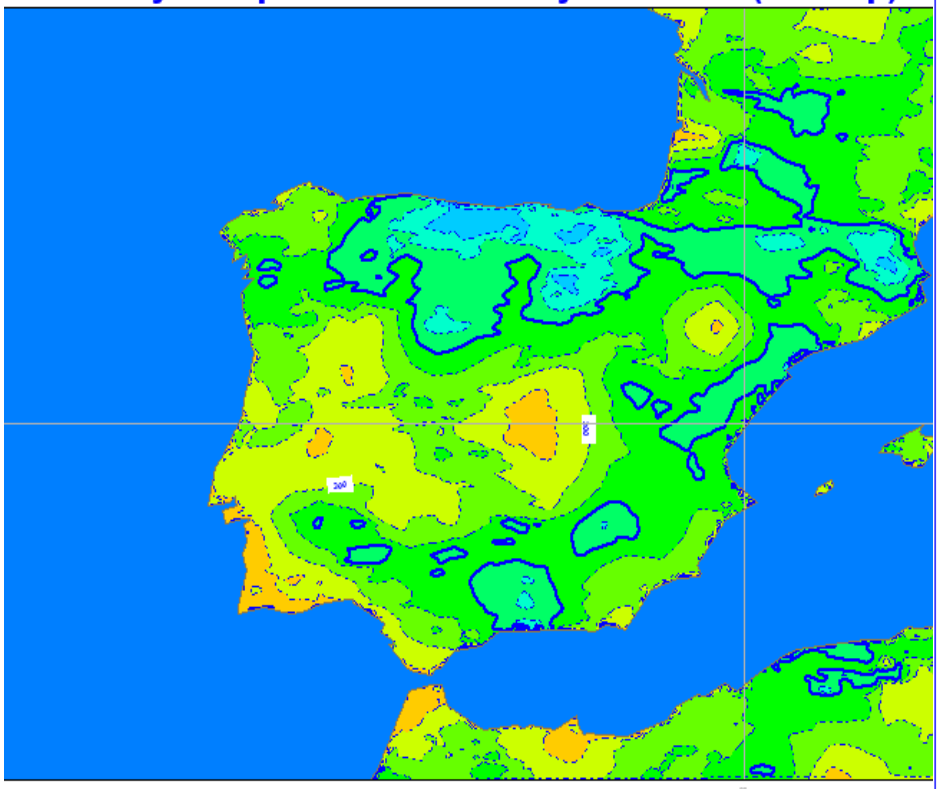


" Tuesday 9 Sep 2008 12utc Analysis SWC (2nd Exp) "

