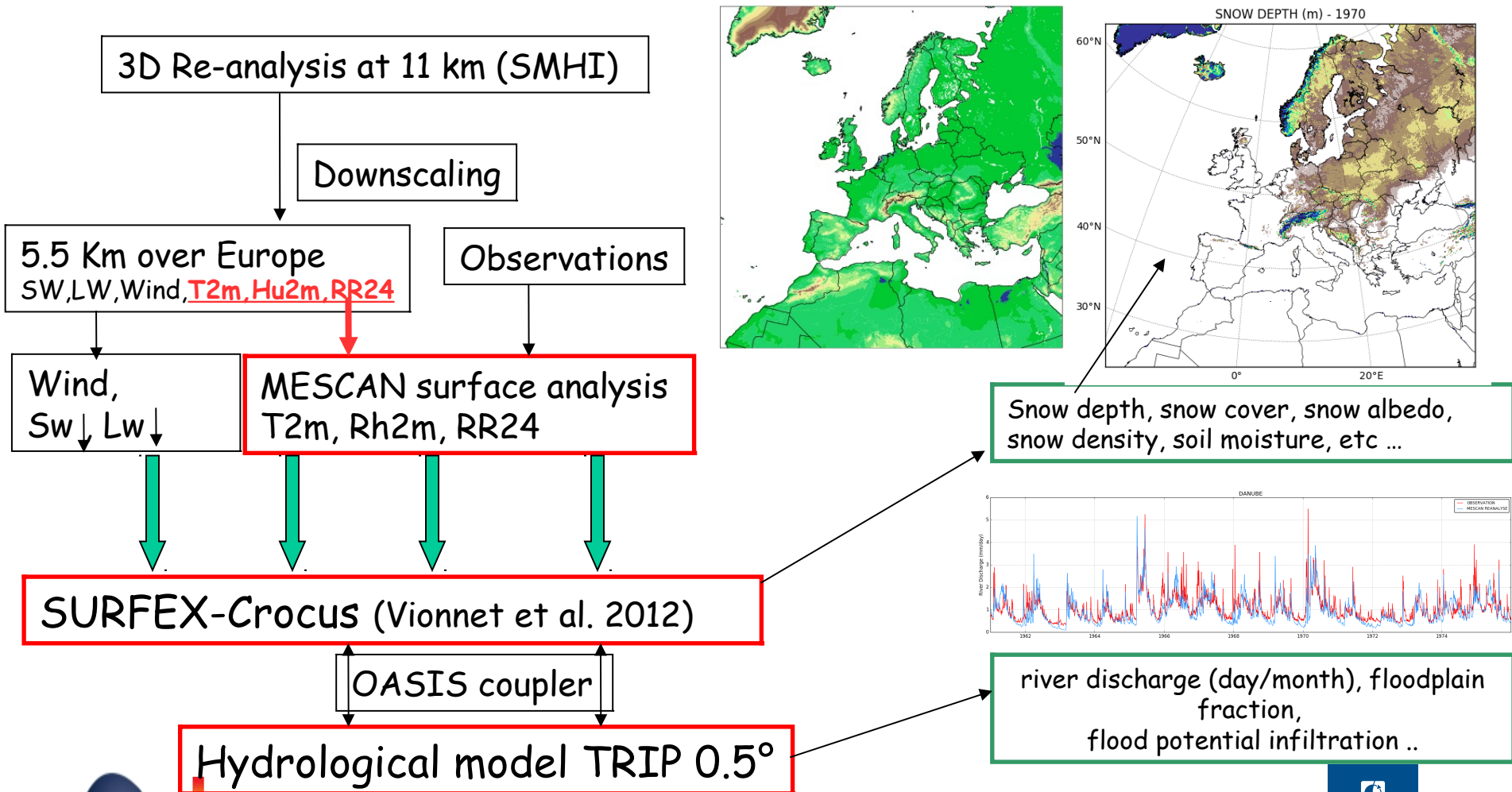


55 years surface re-analysis over Europe at 5.5km : some results

E. Bazile, R. Abida, A. Verrelle,
P. Le Moigne, C. Szczypta,
and F. Besson.

UERRA surface re-analysis 1961-2015 : MESCAN-SURFEX-TRIP

-2D surface analysis at 5.5km for 1961-2015 with precipitation analysis

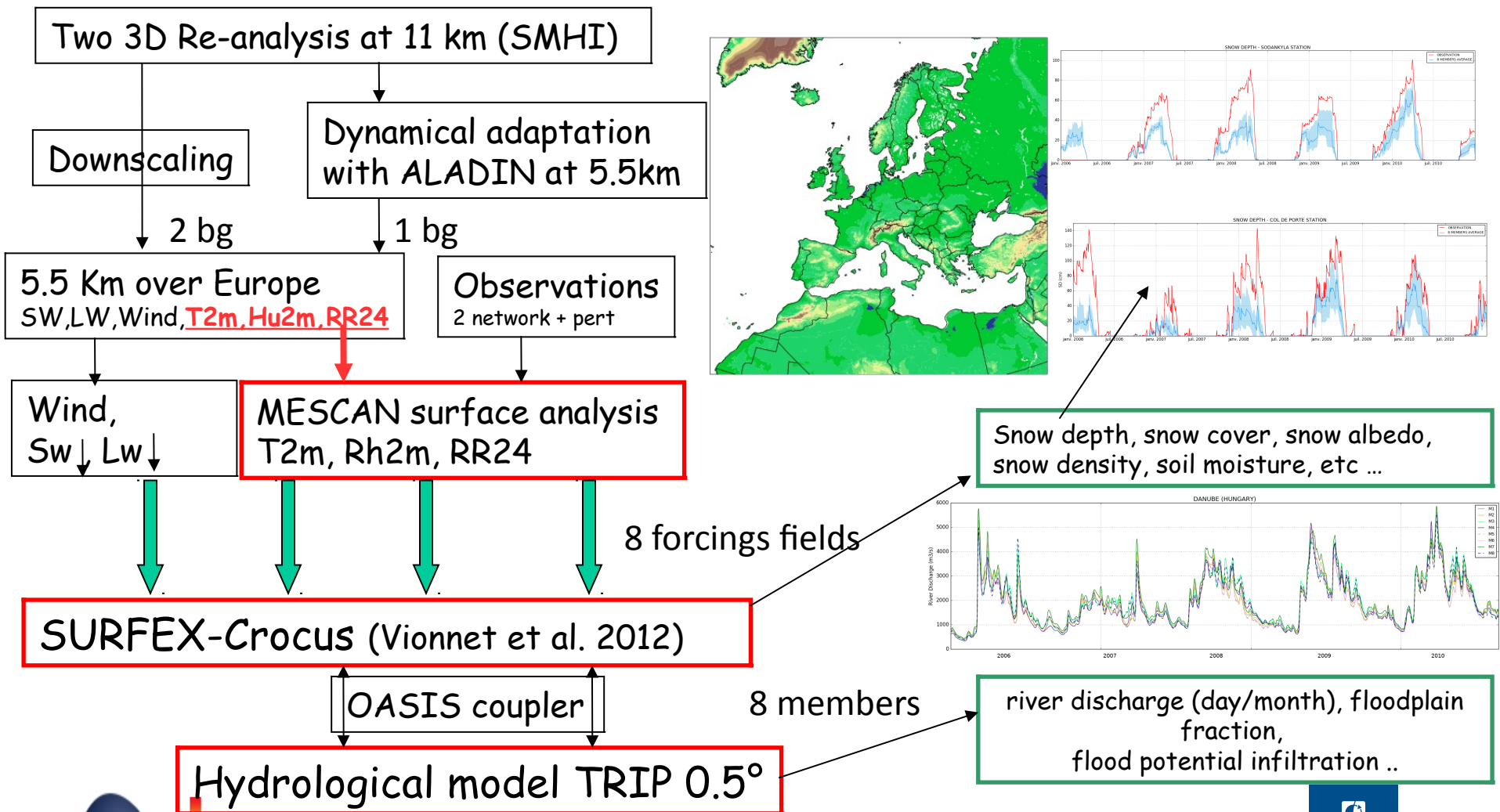


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Ensemble with 8 members

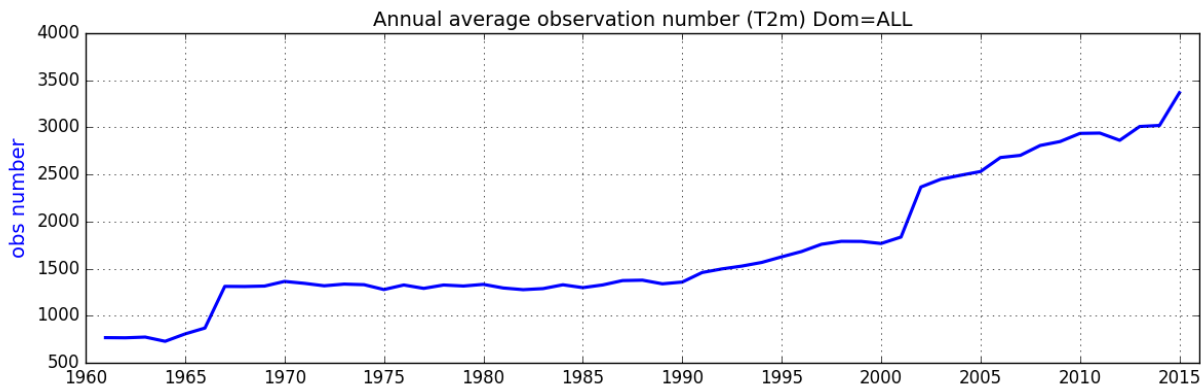
ONLY 2006-2010 (UERRA report D2.9)



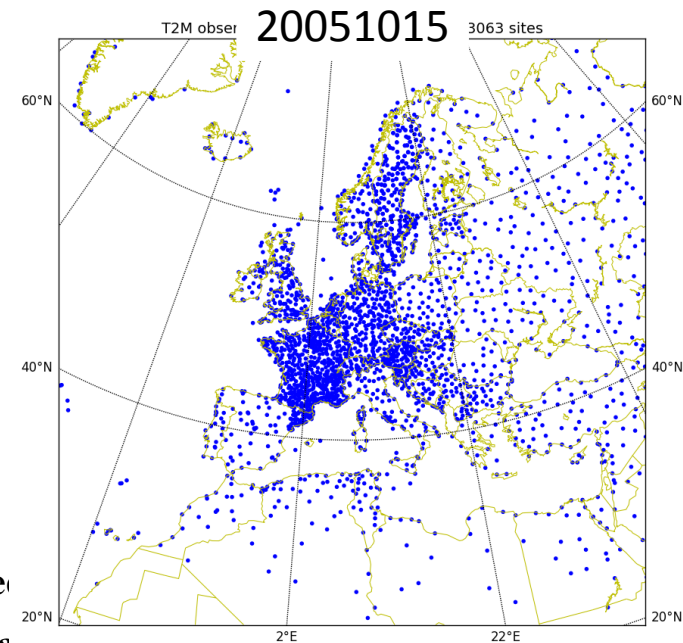
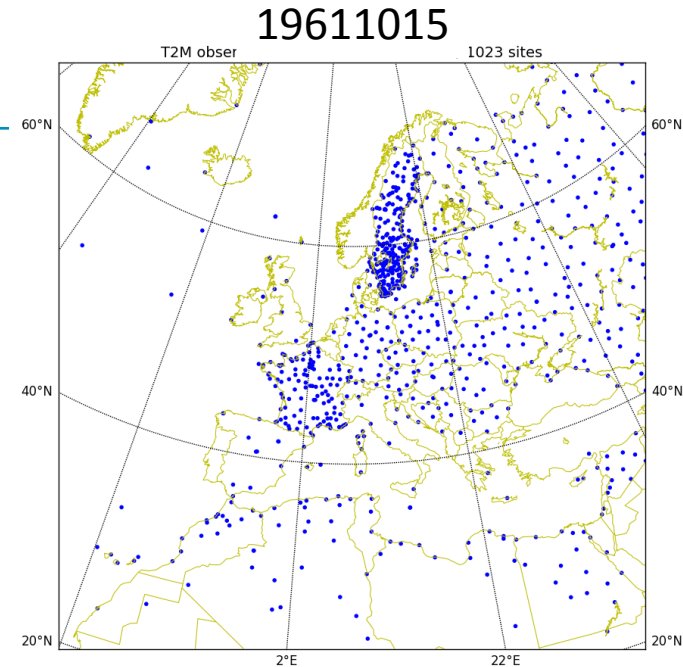
T2m, Rh2m observations

- # Network density is not homogeneous in time and space
- # without enough observations the reanalysis tends to drift towards the model climatology.
- # A sharp increase in observation density might lead to misleading results. Particularly, for surface trend interpretation..
- # Observations (T2m, Rh2m) from ECMWF + some additional national database (France, Sweden & Norway) + some input from WP1

