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Status of Canari in Harmonie.

Maria Diez

NetFAM workshop on surface and soil
data assimilation, March/2009

Overview.

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

- 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.

- 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.
 - The analysis is mono-variant.
 - The O.I algorithm is:

$$X^A = X^G + BH^T (HBH^T + R)^{-1} (Y - HX^G)$$

K

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

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

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

- For soil water content:

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

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

- 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.
 - In this conditions there are not any relationship between the atmospheric 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

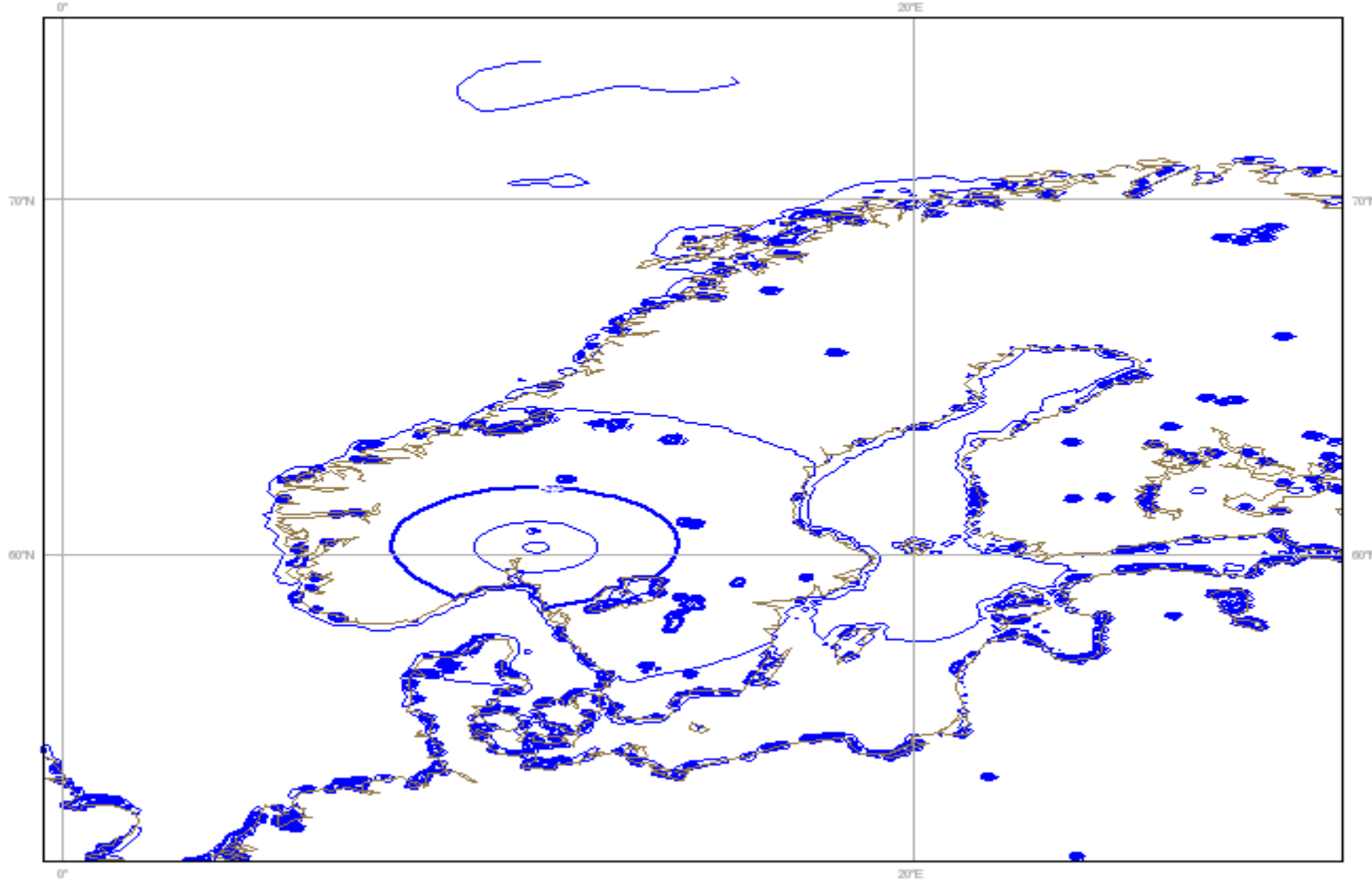
- There are different values for the observation and background error between SPAN and CANARI. For example for T2m are:
 - SPAN $\Rightarrow \sigma_0=1, \sigma_B=2$
 - CANARI $\Rightarrow \sigma_0=1.4, \sigma_B=1.6$
- And for the H2m is:
 - SPAN $\Rightarrow \sigma_0=0.1, \sigma_B=0.15$
 - CANARI $\Rightarrow \sigma_0=0.1, \sigma_B=0.18$

Single observation experiment.

- An 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.

Tuesday 1 July 2008 00UTC ATHEN Analysis t+ VT: 00UTC 0m temperature



Single observation experiment for hirlam.



- For Hirlam we must know that the analysis are made per each tile.
- In this case we draw the average value of vegetation and forest tiles.
 - This could be the reason for the irregular shape.

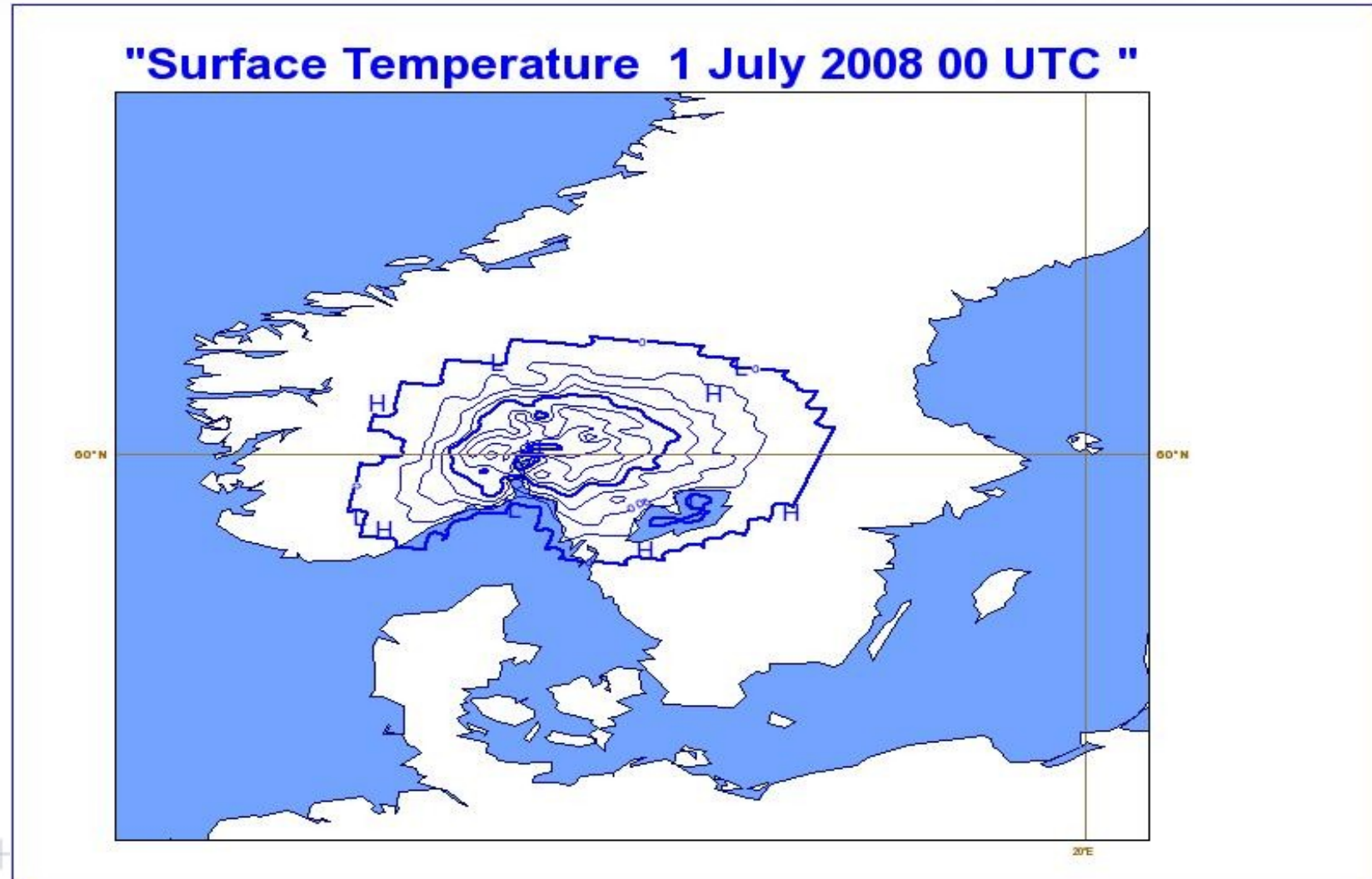
Single observation experiment for hirlam.