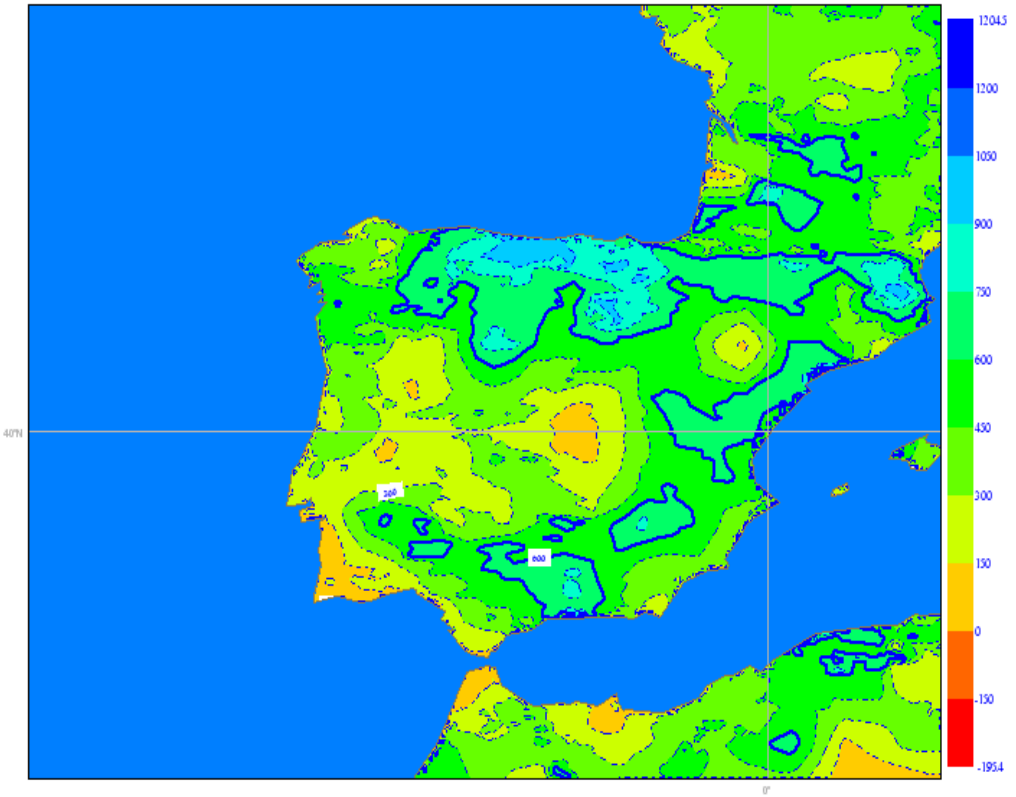


- And for deep soil moisture:

"Tuesday 9 Sep 2008 12utc Analysis SWCd (1st Exp) "