Obs T2m used in UERRA surface re-analysis

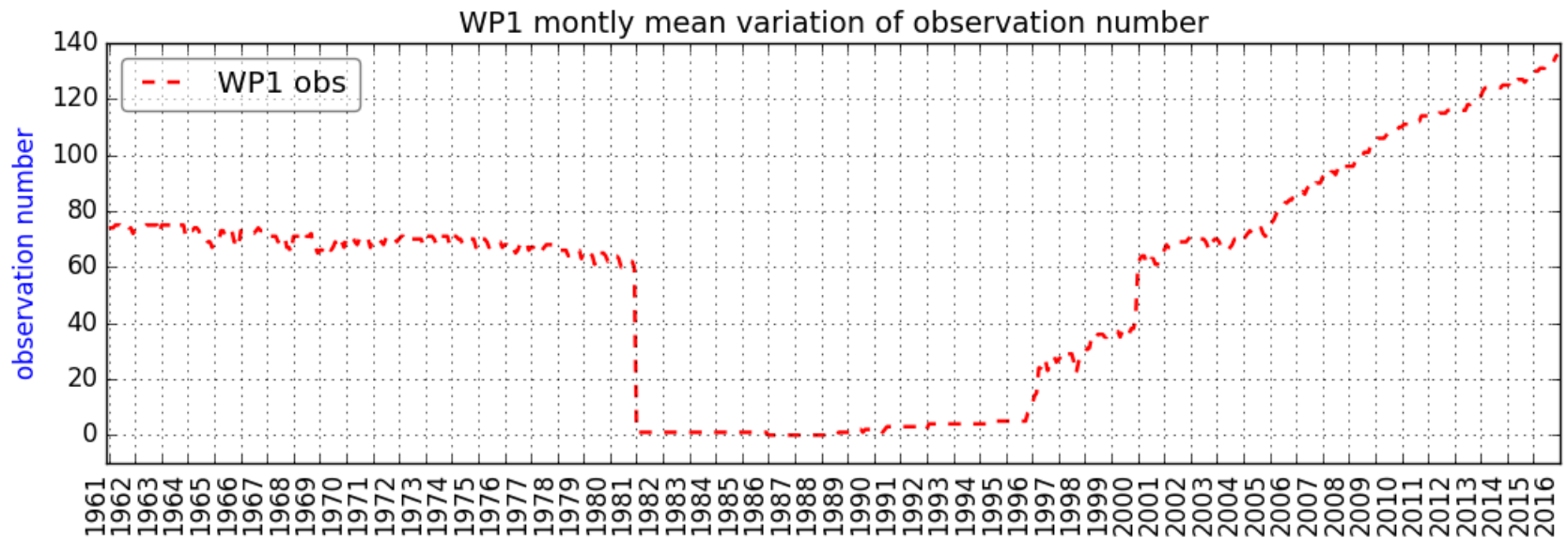


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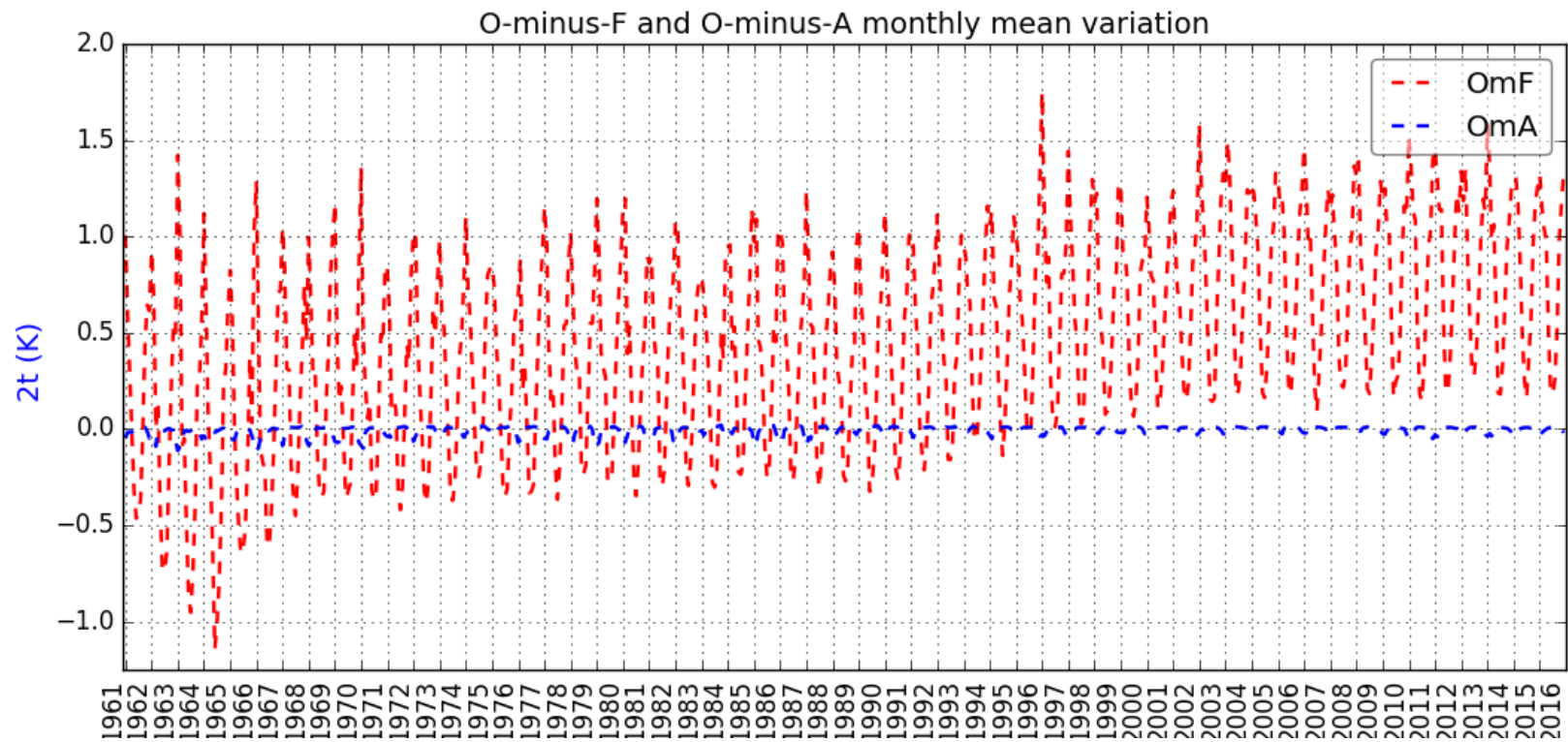
T2m, Rh2m observations

Obs T2m used in UERRA from WP1



Data Rescue + Norway no additional data between 1981 and 1999 + data from Catalonia since 09/1988

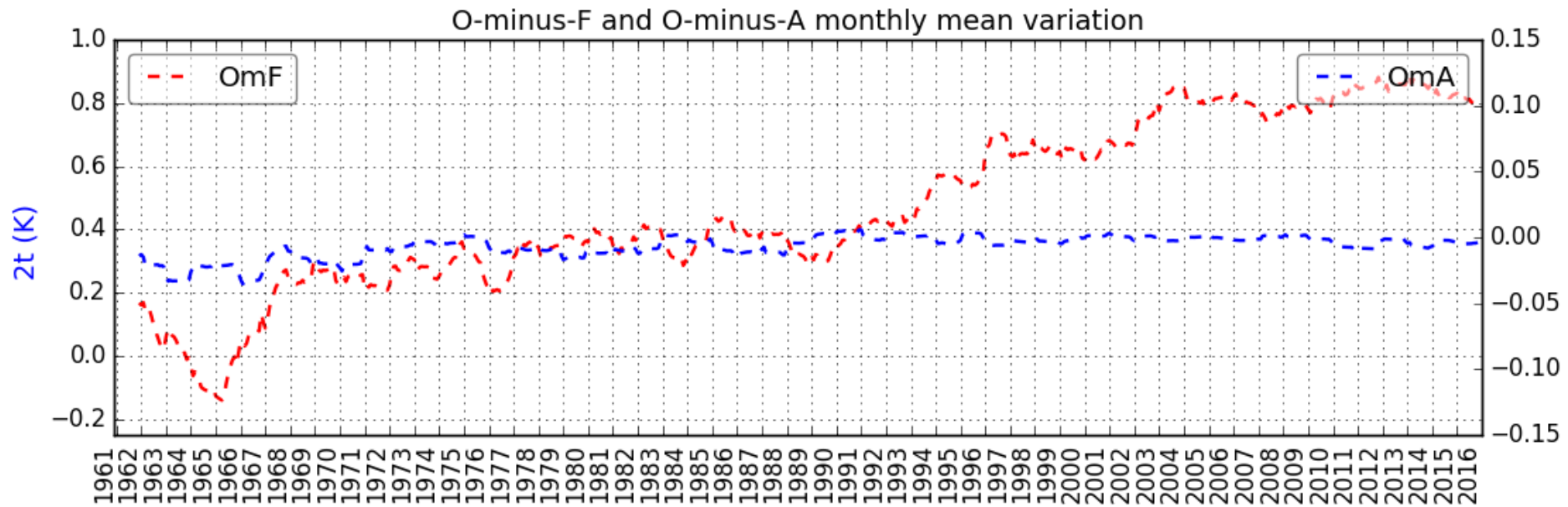
MESCAN verification T2m



A slight increase of the O-G after 1992 due probably to a denser observation network in the Eastern part of Europe and over the Alps.

Nevertheless the impact on the O-A is very small

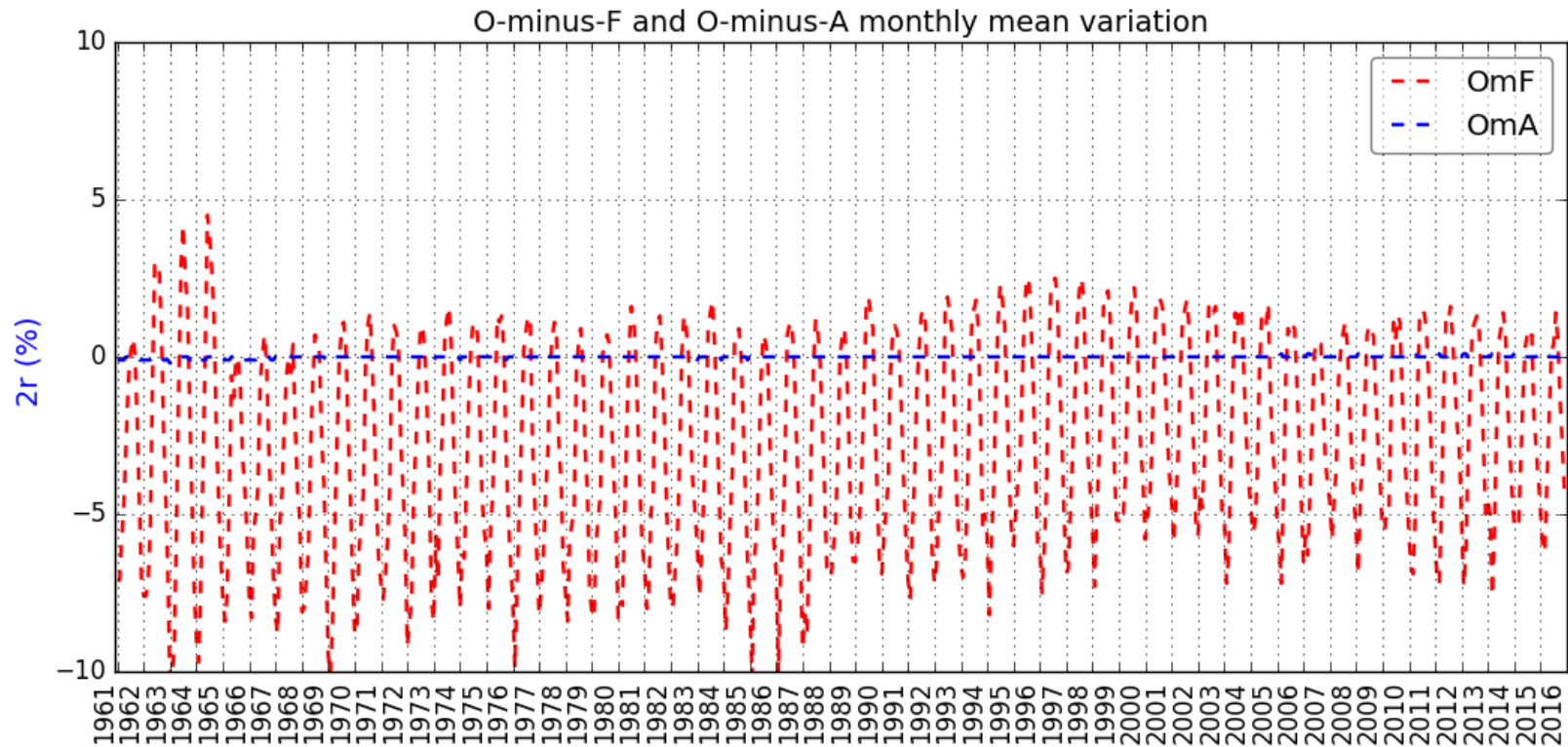
MESCAN verification T2m



A slight increase of the O-G after 1992 due probably to a denser observation network in the Eastern part of Europe and over the Alps.

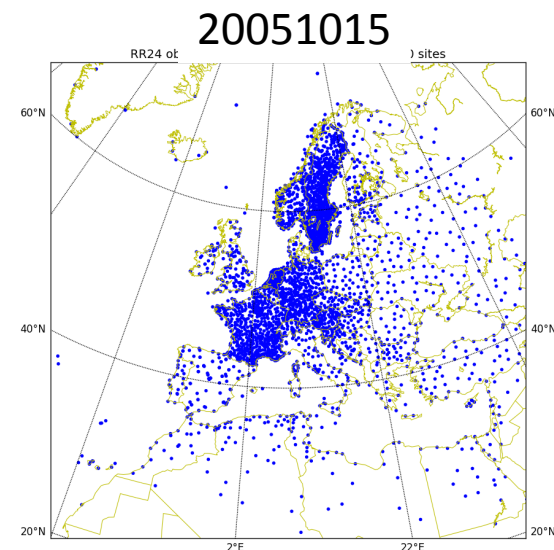
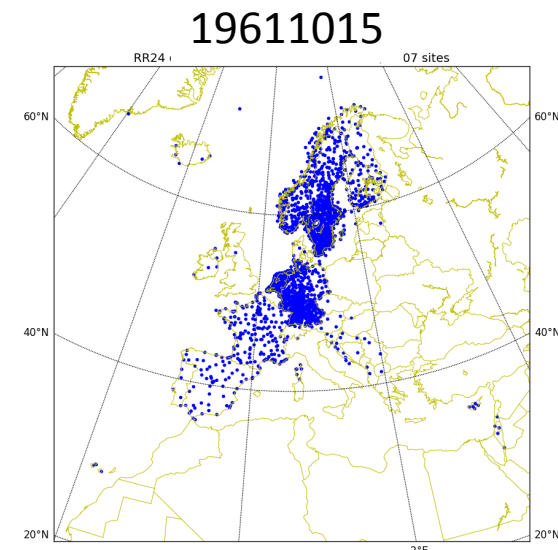
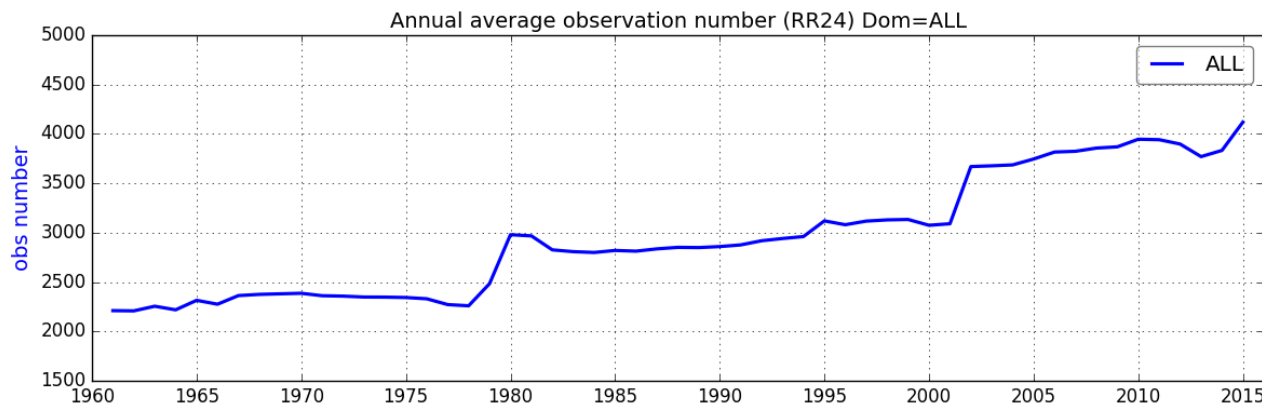
Nevertheless the impact on the O-A is very small