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An example.

- Between the days 9th and 10th of September it rained in Spain.
 - After a dry summer.
- We performed 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.

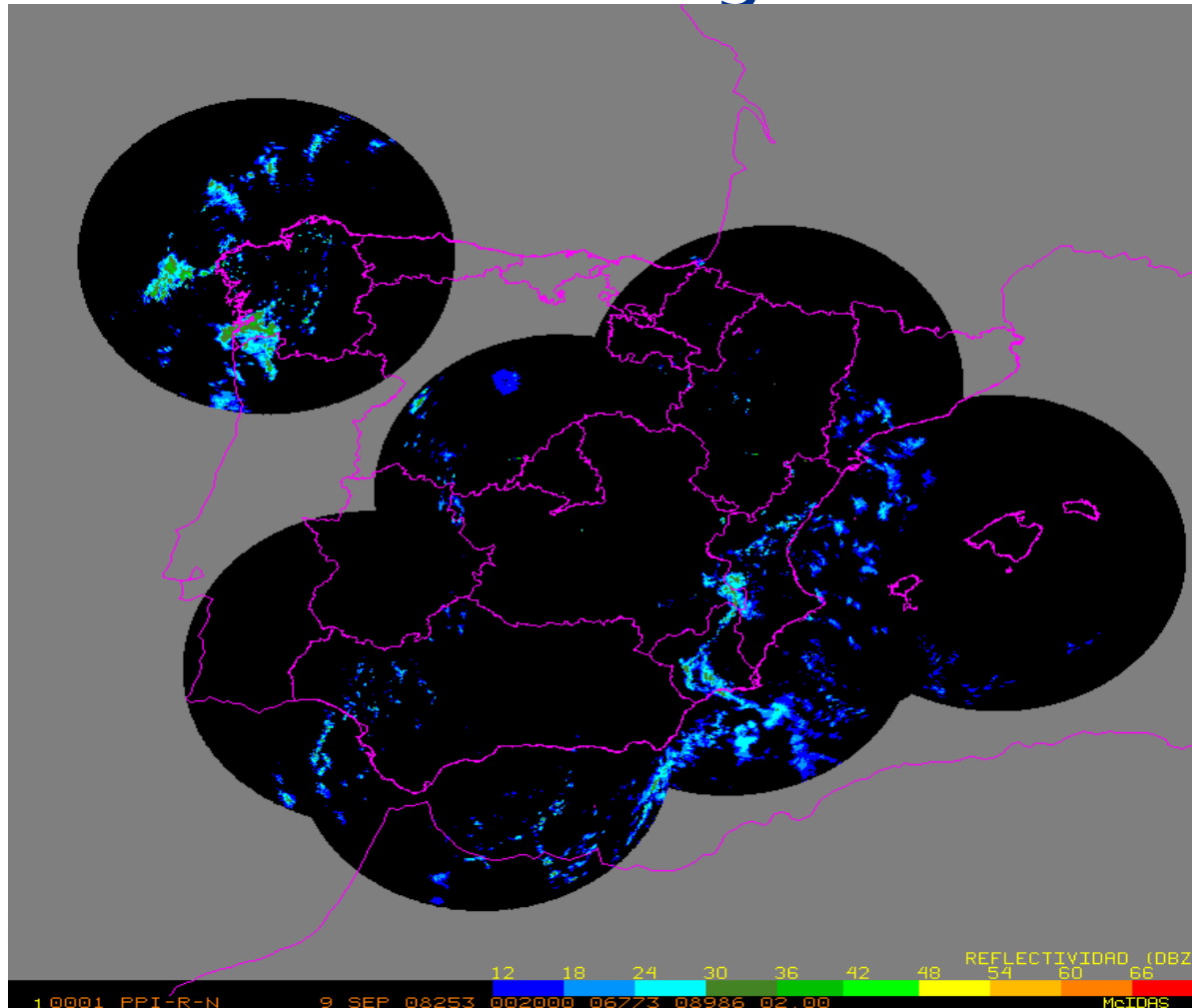


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- We can see radar images.



An example.