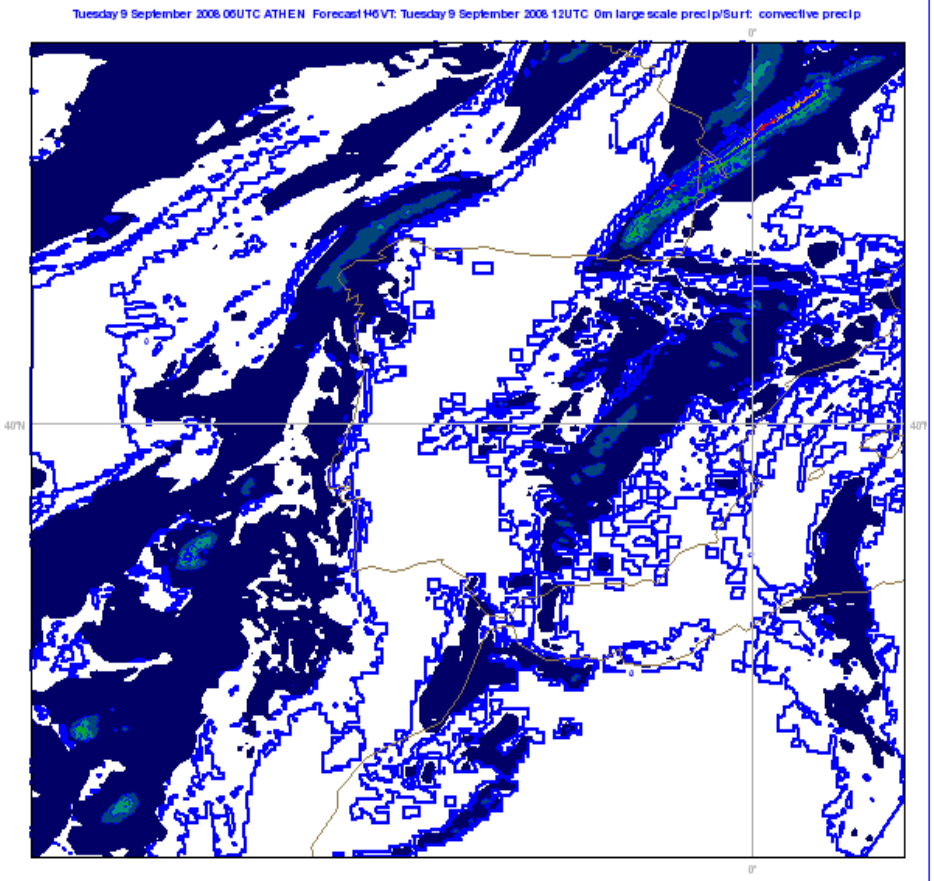


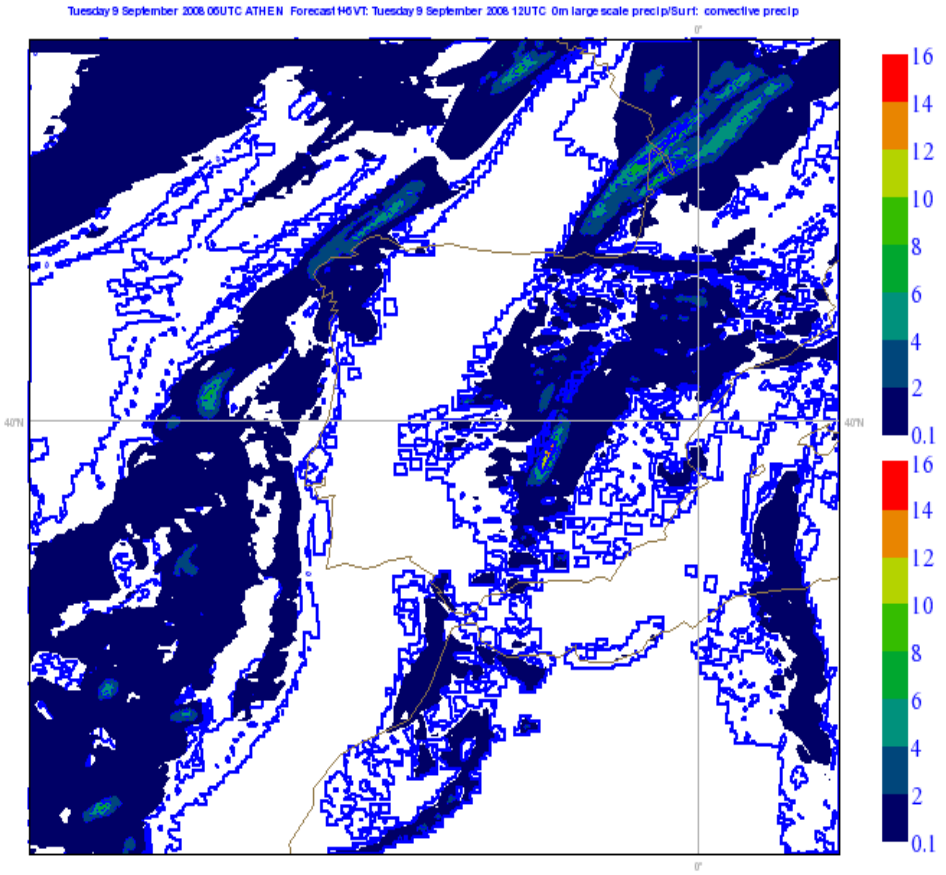
" Tuesday 9 Sep 2008 12utc Analysis SWCd (2nd Exp) "



An example.

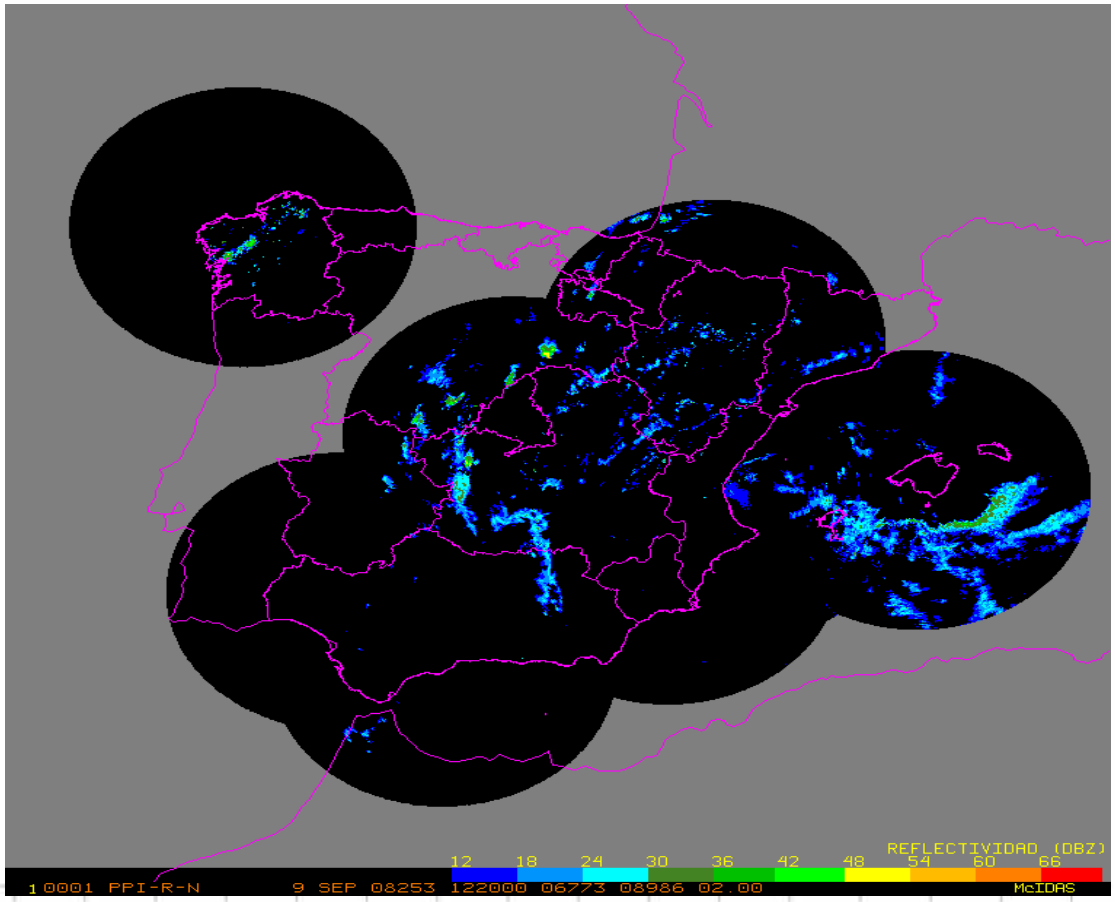
- Precipitation forecast:





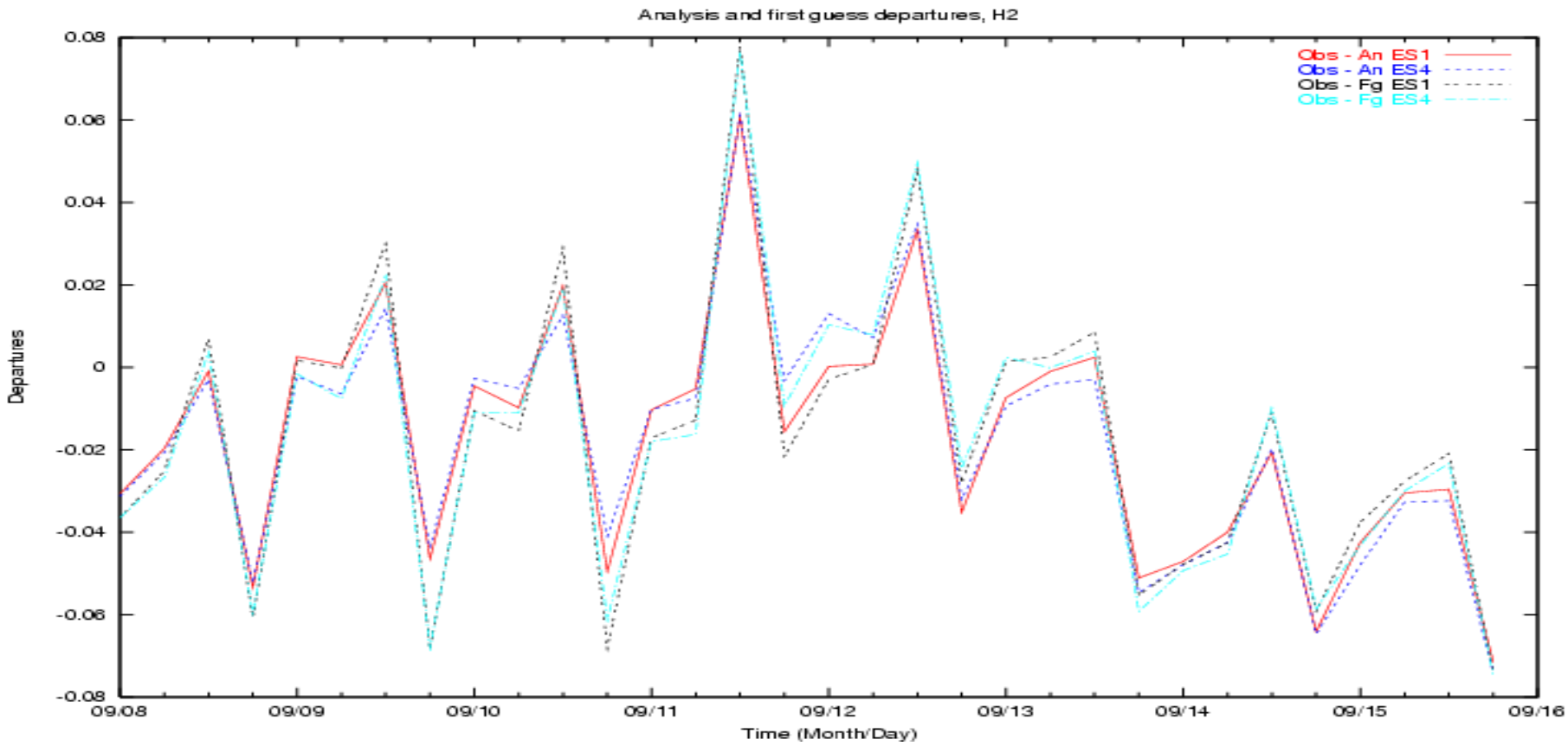
An example.