MESCAN verification Rh2m



Rainfall observations

- # Before 1978 no observations available or used over north Africa and East Europe !
- # Observations from national database (France, Sweden & Norway), ECA&D and ECMWF but ...
- # From the MARS archive only two 12h accumulated RR were used



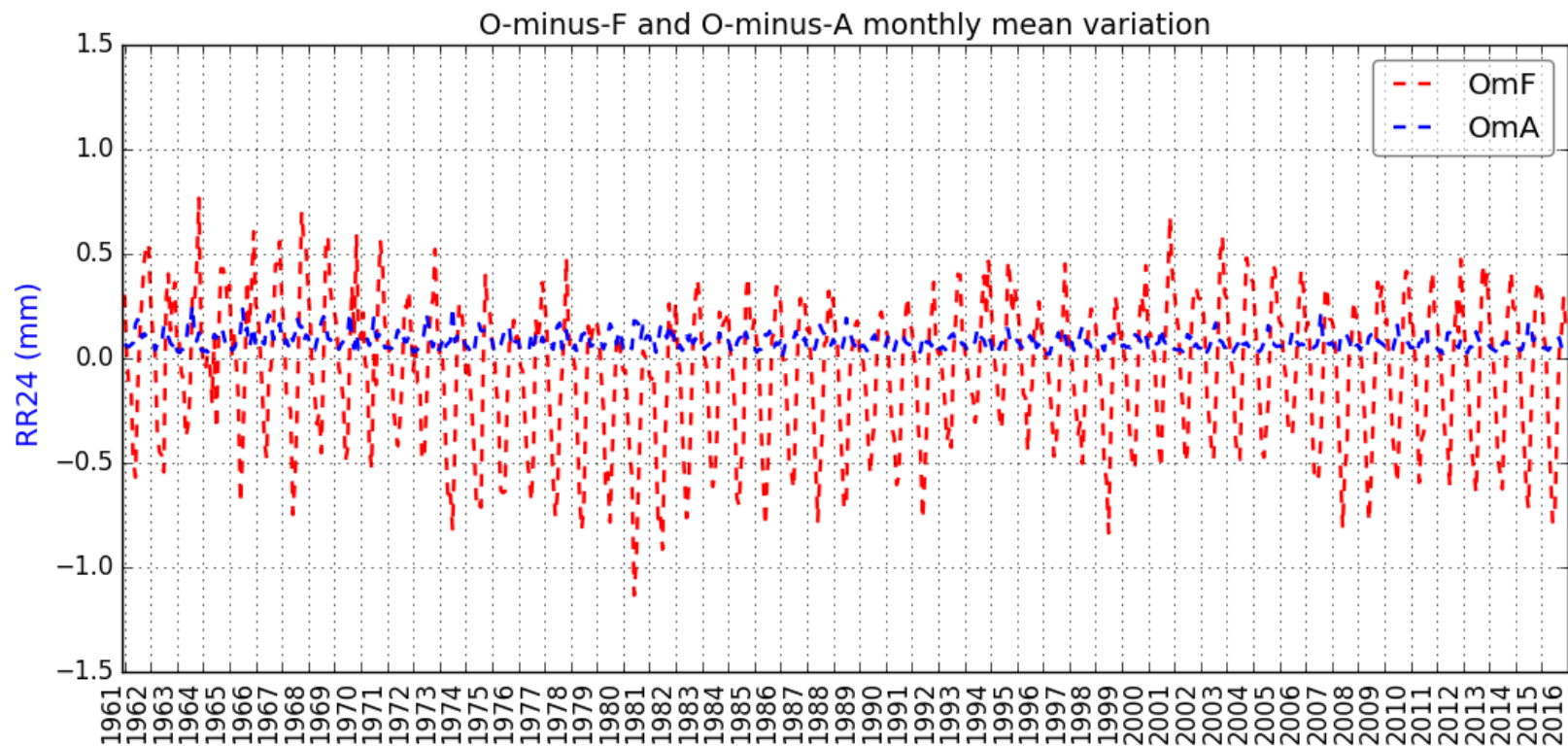
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MESCAN verification : RR24

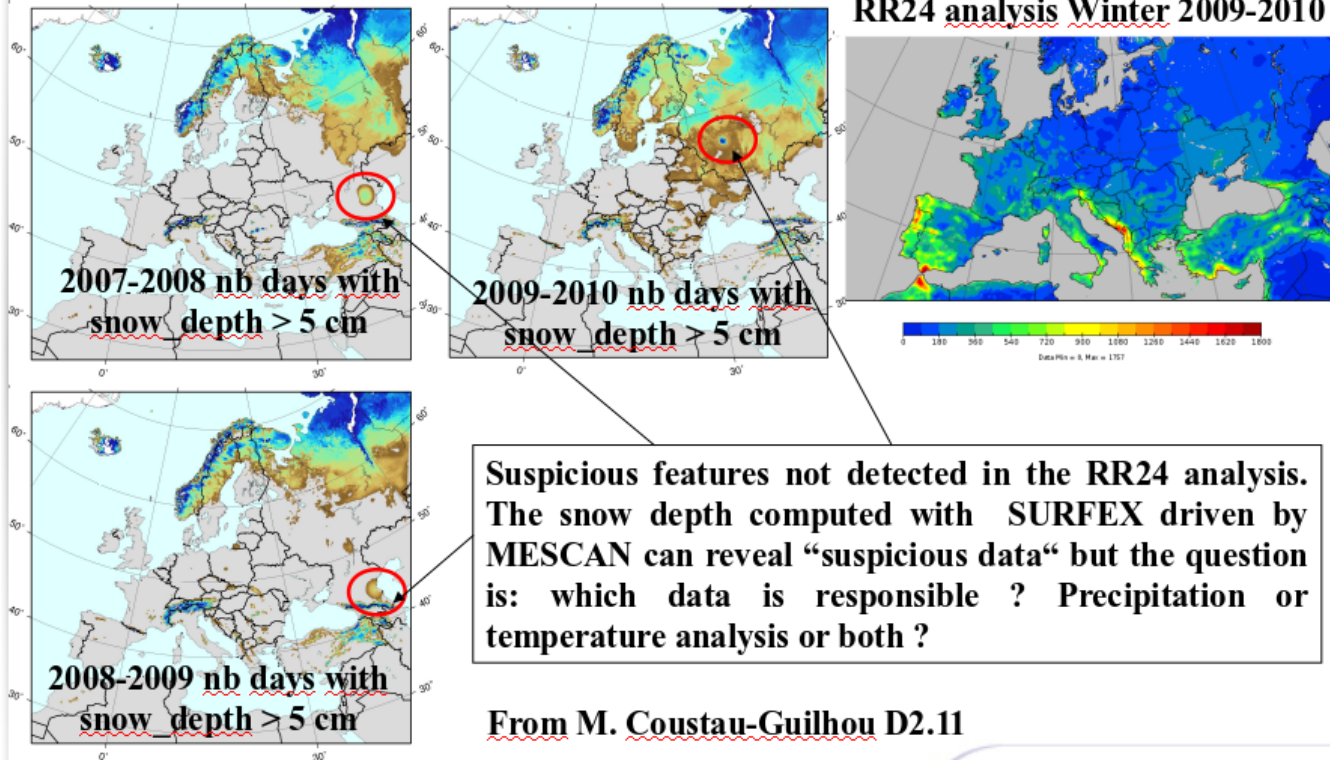
New tunings for the statistical errors for the precipitation analysis with a variable σ_o instead of $\sigma_o = 5\text{mm}$ to reduce the problem of overestimation of wet days

$RR_{obs}=0. \rightarrow \sigma_o=0.001$; $RR_{obs}<50\text{mm} \rightarrow \sigma_o=0.7+RR*0.1$; $RR_{obs} \geq 50\text{mm} \rightarrow \sigma_o=5.7$



Problems with the precipitation observations

Lessons from Euro4M



From M. Coustau-Guilhou D2.11



UERRA meeting Exeter, 25-27 March 2014



METEO FRANCE
Toujours un temps d'avance

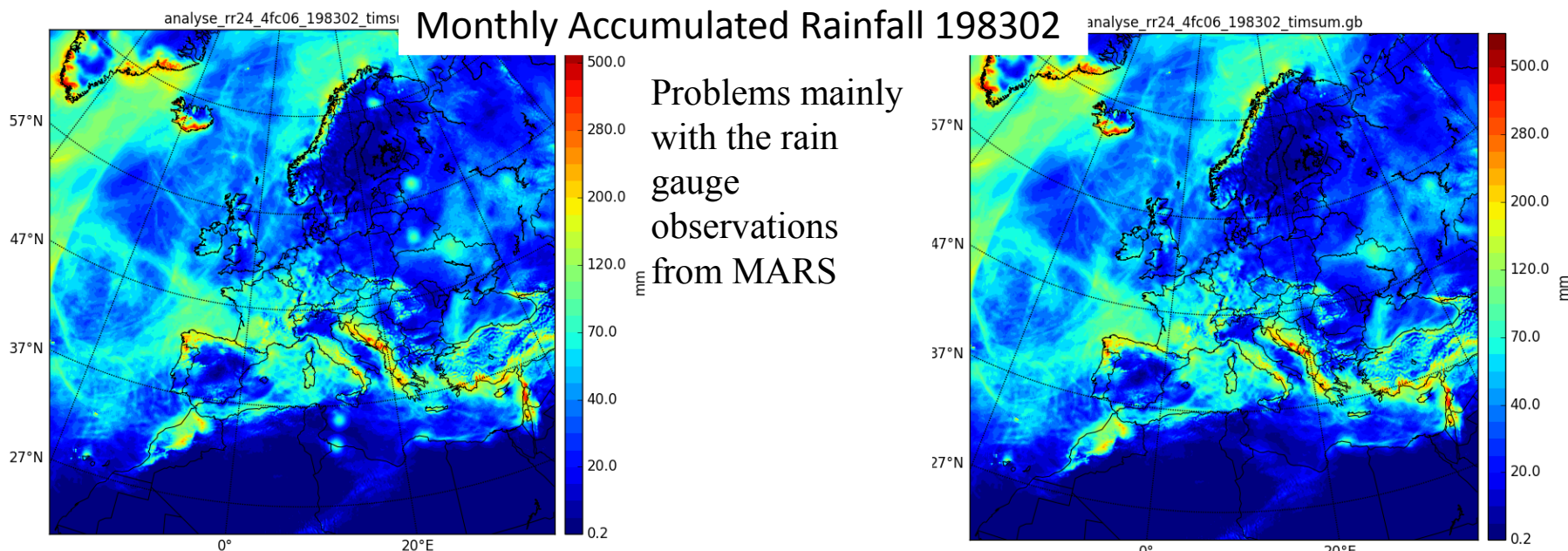


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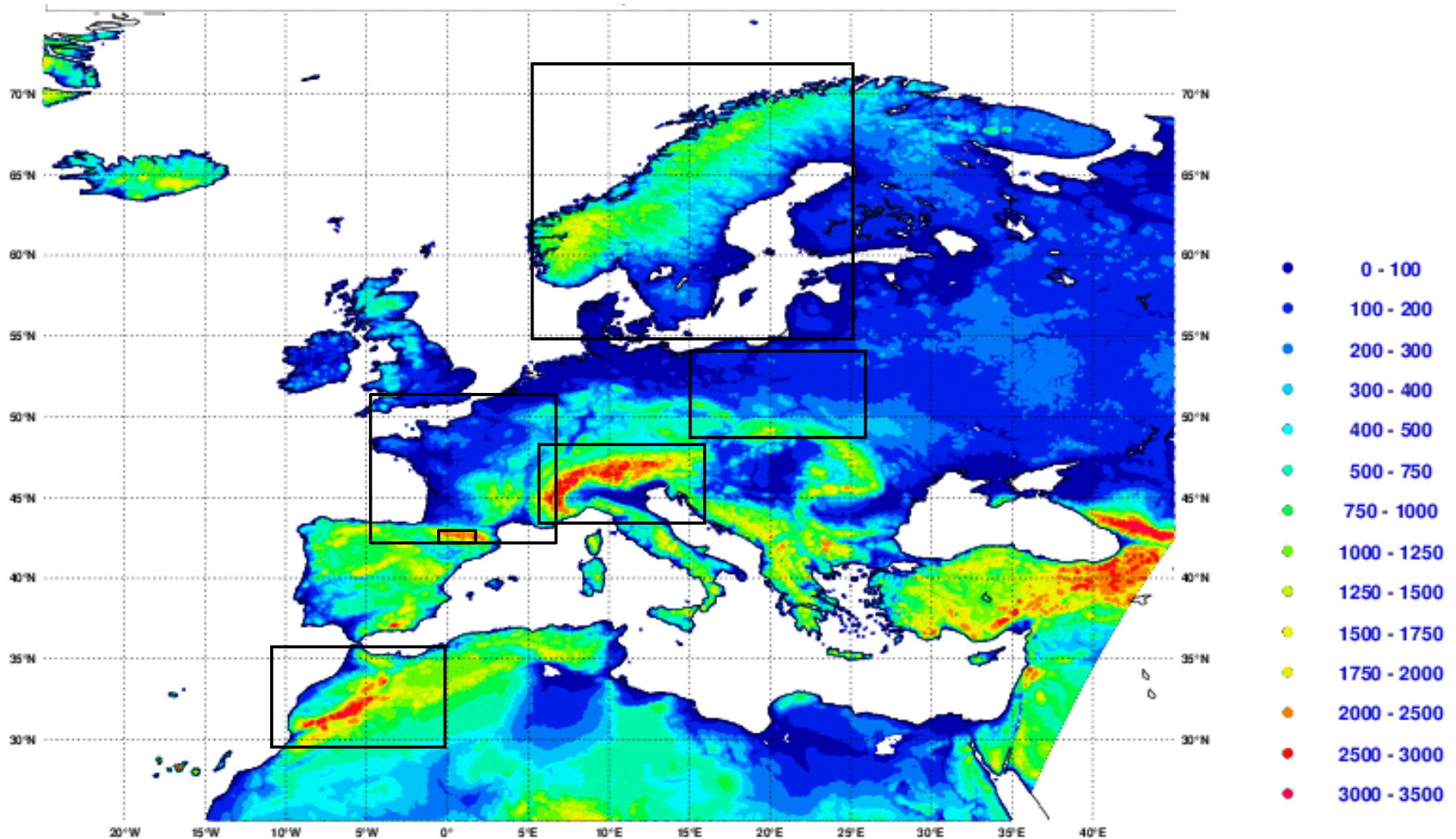
Quality of the precipitation observations