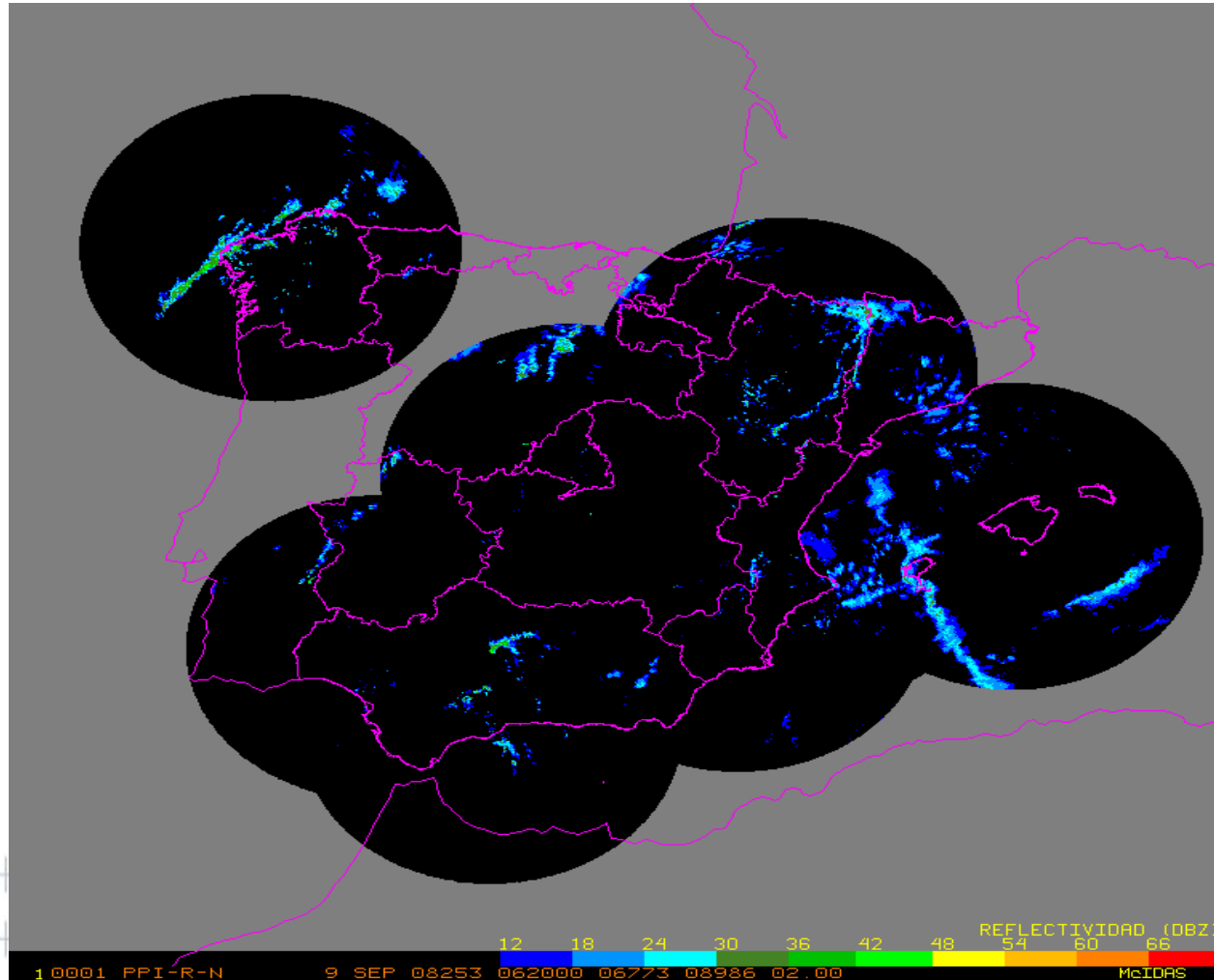


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An example.

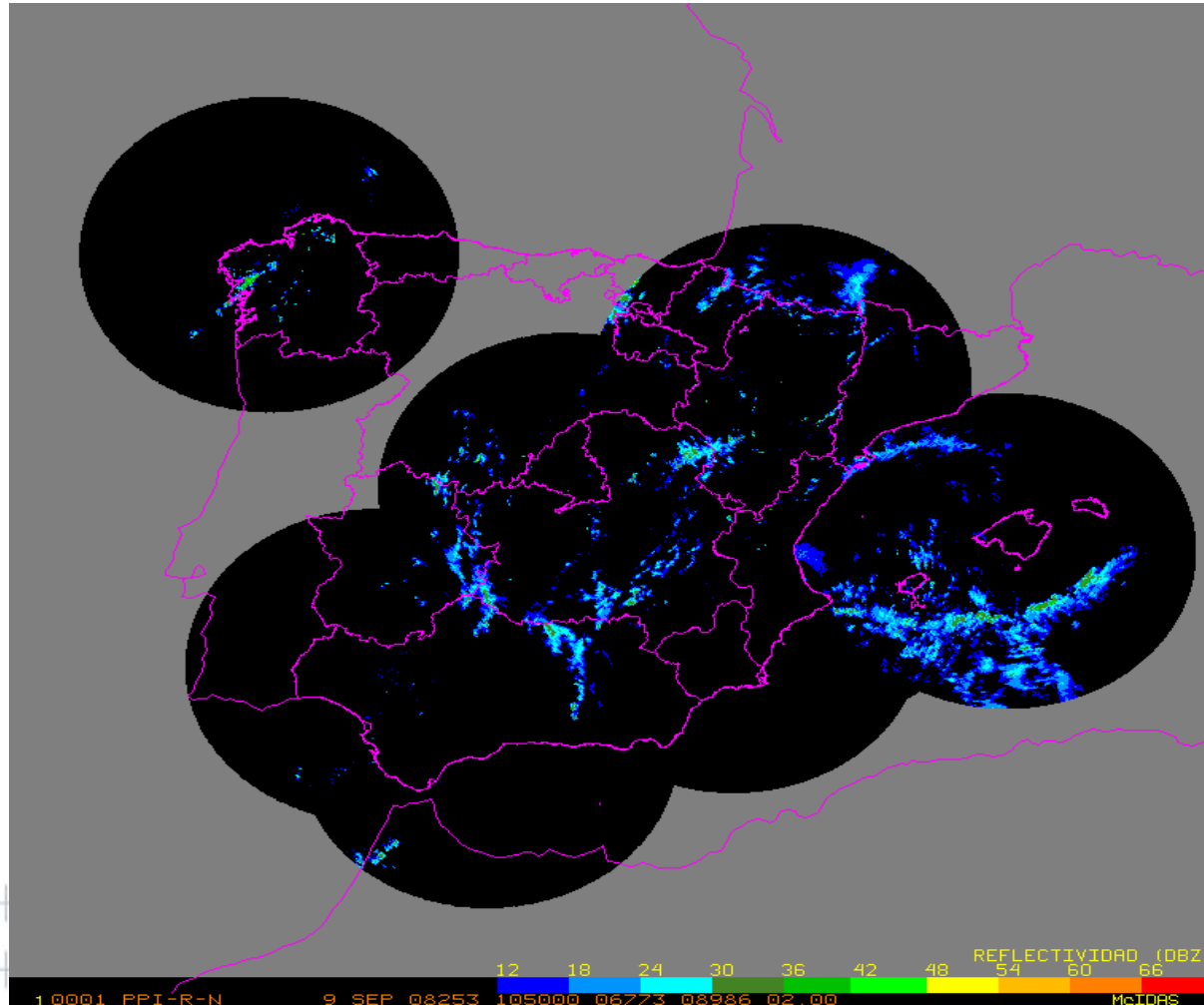


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An example.