- Remember the radar!!!!



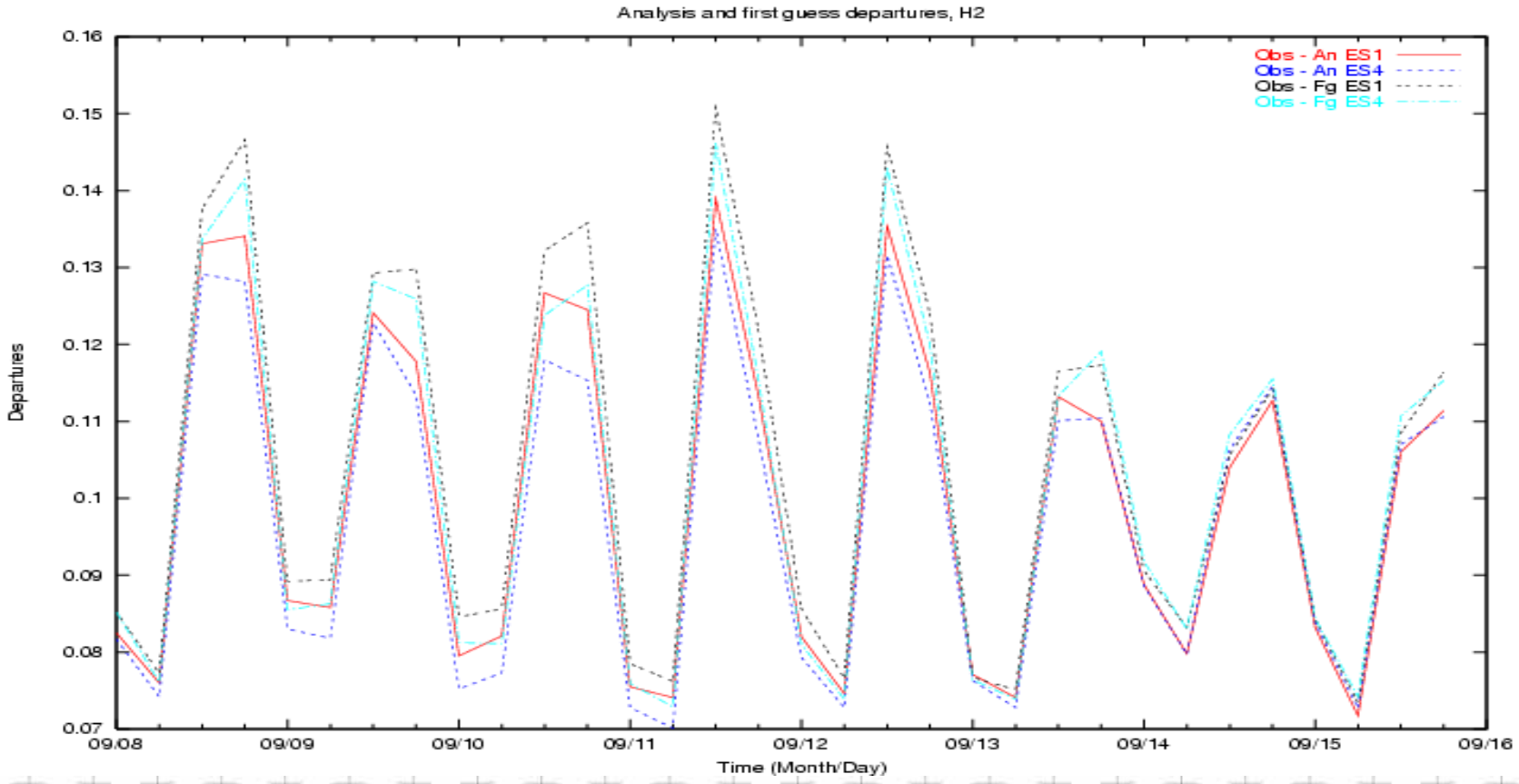
An example.