- QC done with Obs-FG impossible to optimize: to keep the extreme convective events and to reject all the suspicious obs → finally manual correction and re-run the analysis ! → take a lot of time → for the future need to develop a «clever» and specific QC for the precipitation
- Observation rejection criterion (NOT ACTIVATED):

$$\frac{(O-G)^2}{\sigma_o^2 + \sigma_b^2} > T \quad (= \text{threshold})$$
 Ex: $O=400 \text{ mm}$, $G=50 \text{ mm}$, $\sigma_o=5.7$, $\sigma_b=13 \Rightarrow T \approx 26$
 With $T=26$, $RR_{\text{obs}}=100 \text{ mm}$, $\sigma_o=5.7$, $\sigma_b=13 \Rightarrow 25 \text{ mm} \leq G \leq 175 \text{ mm}$

Some preliminary results for several domains

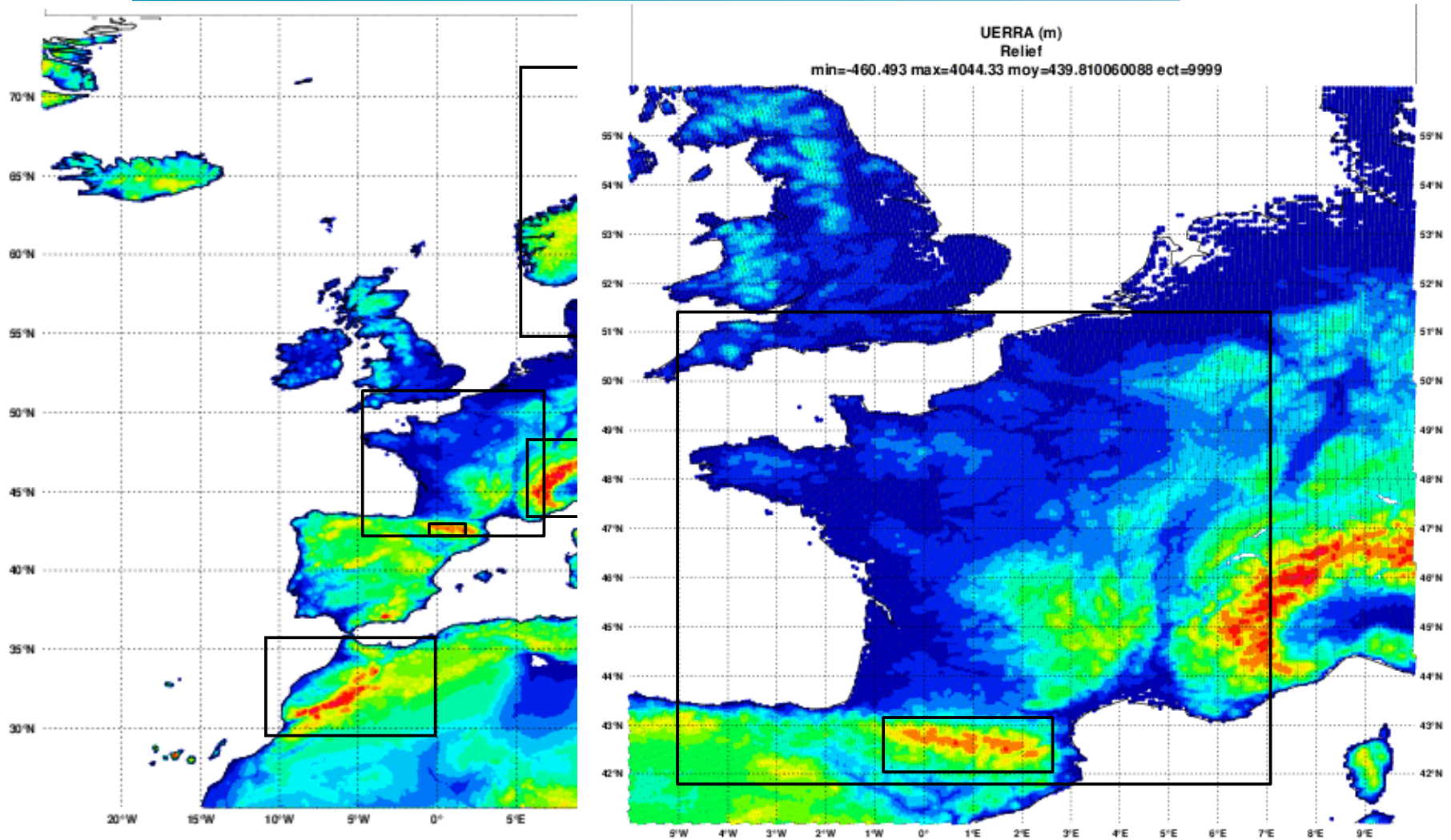


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Some preliminary results for several domains

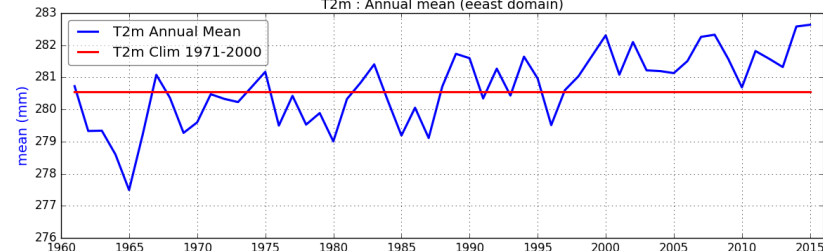
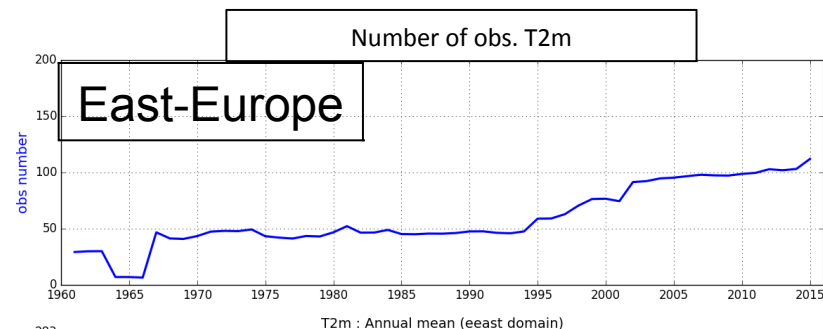
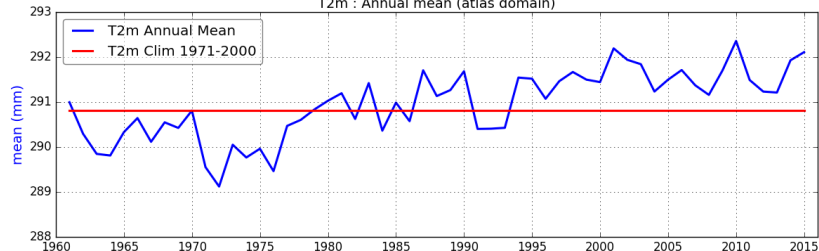
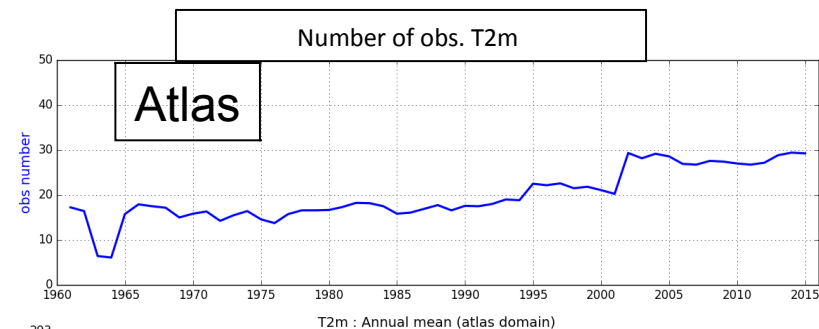
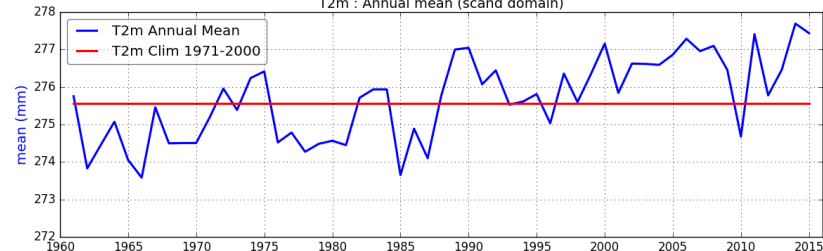
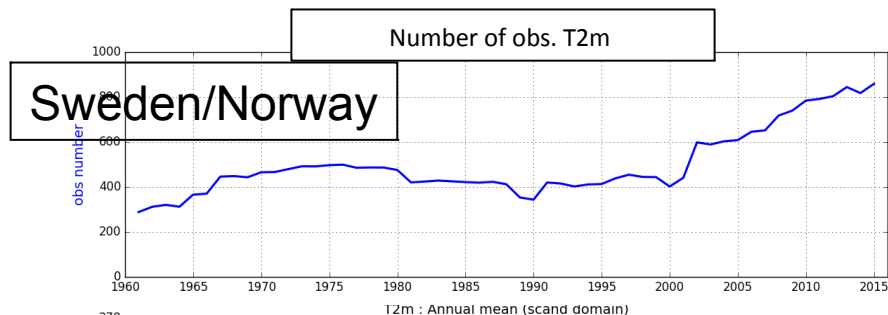
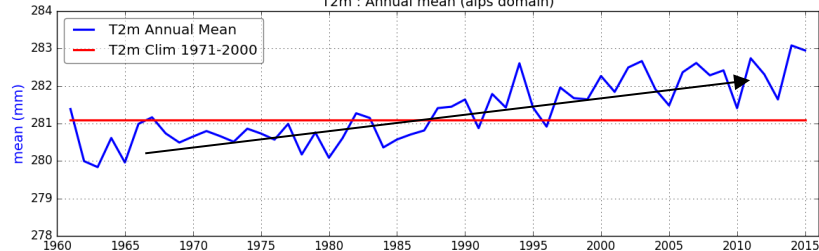
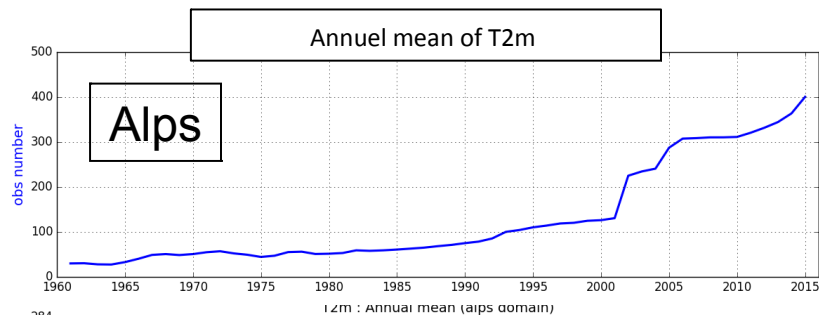


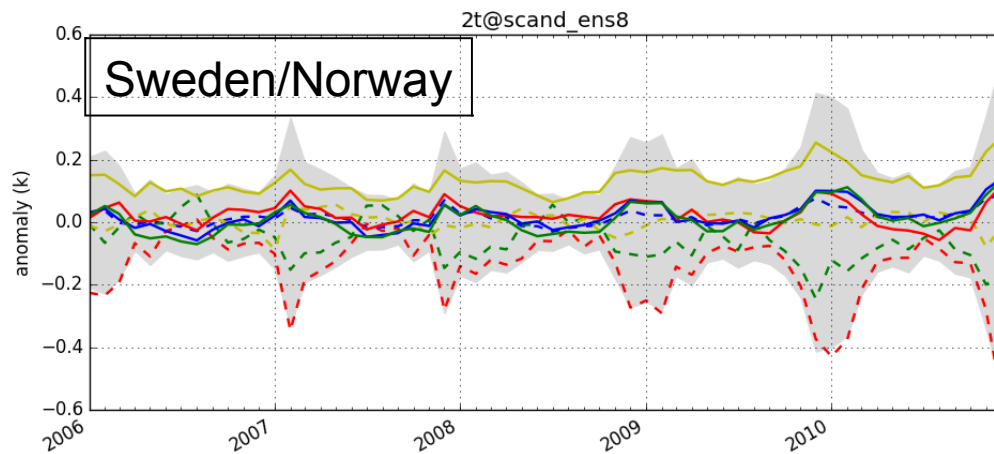
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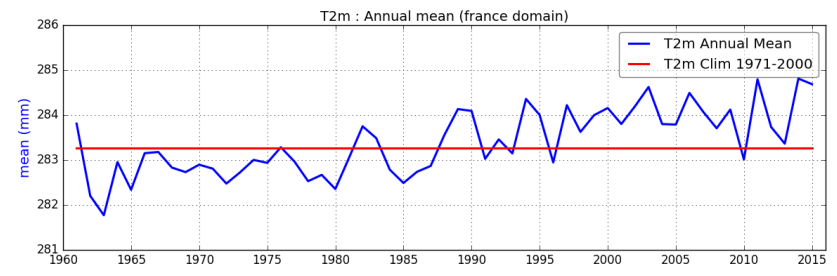
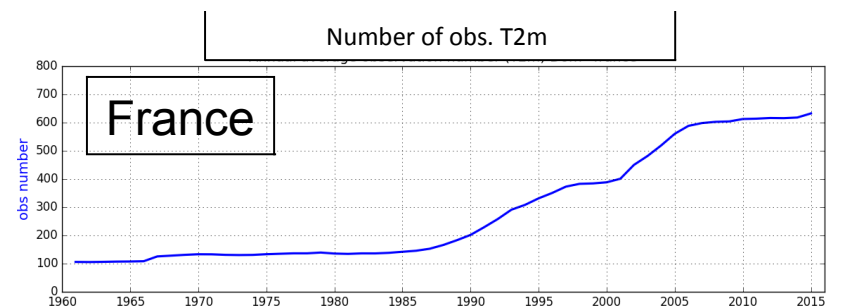
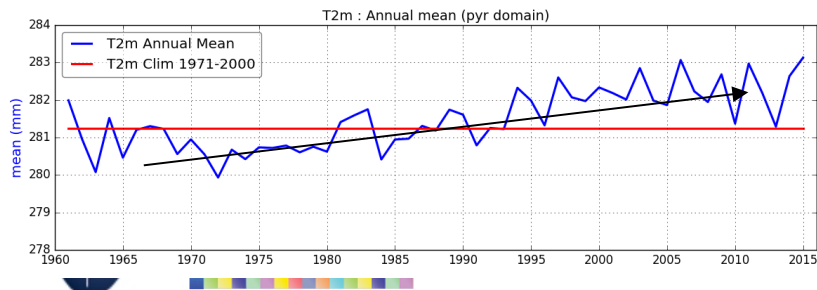
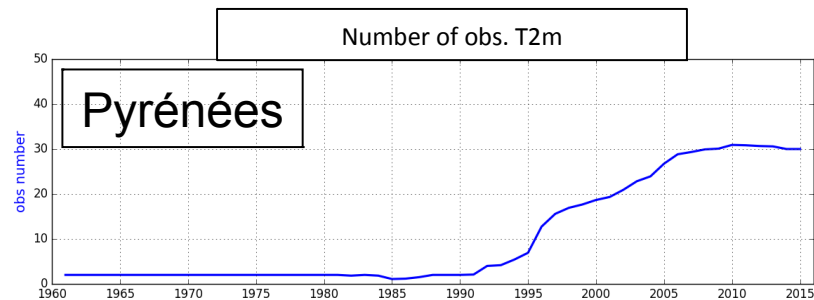
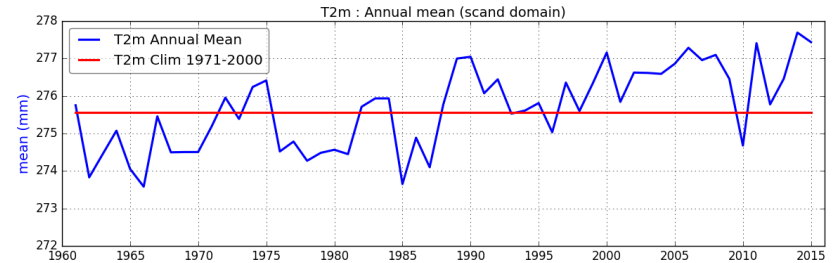
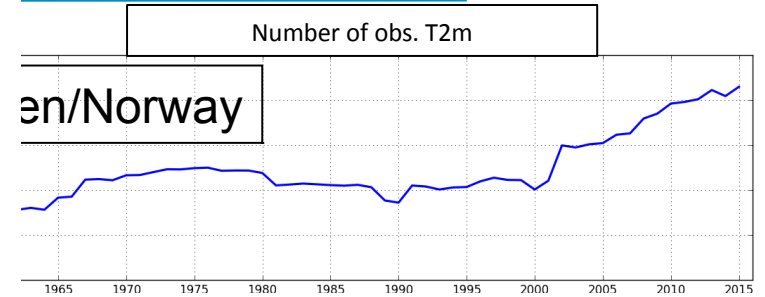