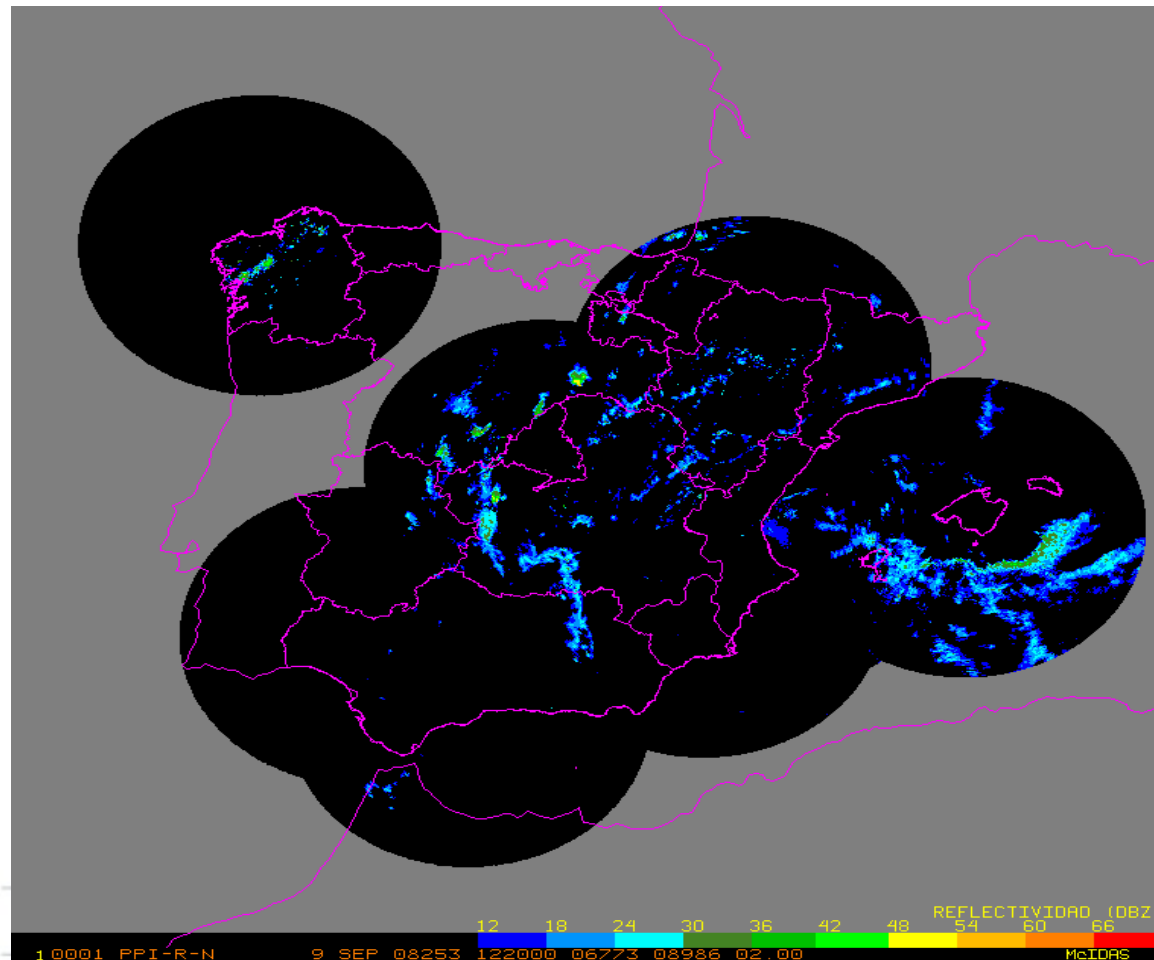


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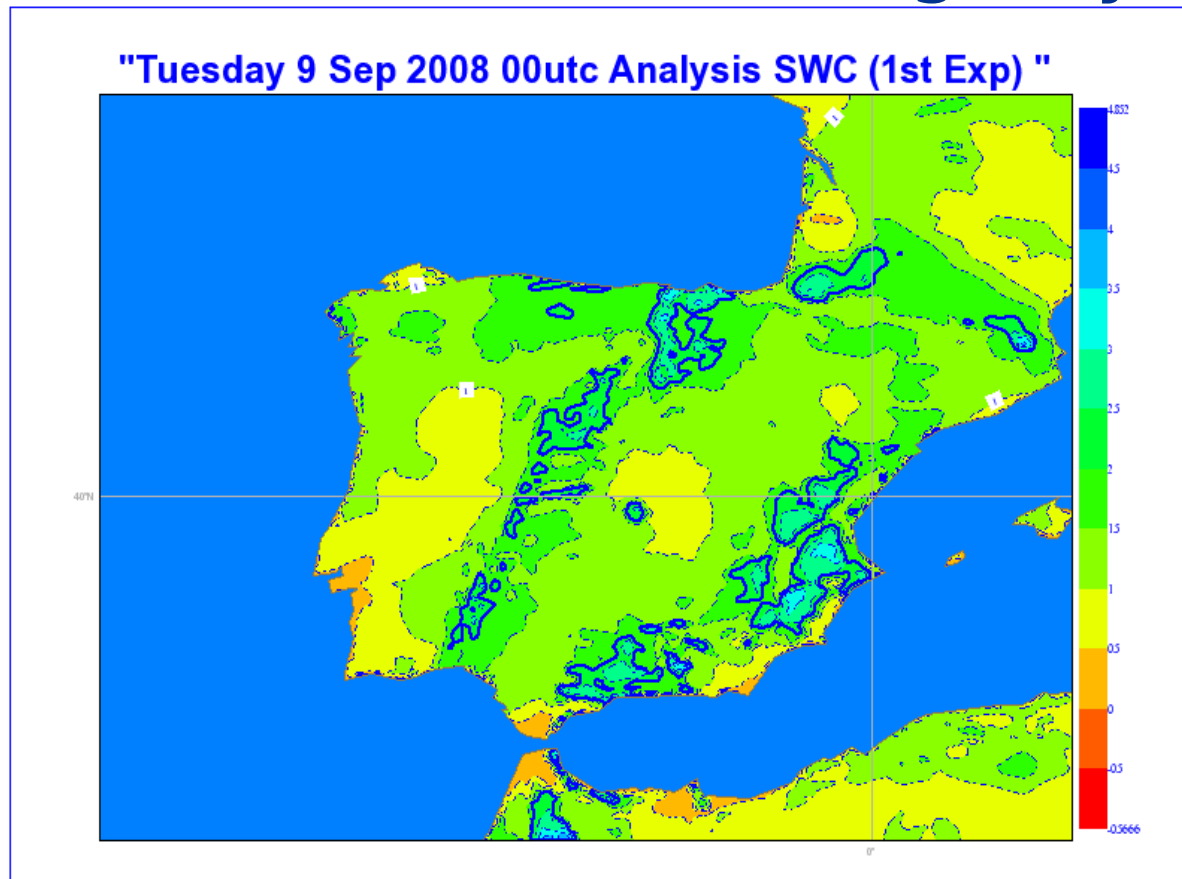
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- We can see radar images.



An example.

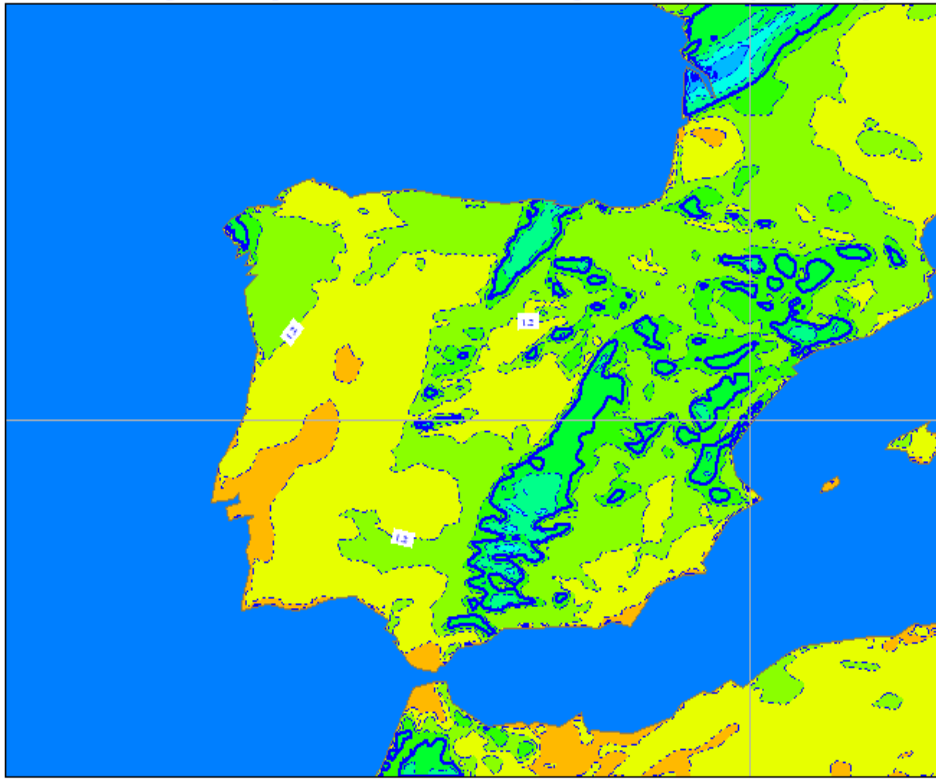
- We can see the evolution of soil moisture for these raining days.