- Now calculate the medium value of first-guess departure and the analysis departure for both cases:



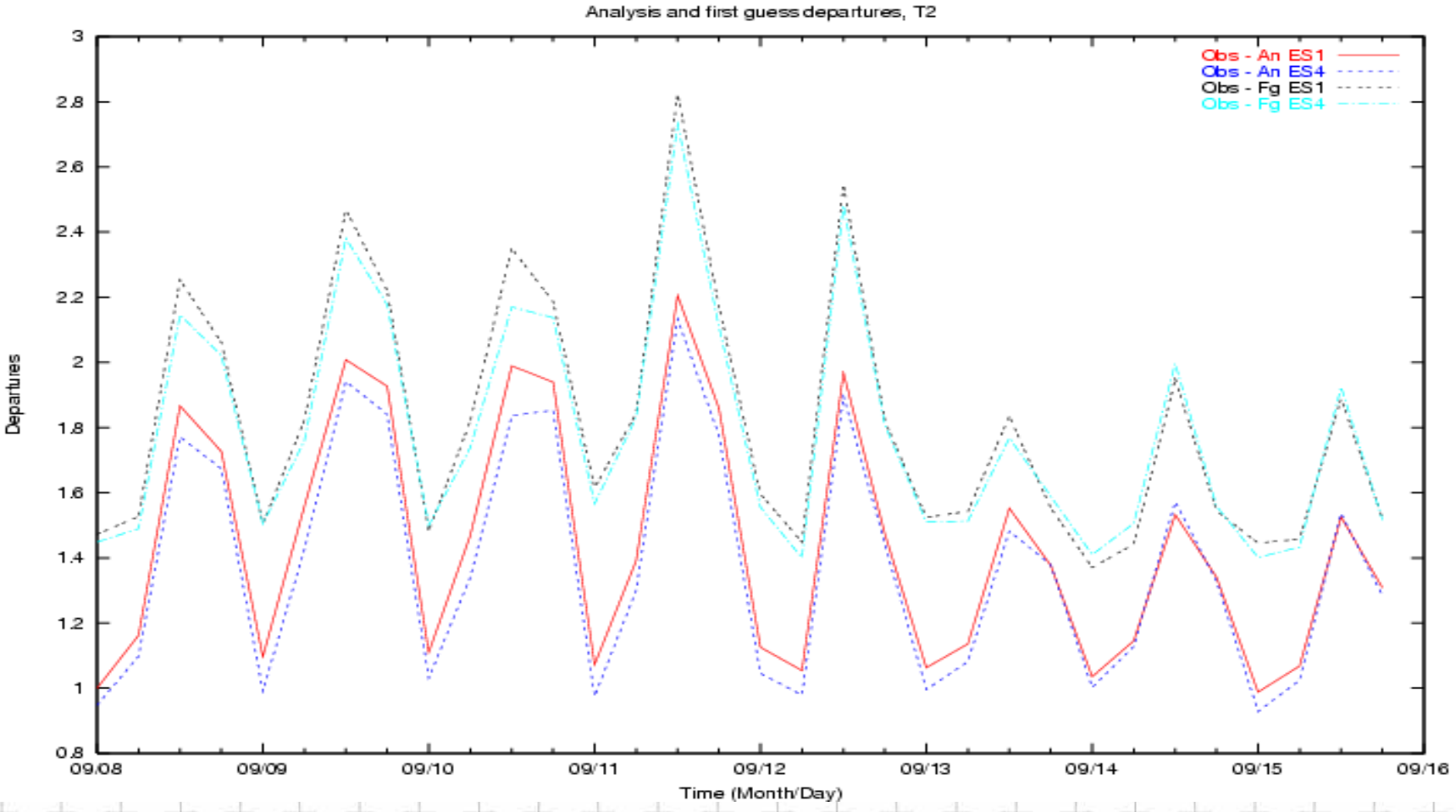
An example.

- Now if we do the same, but making the medium value using absolute value:



An example.

- Obtaining similar results for T2m:



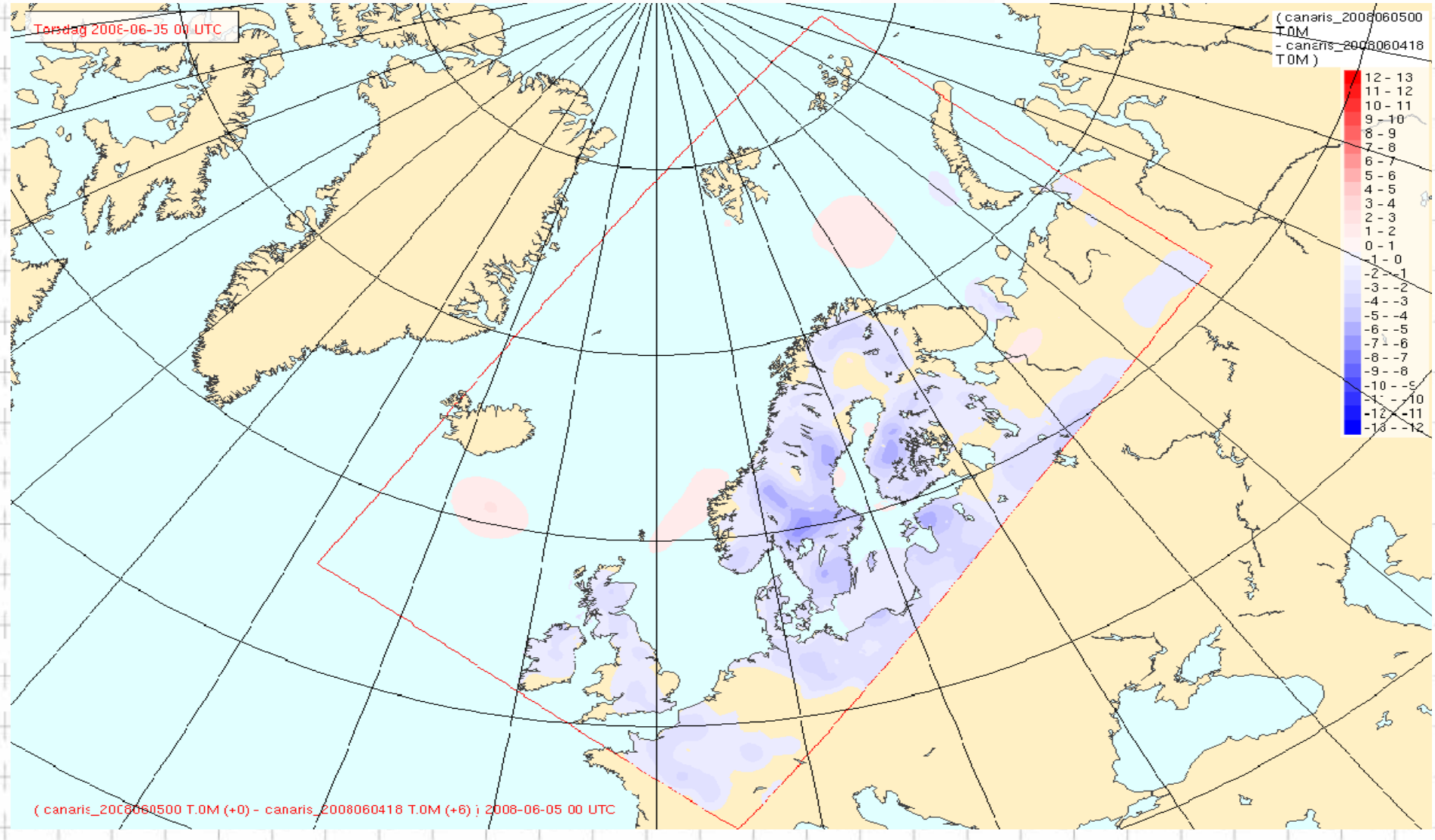
SST maps.

- At the moment SST analysis is made using the ECMWF SST field fitted to Harmonie.
- ECMWF SST is the OSTIA product delivered by UK Met-Office. (From 30 Sep. 2008)