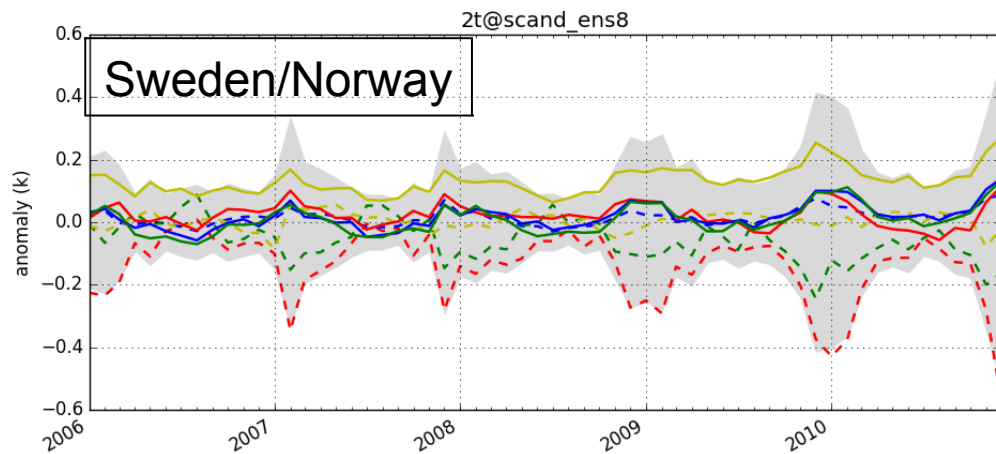
Annual mean 2m temperature: 1961-2015



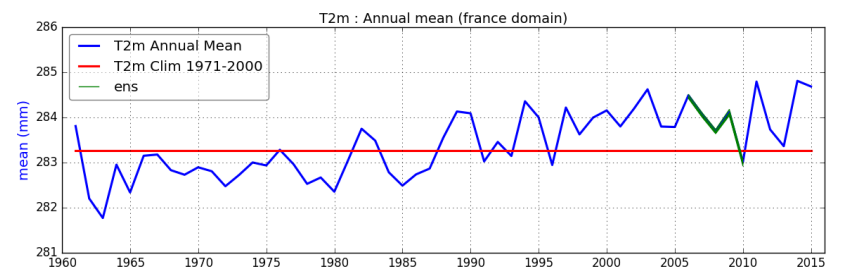
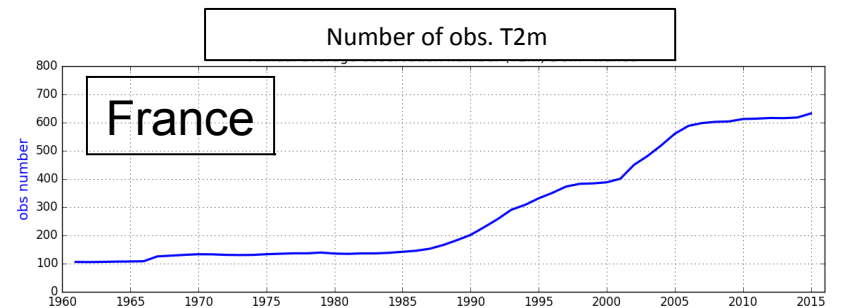
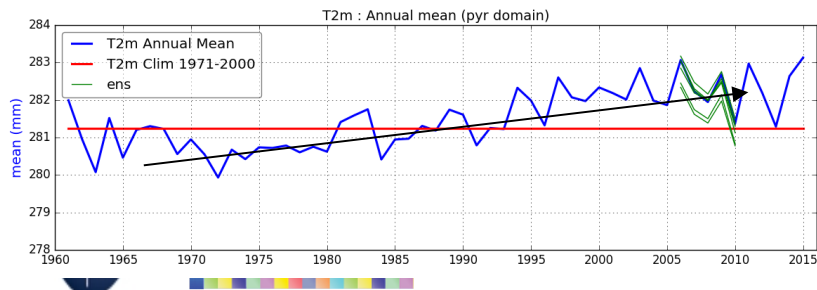
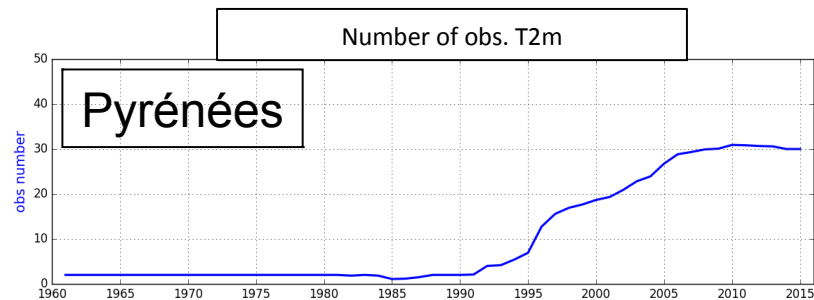
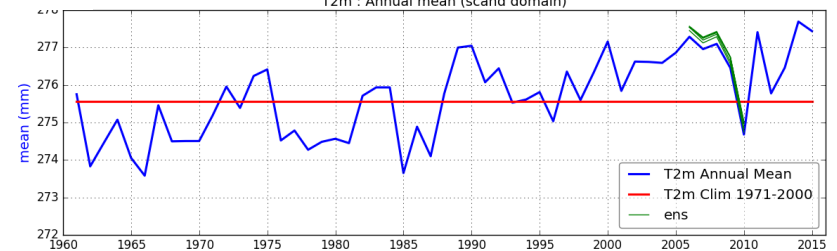
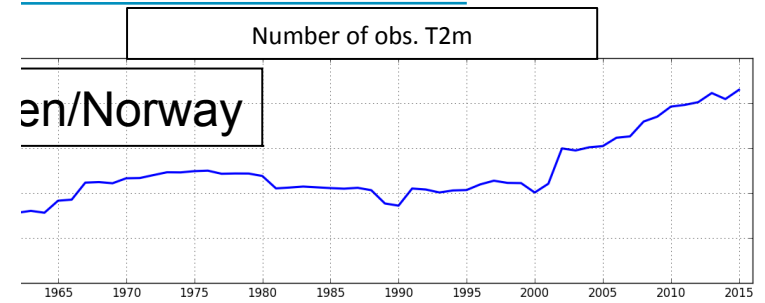