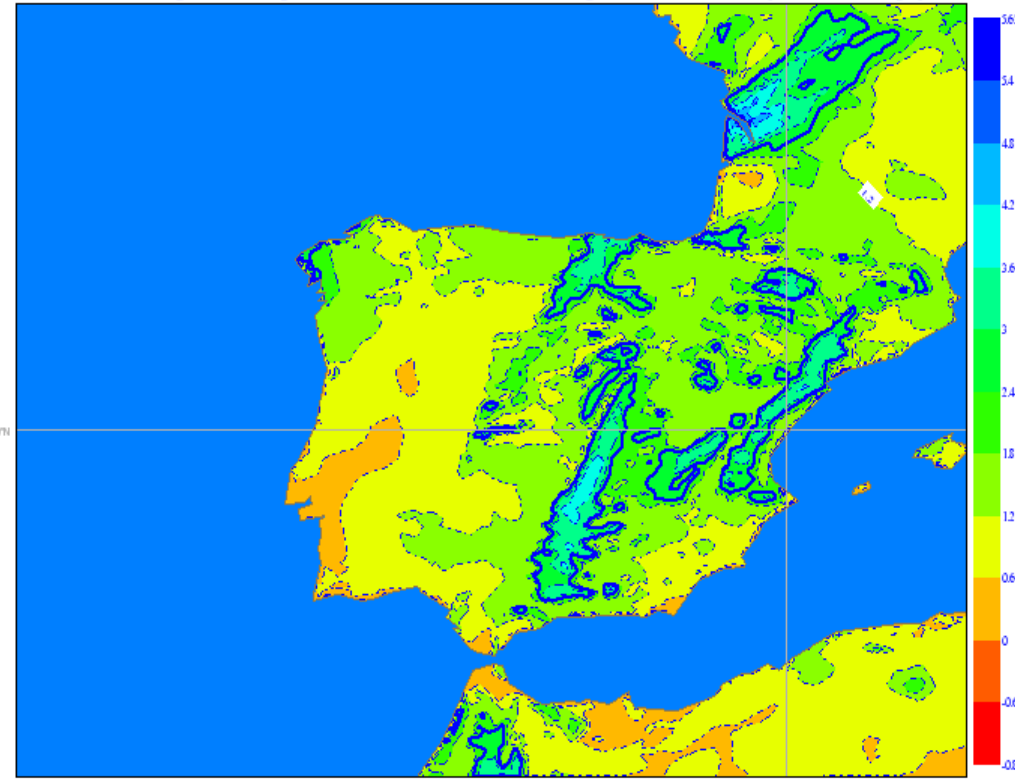
An example.

- 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) "



An example.



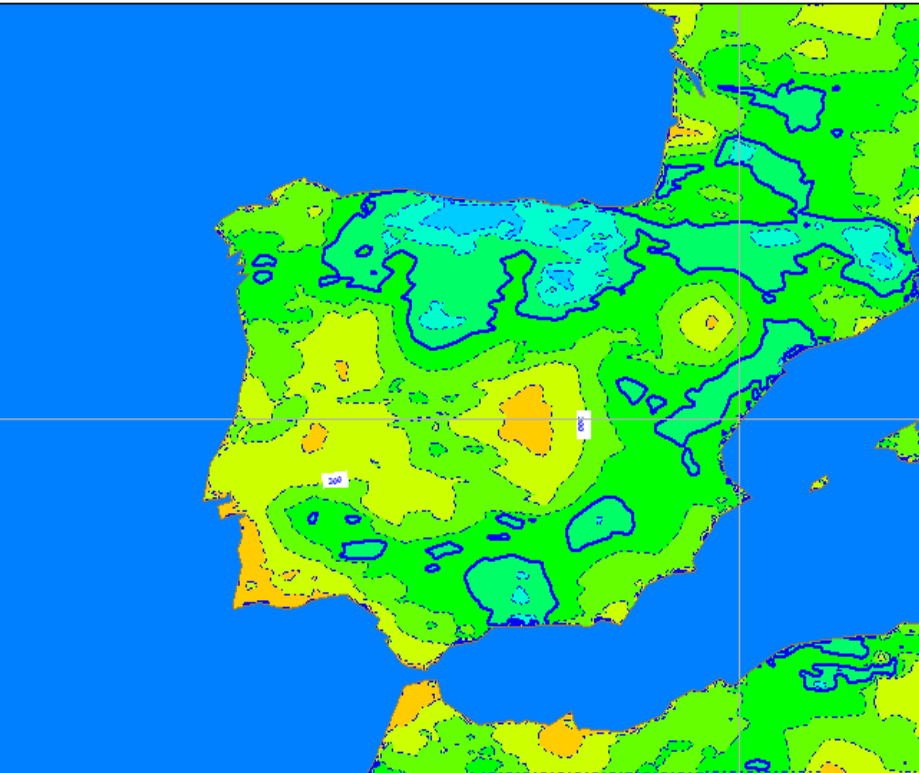
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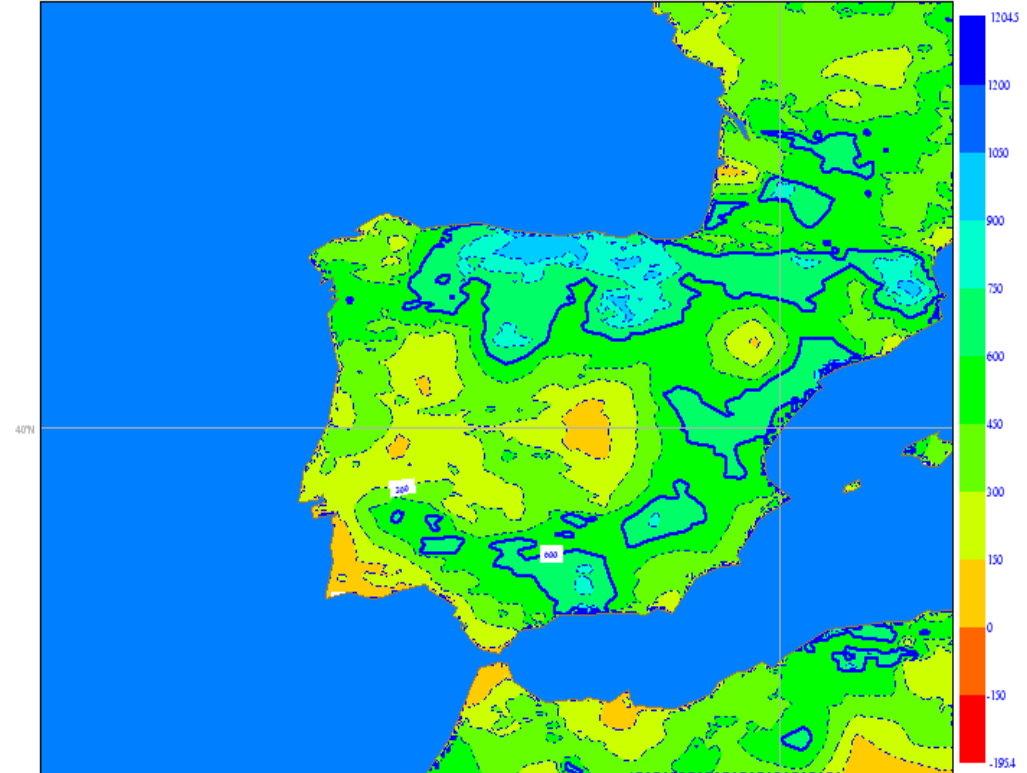
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- And for deep soil moisture:

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



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



An example.