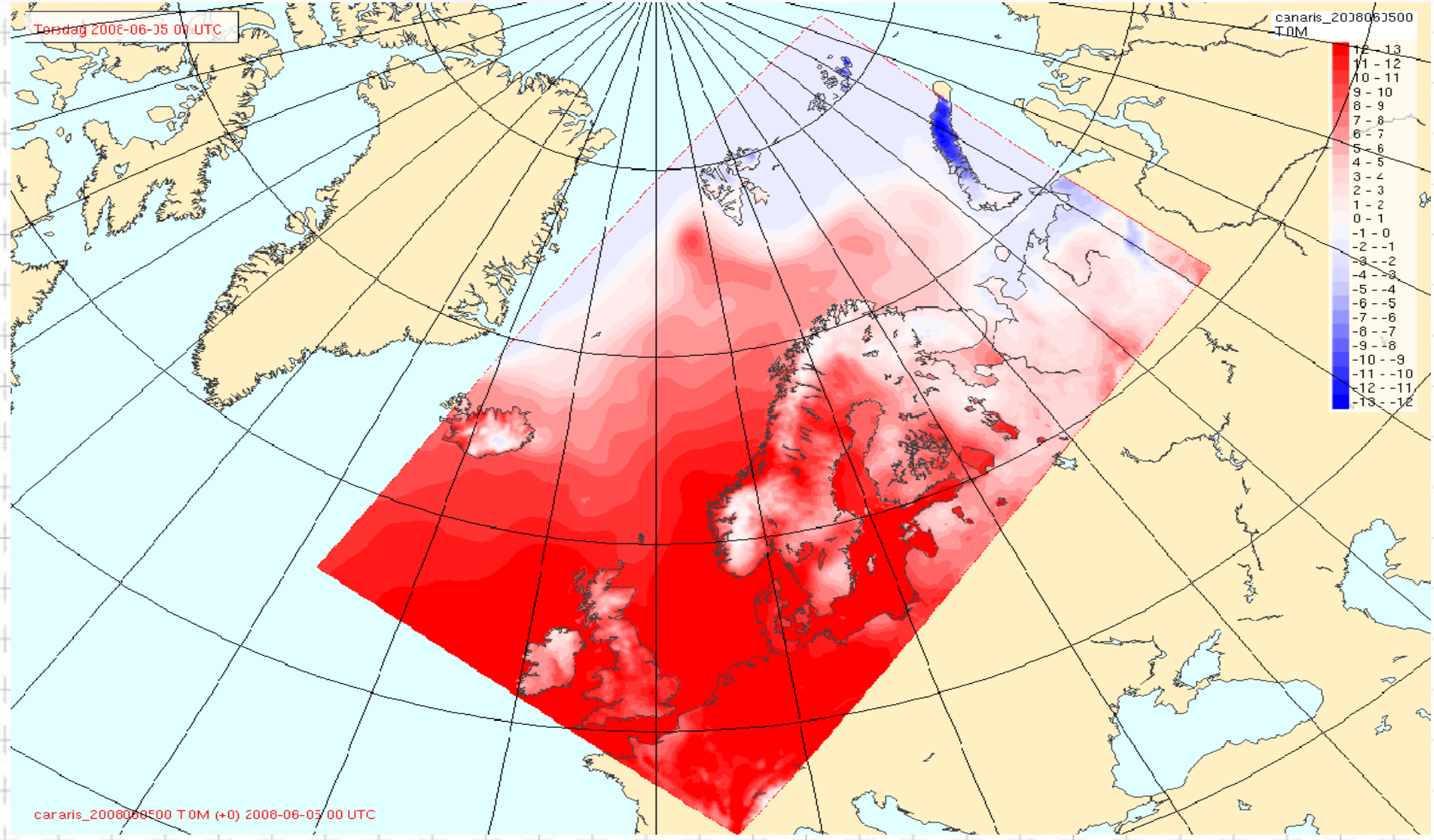
SST maps.

- We show some graphics
  - The first map is the increments from surface analysis performed 5 June 2008 at 00 UTC (new ECMWF SST).
  - The second map is the result of surface analysis performed 5 June 2008 at 00 UTC (new ECMWF SST).

SST maps.


Tuesday 2008-06-05 00 UTC
(canaris_2008060500 T.0M
- canaris_2008060418 T.0M)
12 - 13
11 - 12
10 - 11
9 - 10
8 - 9
7 - 8
6 - 7
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2
0 - 1
-1 - 0
-2 - -1
-3 - -2
-4 - -3
-5 - -4
-6 - -5
-7 - -6
-8 - -7
-9 - -8
-10 - -9
-11 - -10
-12 - -11
-13 - -12
(canaris_2008060500 T.0M (+0) - canaris_2008060418 T.0M (+6)) 2008-06-05 00 UTC

SST maps.


Tuesday 2008-06-05 00 UTC
canaris_2008060500
T0M
12 - 13
11 - 12
10 - 11
9 - 10
8 - 9
7 - 8
6 - 7
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2
0 - 1
-1 - 0
-2 - -1
-3 - -2
-4 - -3
-5 - -4
-6 - -5
-7 - -6
-8 - -7
-9 - -8
-10 - -9
-11 - -10
-12 - -11
-13 - -12
canaris_2008060500 T0M (+0) 2008-06-05 00 UTC

SST maps.

- Mariken Homleid from Met Norway work in SST analysis and snow.
- If you have any questions please contact with her:
  - mariken.homleid@met.no

- Future plans of Surface Assimilation on Harmonie.
  - For the short term.
    - Continue working with Canari scheme to achieve better results.
      - Performance Canari and 3D-VAR together in the IBERIA domein.
    - Try to make more improvements like lake analysis.

Future plans in surface assimilation.

- Plans in the long term.
  - Study new techniques like SEKF in the SURFEX scheme.
  - Snow and Ice analysis.
    - It is an important issue for all but for Scandinavian countries is critical.

Thank you!!