Temperature: 1961-2015



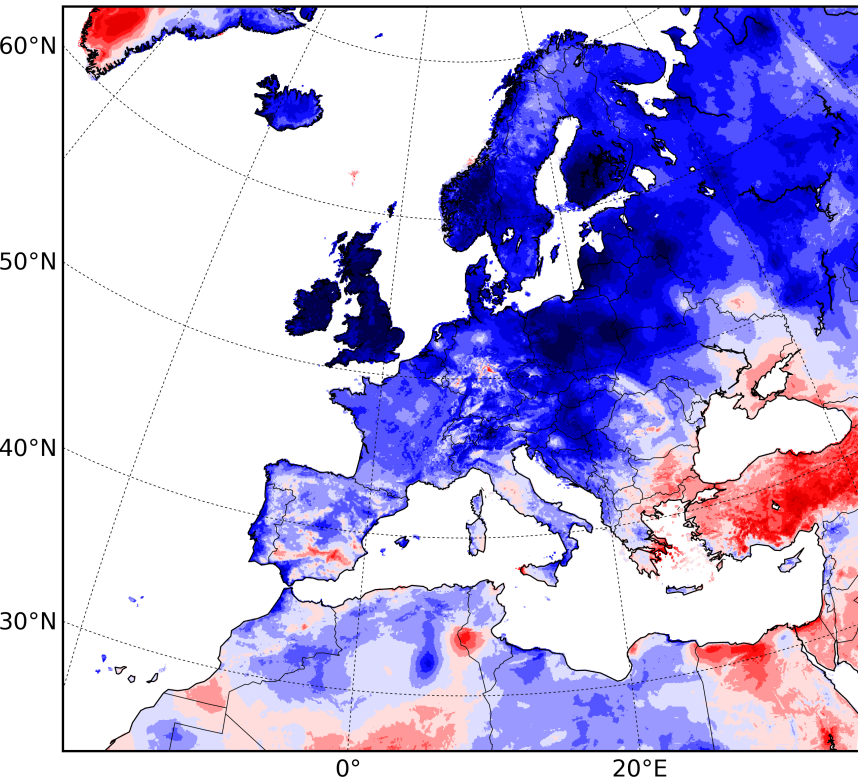


Temperature: 1961-2015

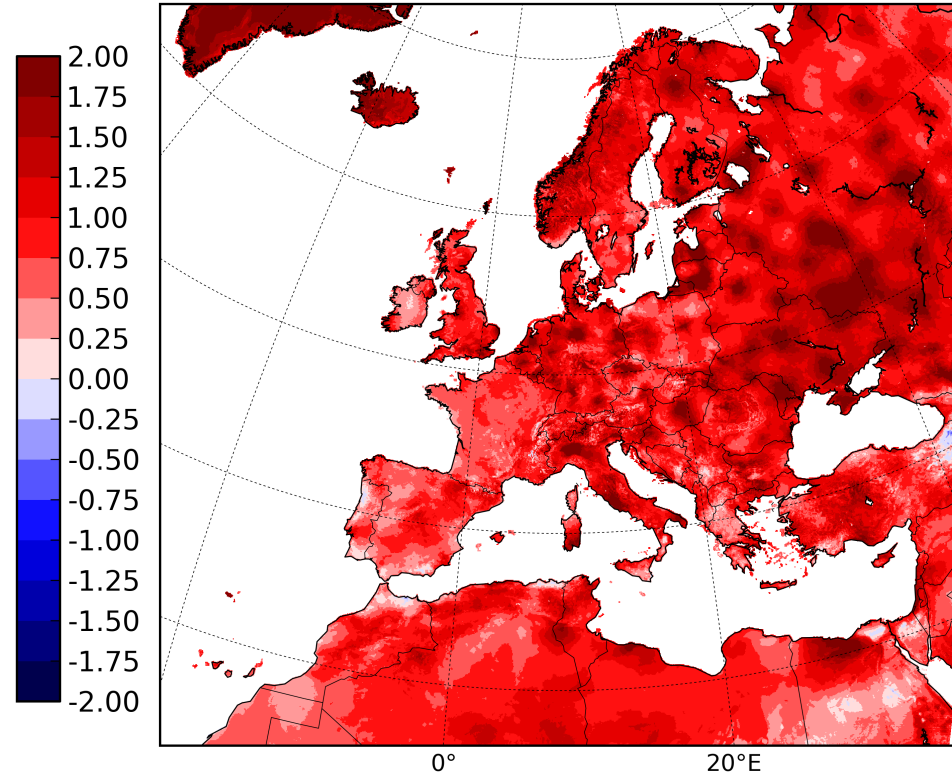


Surface temperature anomaly vs 1971-2000

1962-1970



2001-2009



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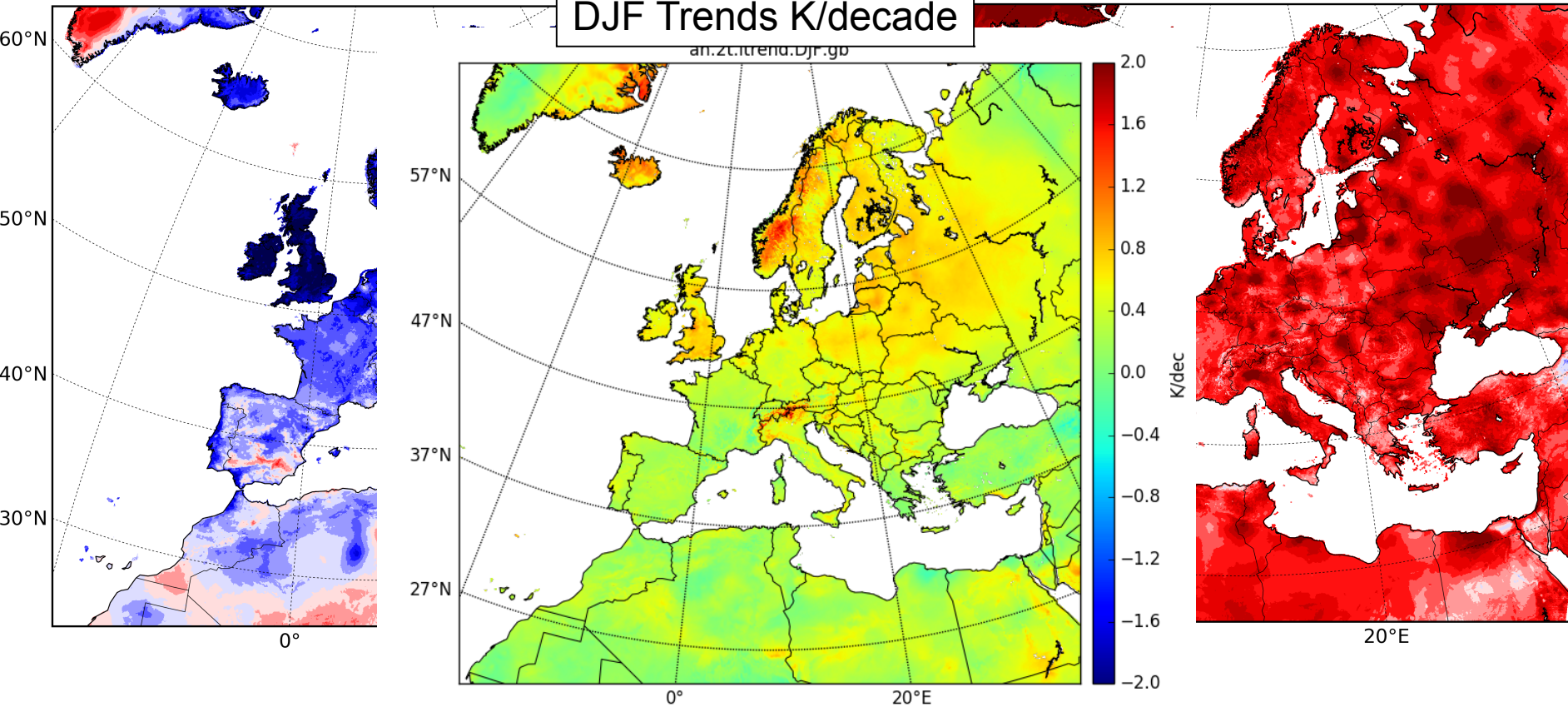
Surface temperature anomaly vs 1971-2000

1962-1970

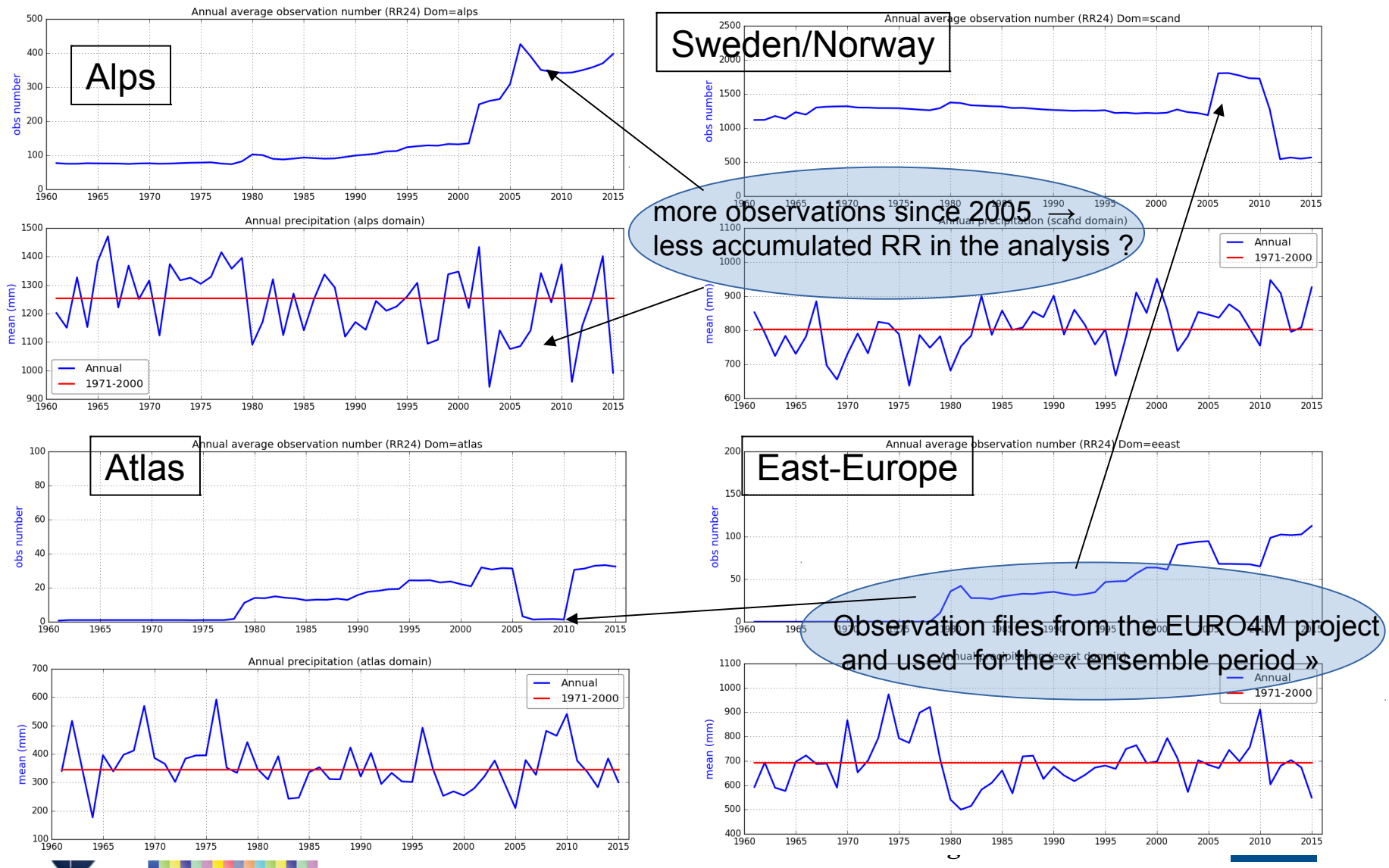
2001-2009

DJF Trends K/decade

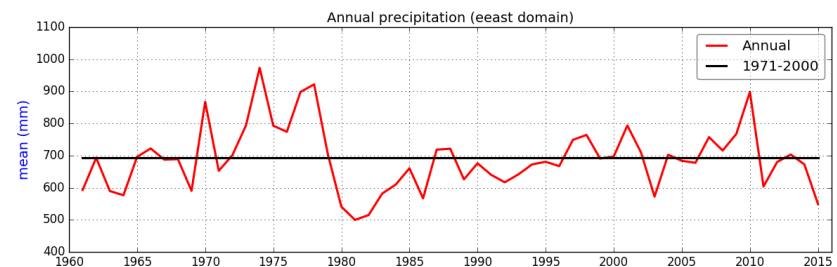
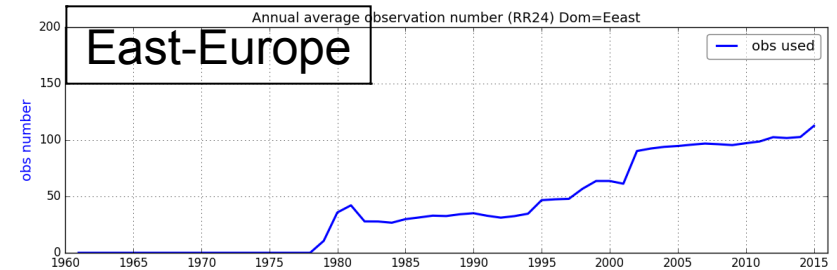
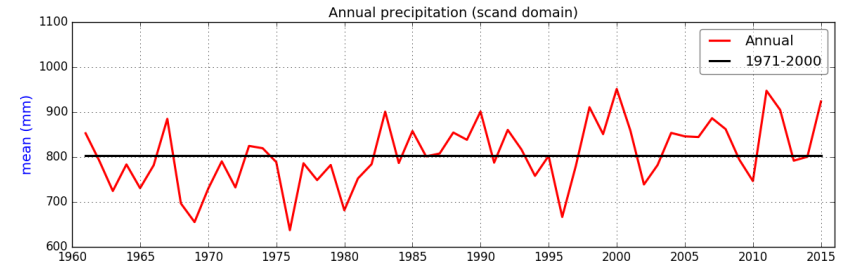
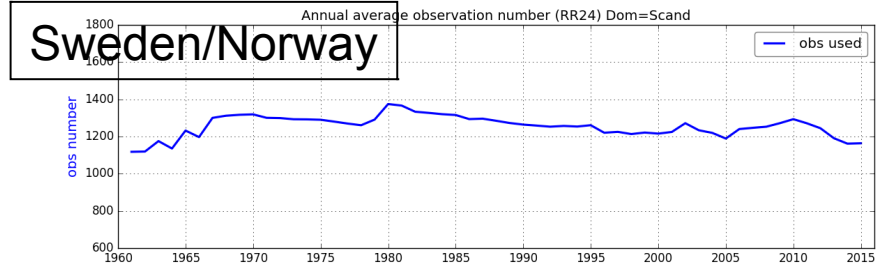
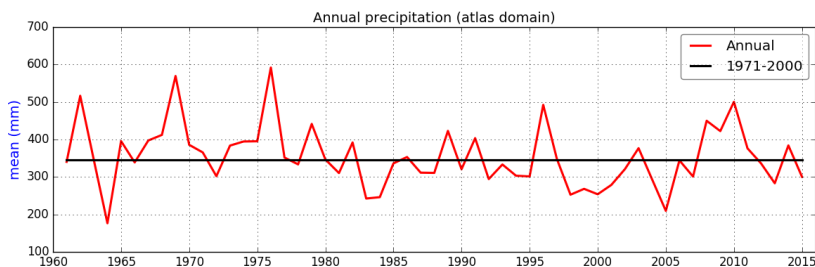
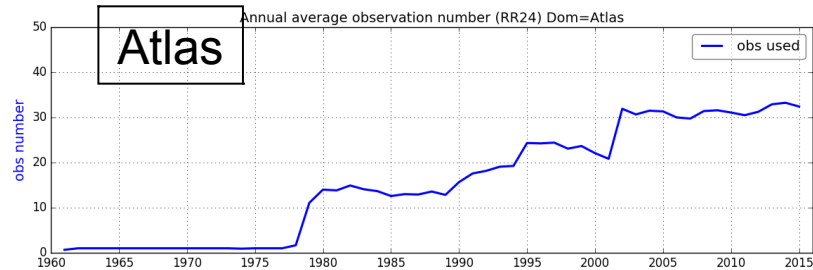
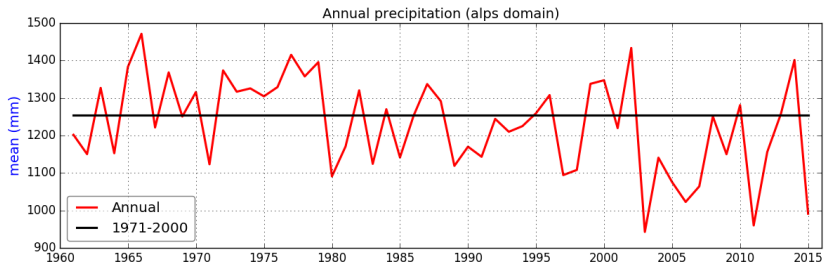
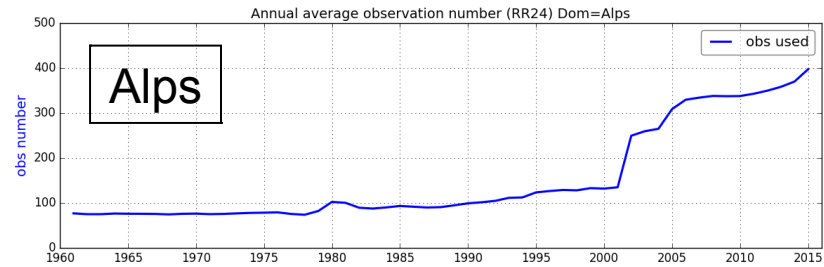
an.zt.trend.djfr.gb