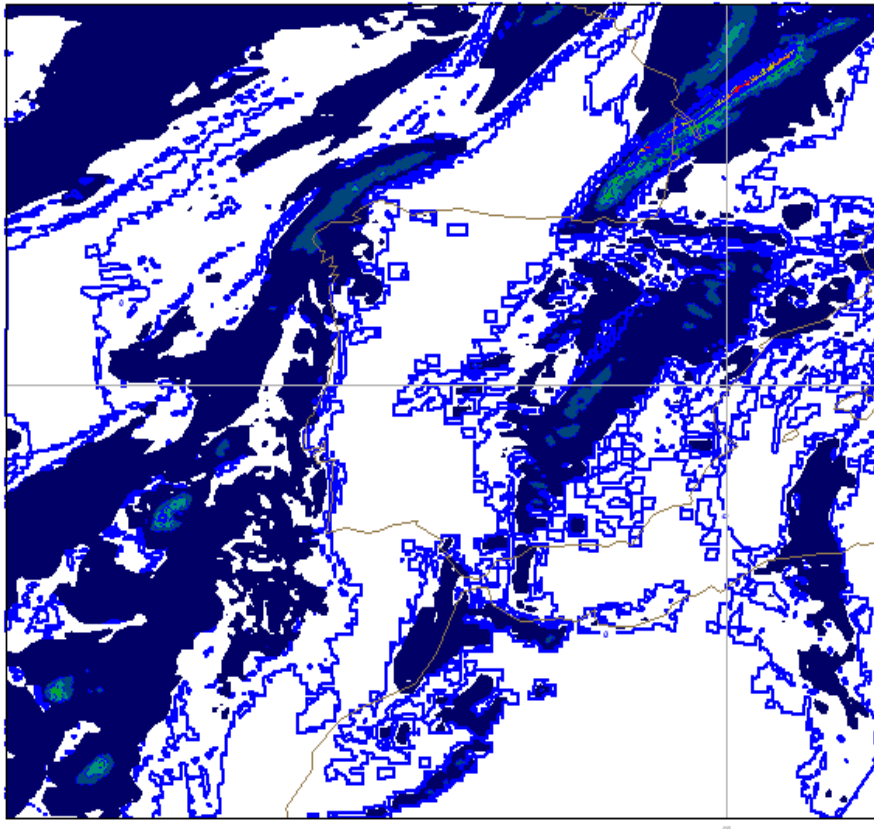
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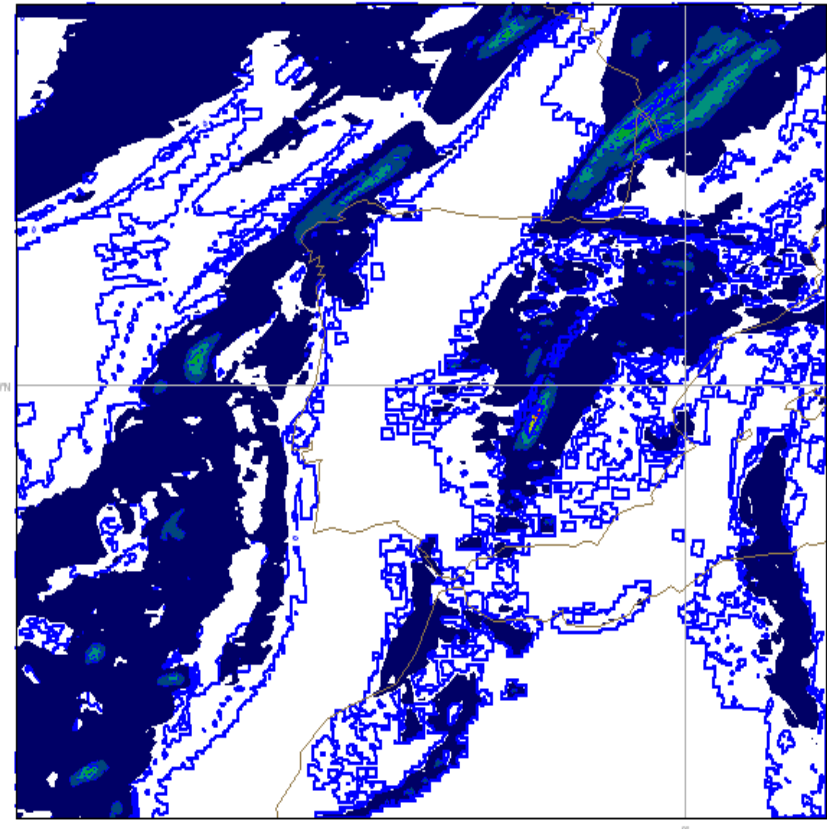
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- Precipitation forecast:

Tuesday 9 September 2008 06UTC ATHEN Forecast H6VT: Tuesday 9 September 2008 12UTC 0m large scale precip/Su: convective precip



Tuesday 9 September 2008 06UTC ATHEN Forecast H6VT: Tuesday 9 September 2008 12UTC 0m large scale precip/Su: convective precip



An example.

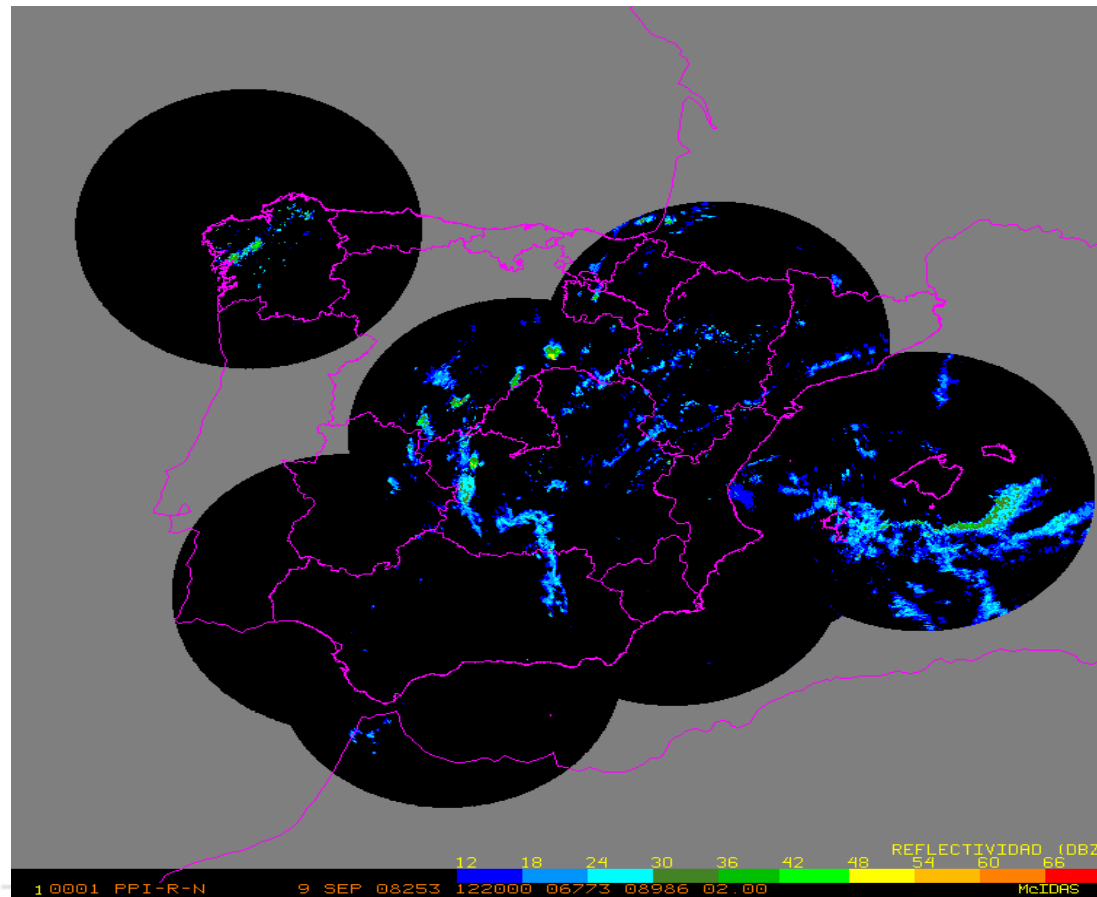


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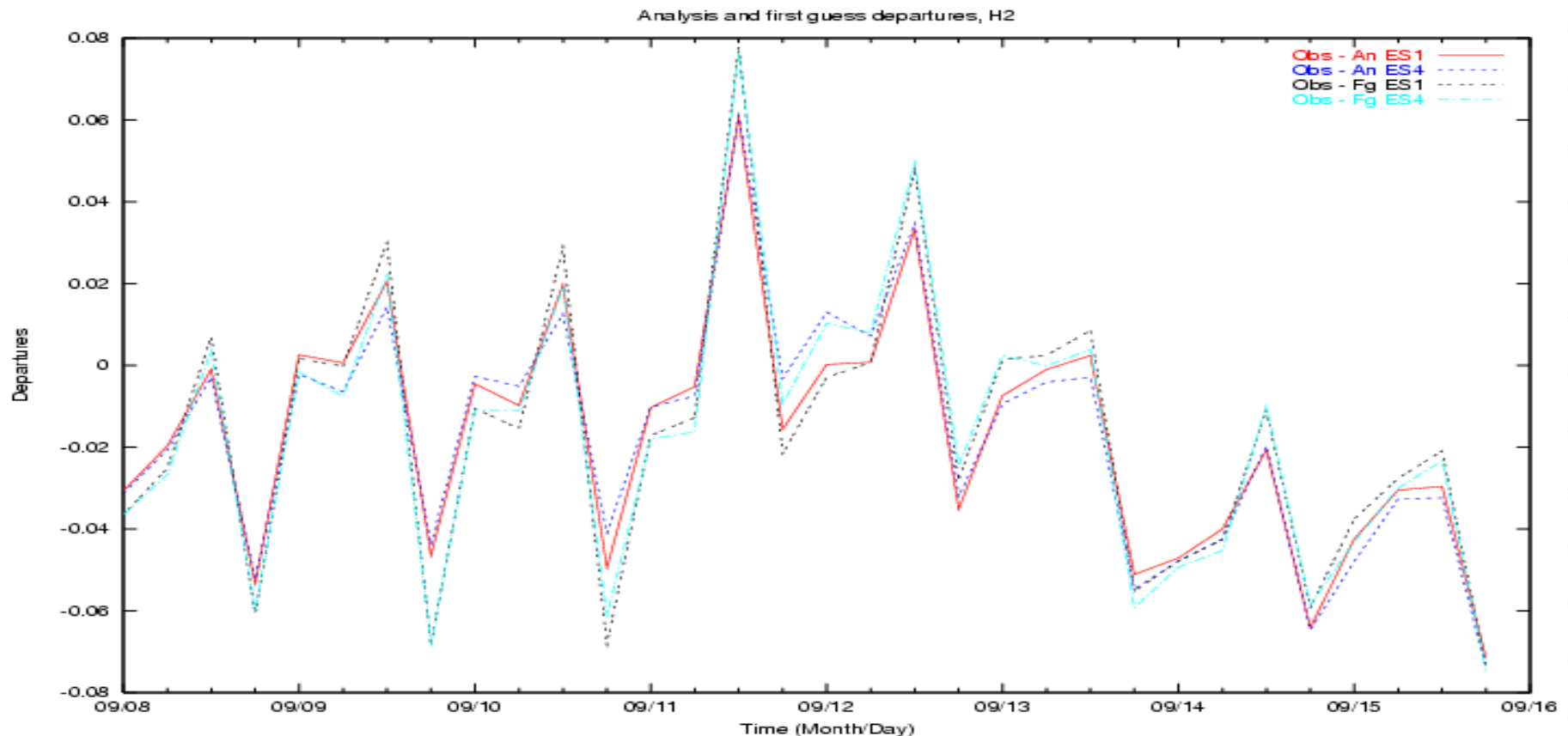
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- Remember the radar!!!!



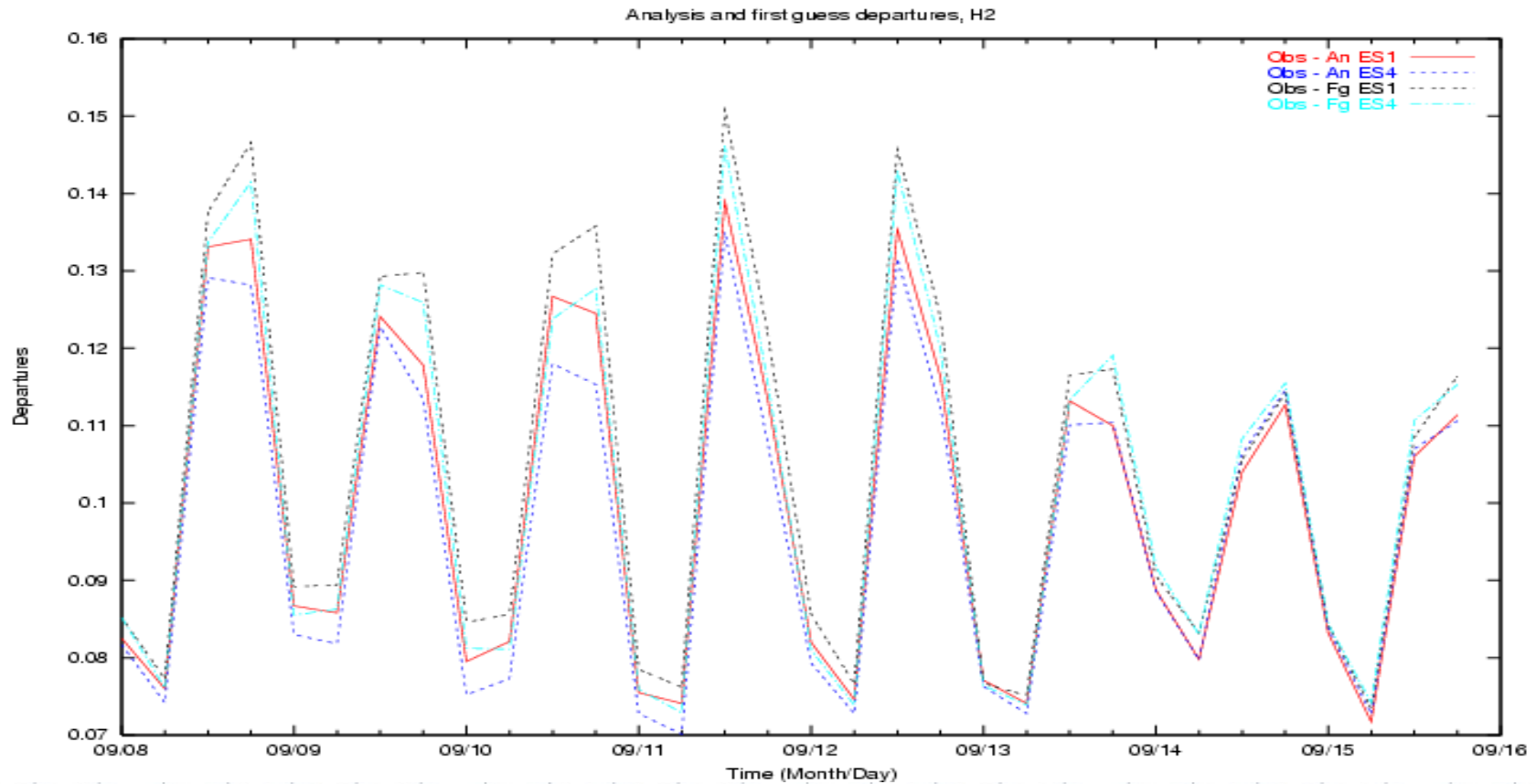
An example.