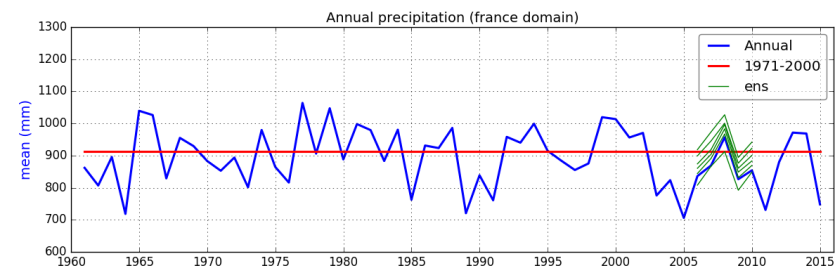
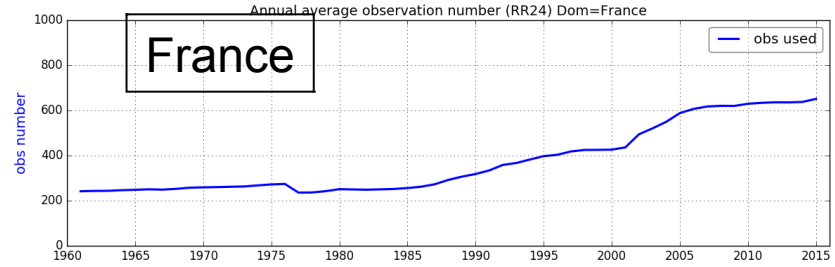
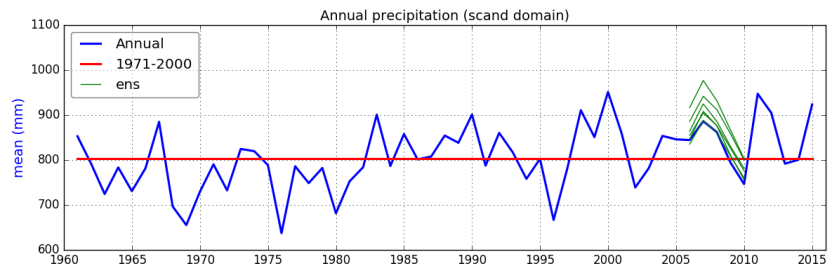
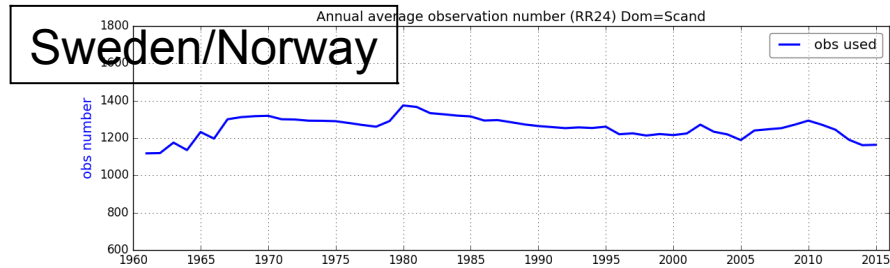
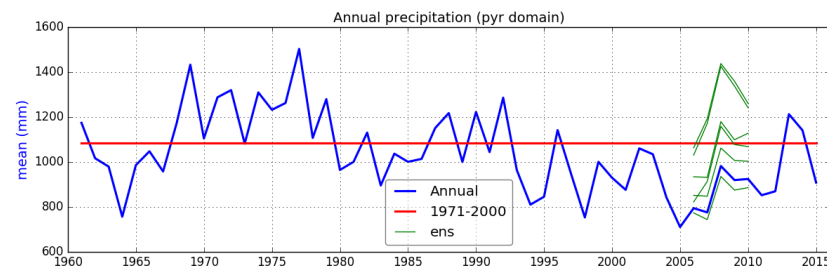
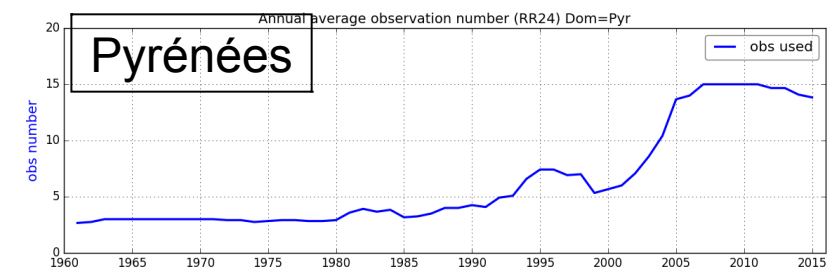
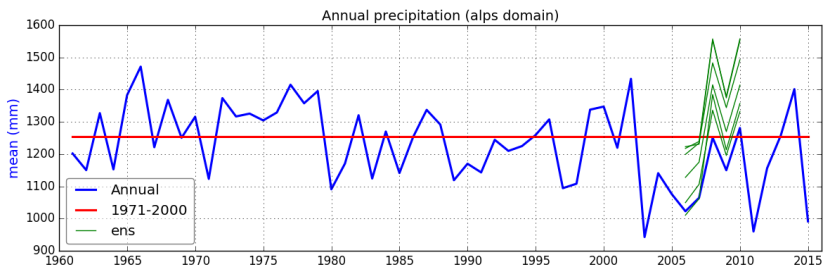
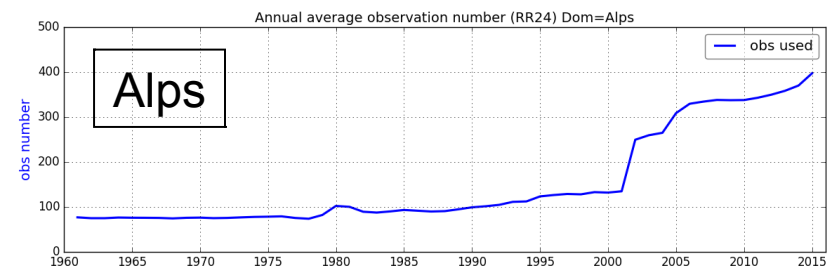
Annual rainfall 1961-2015 (status in sept 2017)



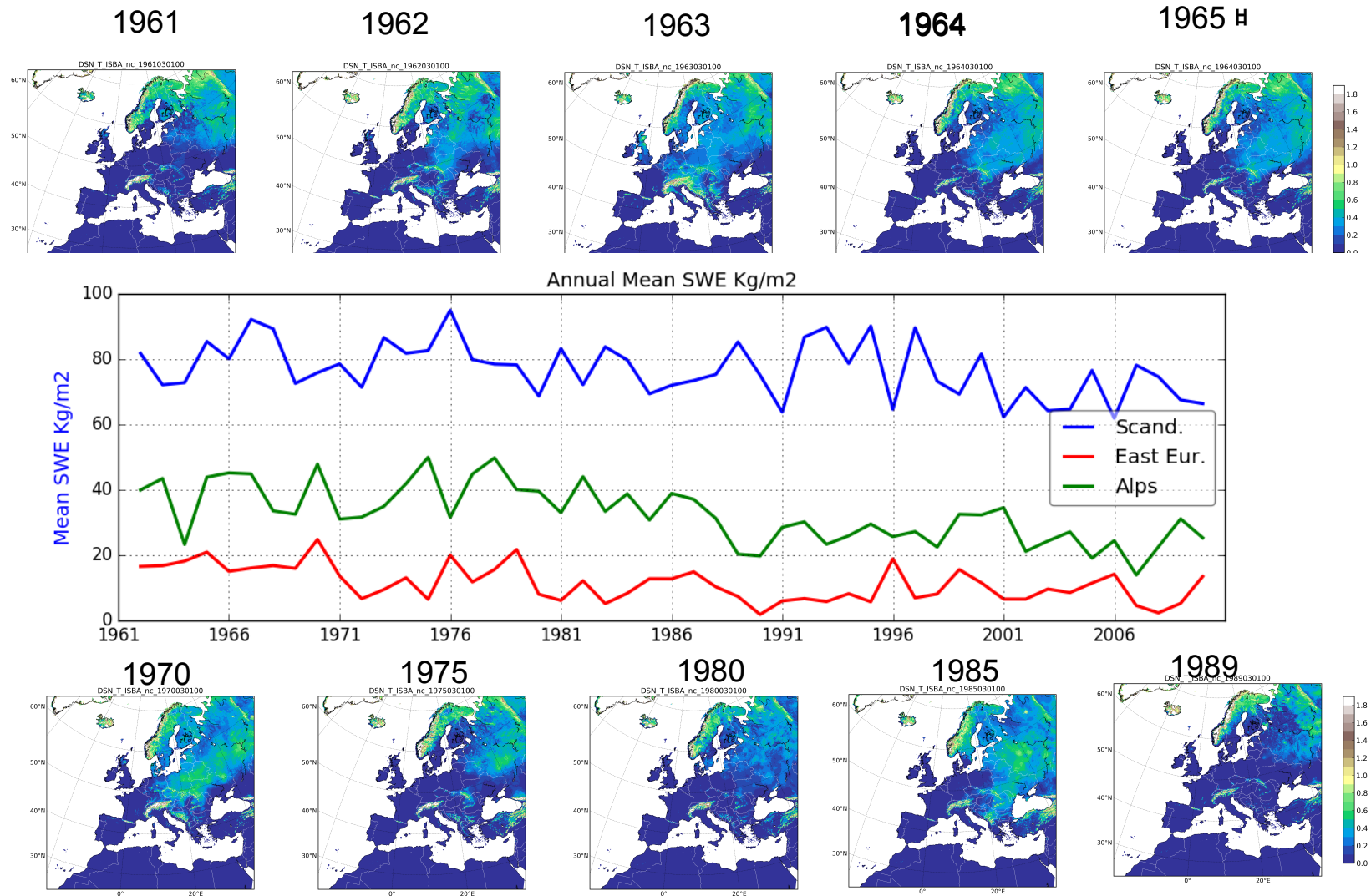
Annual rainfall 1961-2015



Annual rainfall 1961-2015

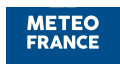


Snow height and SWE from MESCAN-SURFEX

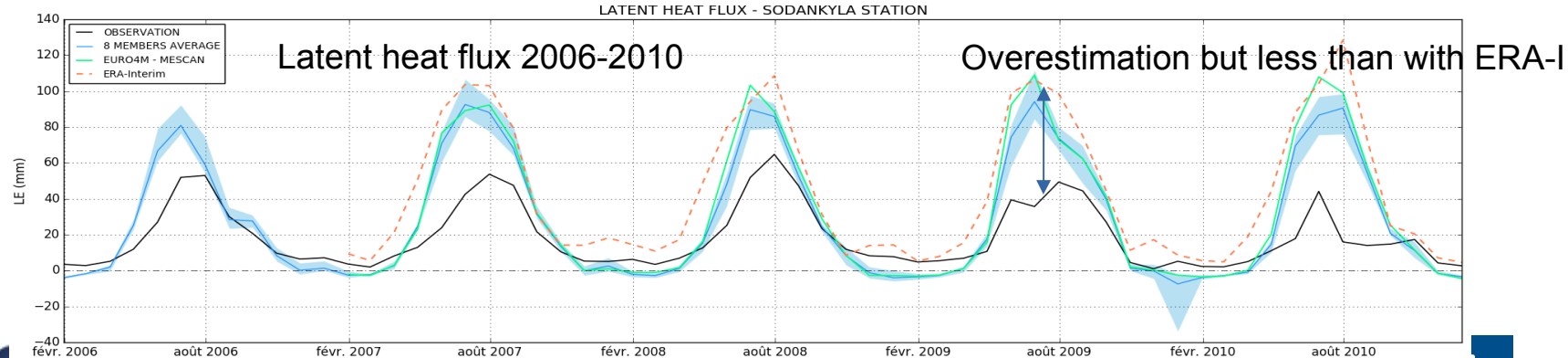
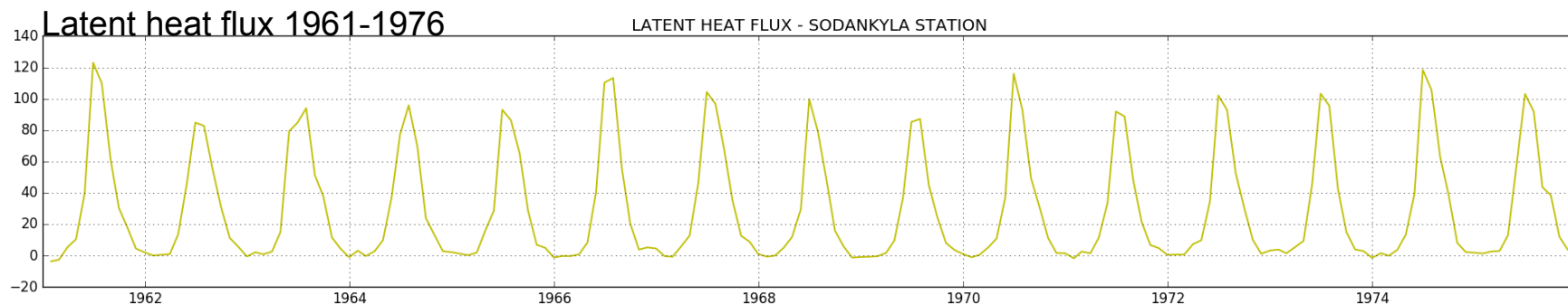
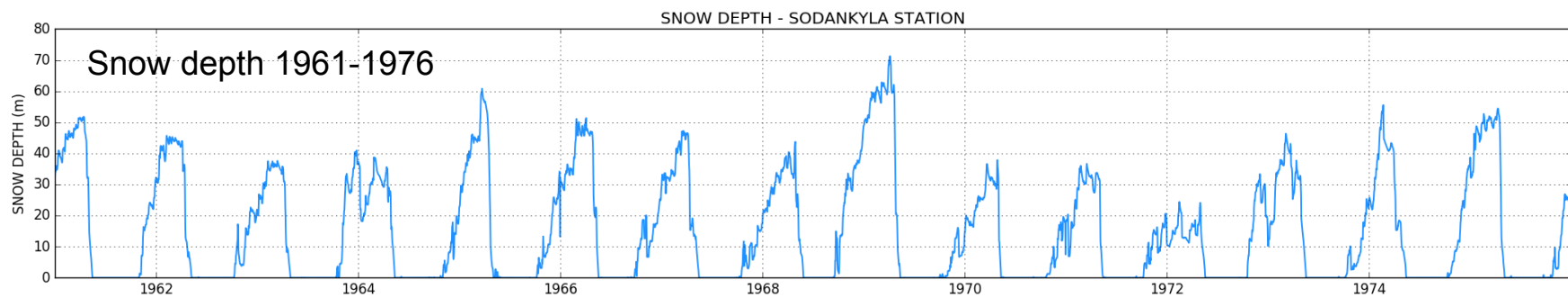


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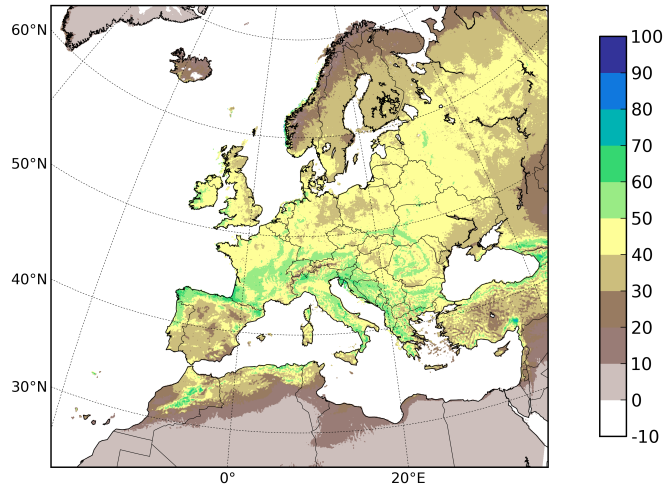


Preliminary results with SURFEX/TRIP at Sodankyla

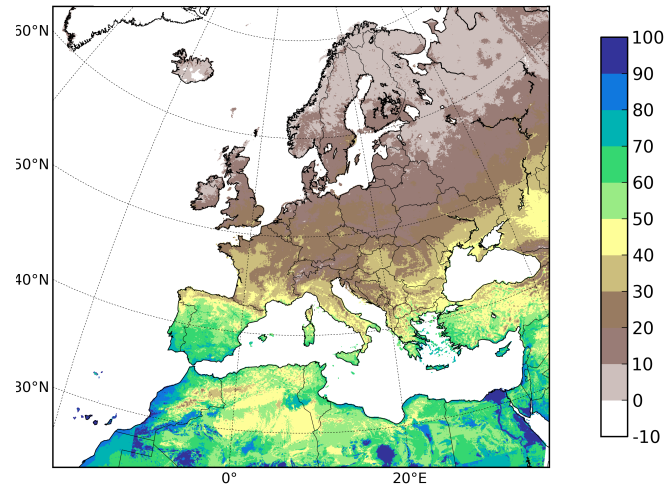


Some surface maps : 1962-2010

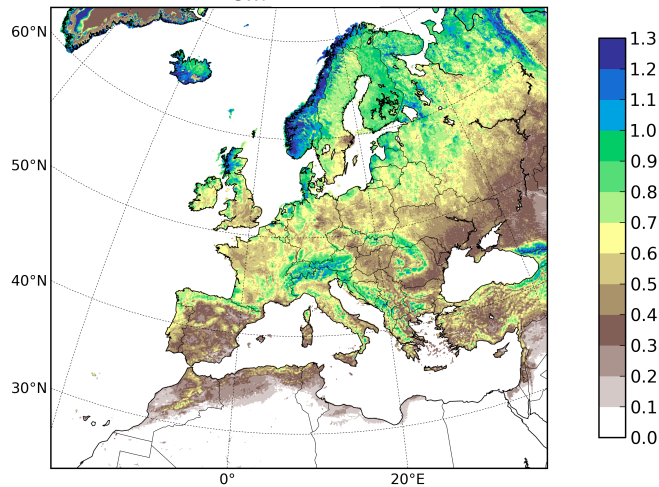
Latent heat W/m²



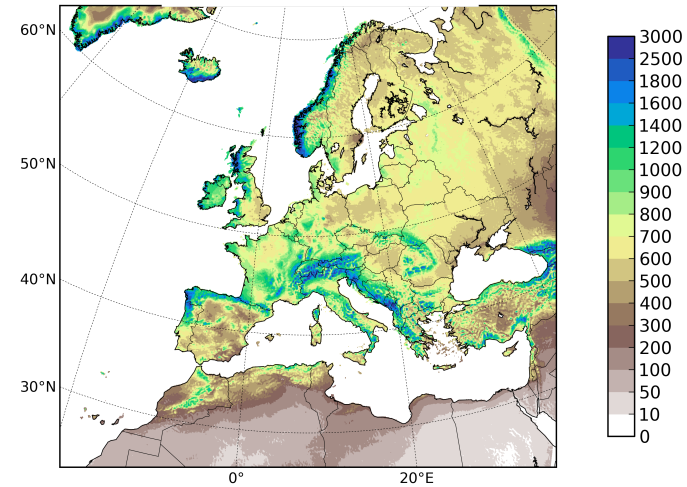
Sensible heat flux W/m²



SWI



Precipitation mm



More details in
P. LeMoigne talk

Uncertainties in ensembles of regional reanalyses

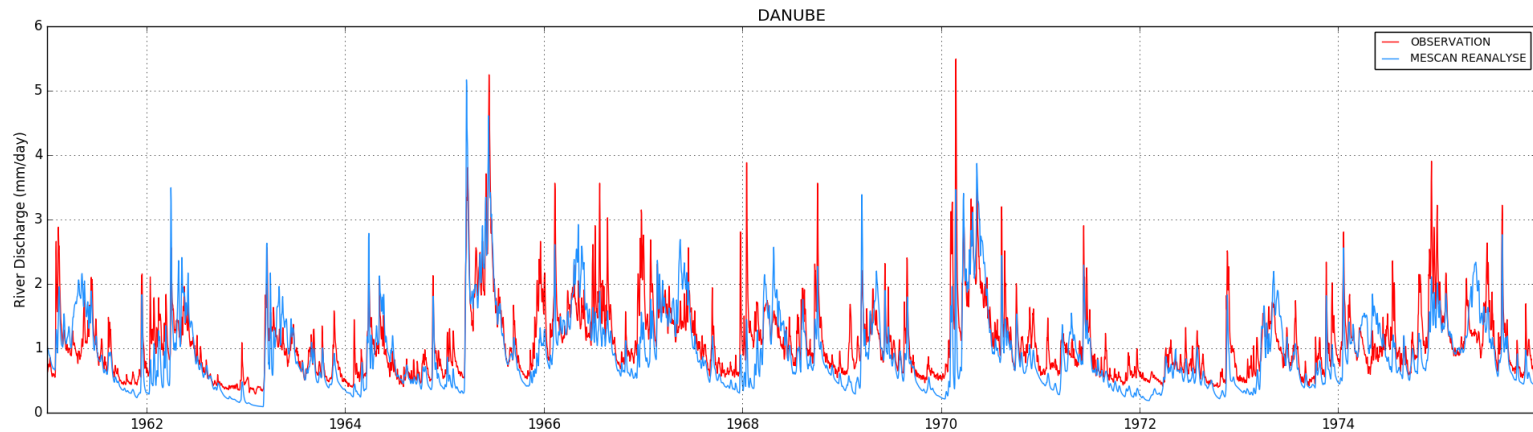
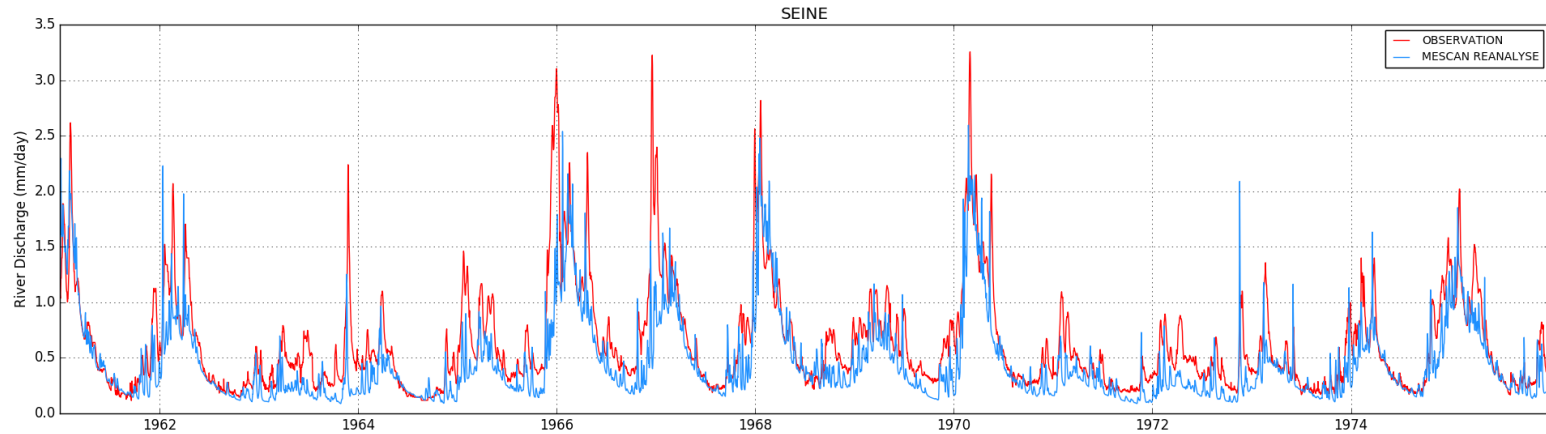
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Preliminary results with SURFEX/TRIP

River discharge

More details in
P. LeMoigne talk

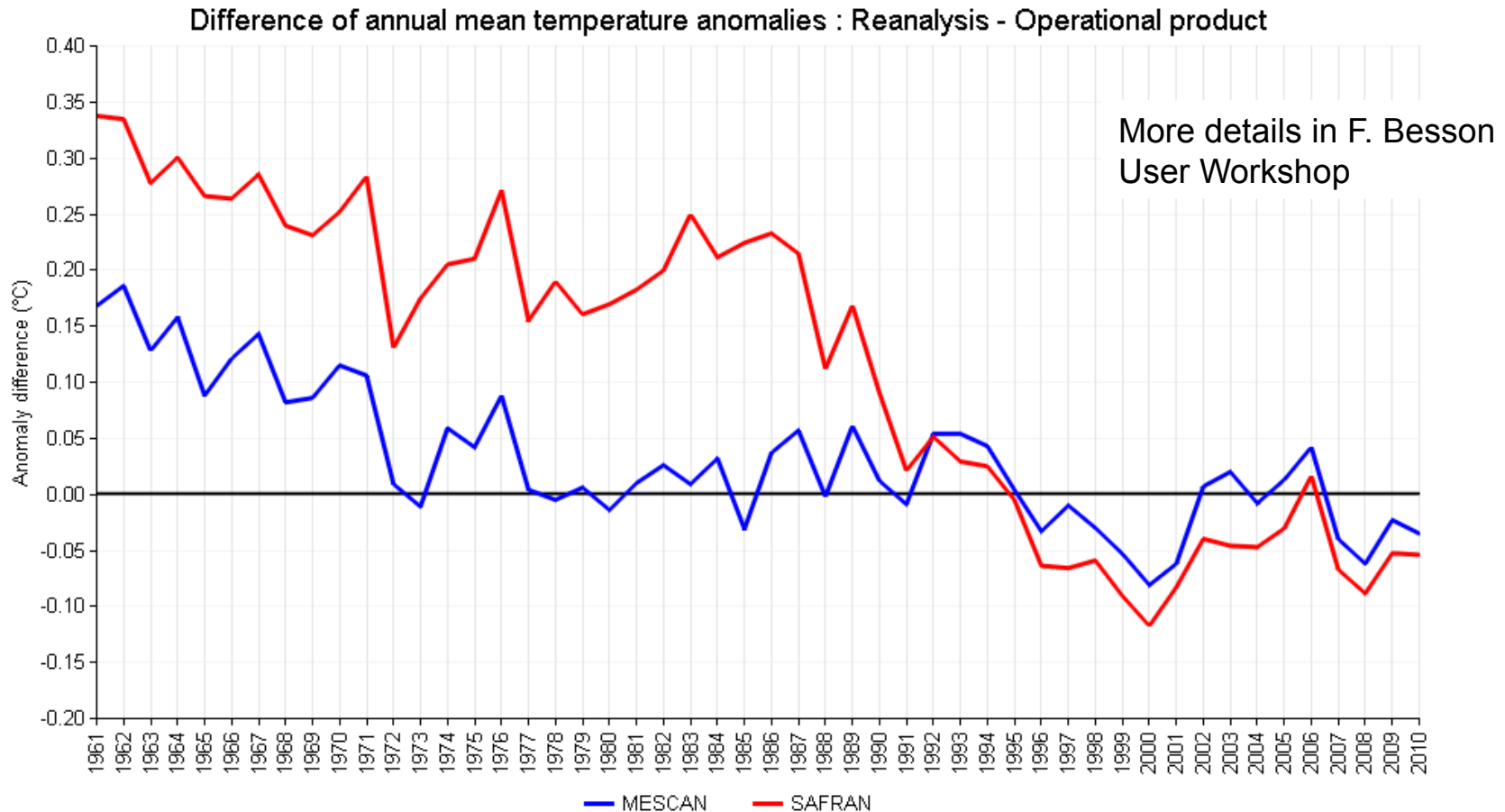


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Temperature anomalies over France



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Problems, lessons and near future ...

- Transform native SURFEX NetCdf files into GRIB2
- Define the new soil layers and variables in GRIB2 format from SURFEX → lot of exchange with ECMWF and SMHI. Validation of the tools took a lot of time
- Human resources: C. Sczsypta responsible for SURFEX-TRIP hands in resignation the 1st September 2017 in addition to an other event in our group in April.
- For SURFEX-TRIP not possible to run several streams in parallel due to the long-time spin-up of the deep soil moisture → complete final production delayed
- Correction of precipitation done manually → necessary to avoid “spurious spot » on snow cover ...



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Problems, lessons and near future ...

Status of the production and the MARS archive for MESCAN-SURFEX :

- MESCAN-SURFEX-ENS : 2006-2010 archived on MARS-oper. Special thanks to R. Mladek and S. Villaume for their help for fixing the problem of the scanning factor and for “moving” files from “test” to “prod”.
- MESCAN-SURFEX:
 - type=fc/stream=oper for MESCAN outputs: **1961-2015 archived**
 - type=an/stream=oper: **1961-2014 archived. Data for 2015 will be archived next week.**
 - type=fc/stream=oper for **SURFEX outputs: 1961-2005 archived.** The archiving is still in progress.

SURFEX : production with hourly output and 14 layers 1961-2009 done → should be finished 15th December

Deliverables D2.8 (MESCAN-SURFEX) and D4.8 (TRIP) : draft. Final report for the 22 December.



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Conclusions

- The preliminary results (long time series, maps, etc ..) are encouraging :
 - Statistics error are almost constant for all the period
 - The snow cover, snow depth and river discharge are reasonable → it is an indirect validation of the precipitation analysis
 - The surface fluxes, snow depth etc... are improved vs ERA-I/SURFEX due to the resolution and **the precipitation analysis**
 - Uncertainties computed on a short period are probably very useful however, the « users » should also use the observation statistics..
- Output surface variables @ 5.5km:
 - T2m, Rh2m, Ws10m, Wd10m every 6h and 24h precipitation
 - Every 1h: Ts, Snow depth, snow density, albedo, SWd, SWnet, LWd, LWnet, LE, SH, surface run-off
 - Every 1h for all the 14 soil layers: soil temperature, total soil moisture , liquid soil moisture (non frozen)

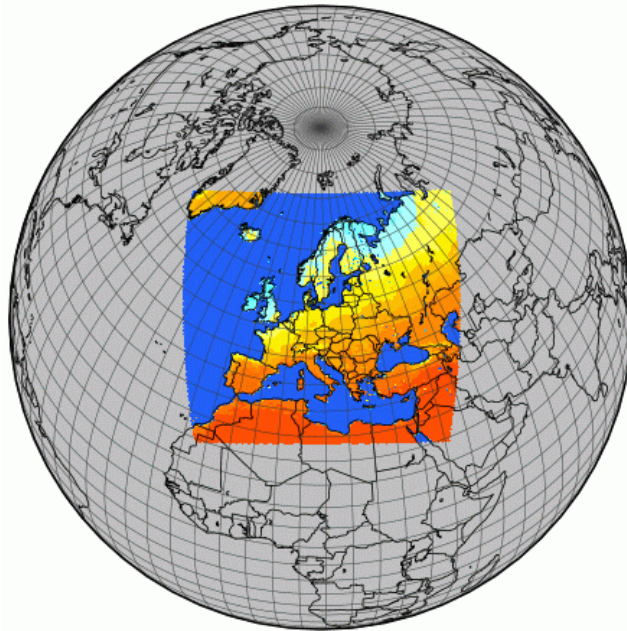


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Thank you for your attention! Questions ?



Acknowledgements

The research leading to these results has received funding from the European Union, Seventh Framework Programme (FP7-SPACE-2013-1) under grant agreement n° 607193.



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