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



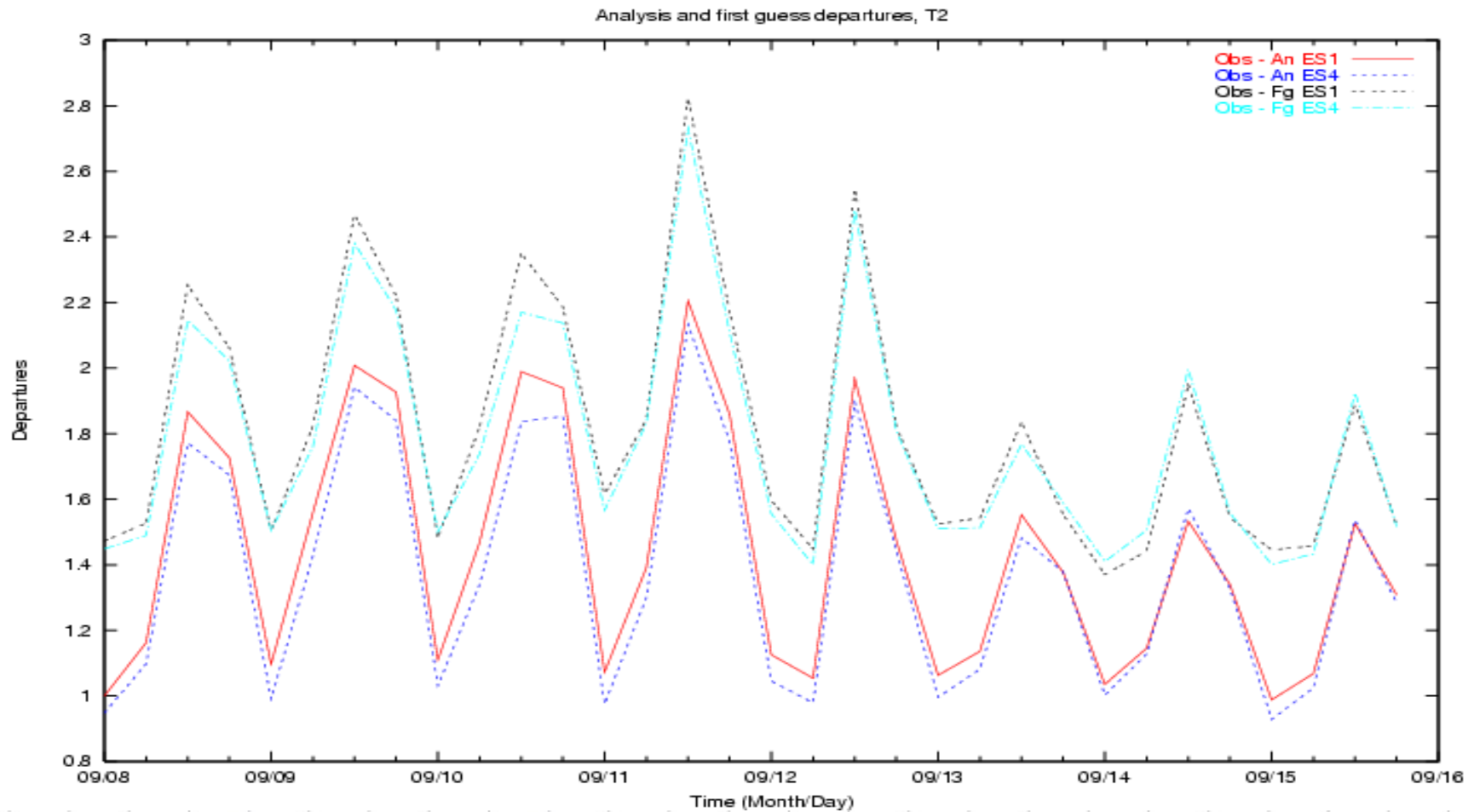
An example.

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



An example.

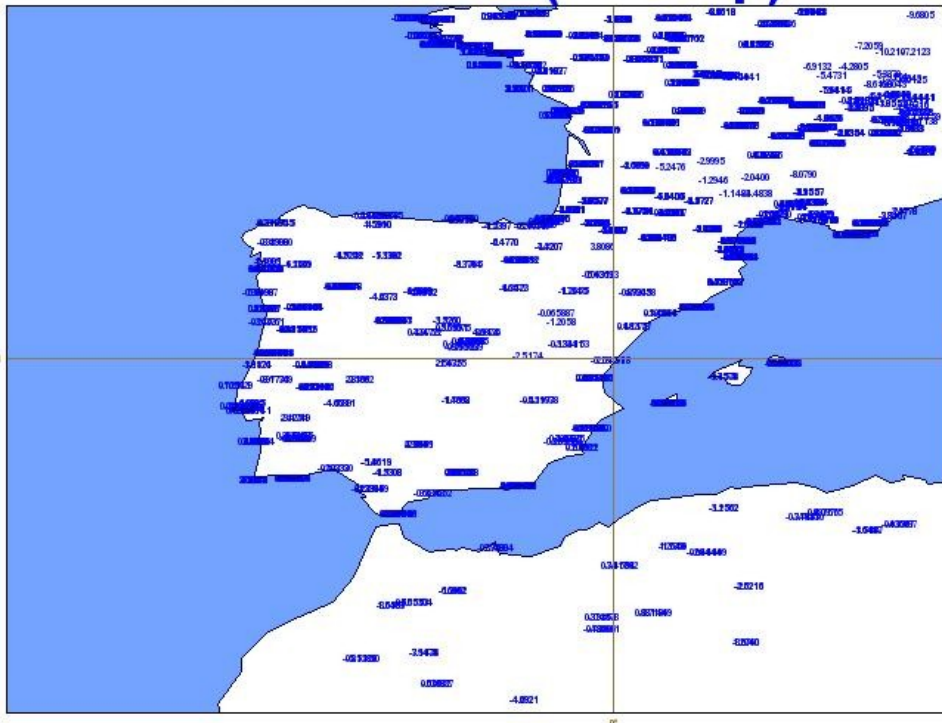
- Obtaining similar results for T2m:



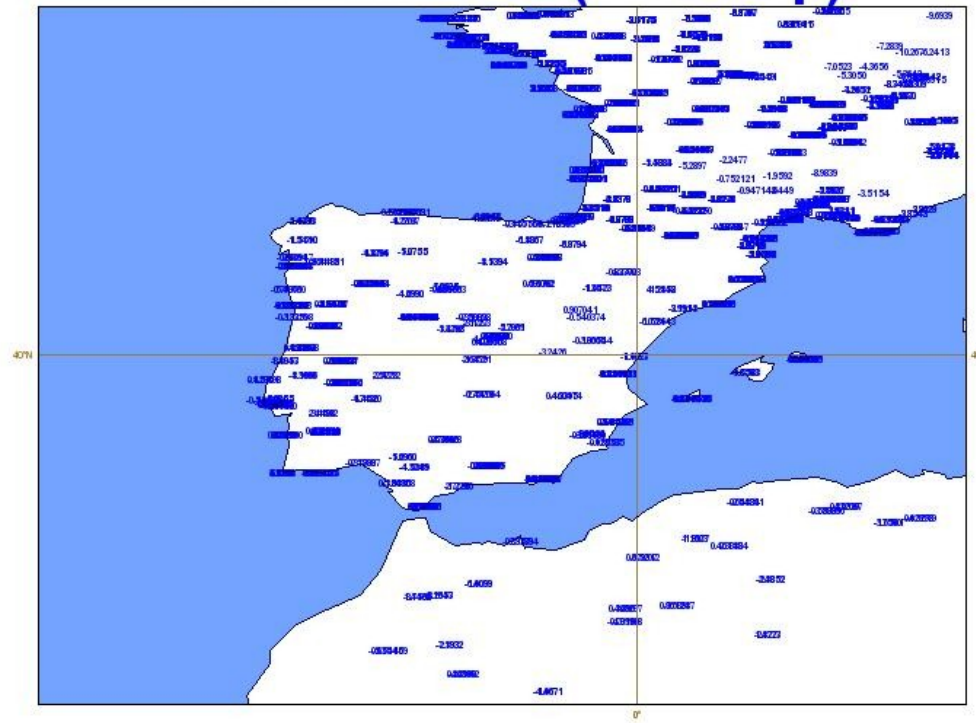
An example.

- If we see the Obs - An in a map:

"Obs - An T2m (1st Exp) "



"Obs - An T2m (2nd Exp) "



An example.



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- If we draw the station rejected for the second experiment:



Future plans in surface assimilation.

- Future plans.
 - Study new techniques like SEKF in the SURFEX scheme.
 - Study more the structure functions for the skin levels parameters assimilation.



Thank you!!