Downscaling of the ECMWF EPS runs

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Outlines

- Experience from ALADIN/ARPEGE/IFS MAP Re-Analysis
- To use downscaled EPS, what for?
- Conversion GRIB to FA format
- Soil problem
- Preliminary results
- Sensitivity to clustering methods for the ECMWF EPS
- Clustering based on different parameters ECMWF
- Results for ALADIN downscaled EPS
- Conclusions

Experience from MAP Re-Analysis (I)

History (Why?)

- **No plans to run ARPEGE 4D-Var Re-Analysis**
- **Discussion: EWGLAM in Lisbon 2003, 13th Ala WS,**
- **First results presented on 14th ALADIN WS,**

Benefits for ALADIN community:

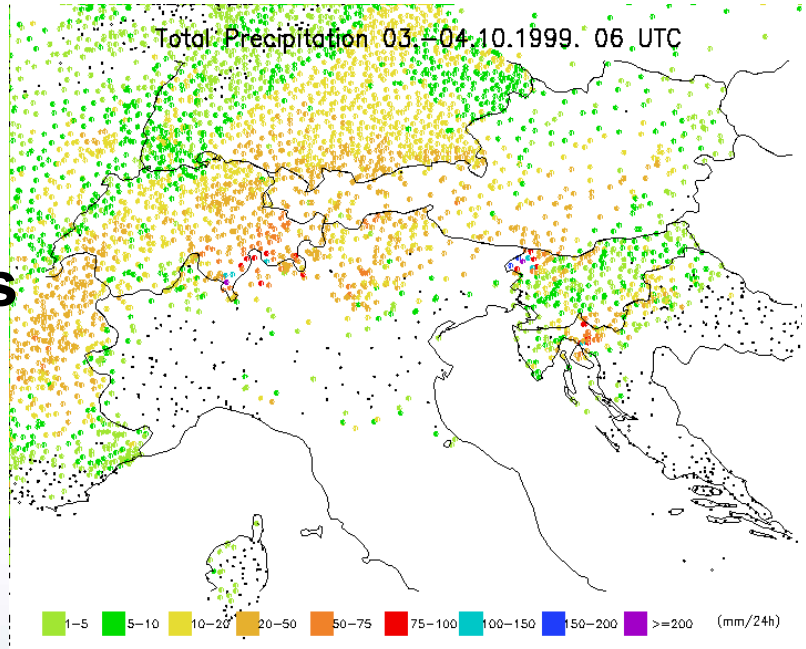
- **better initial and LBC files as background for ALADIN 3D-Var, test bed for high resolution ALADIN configurations, high resolution verification of well described MAP cases and inter-comparison of models.**

More about Ald/Arp/Ifs Downscaled Re-Analysis and other activities in RC LACE group on RC LACE Web pages

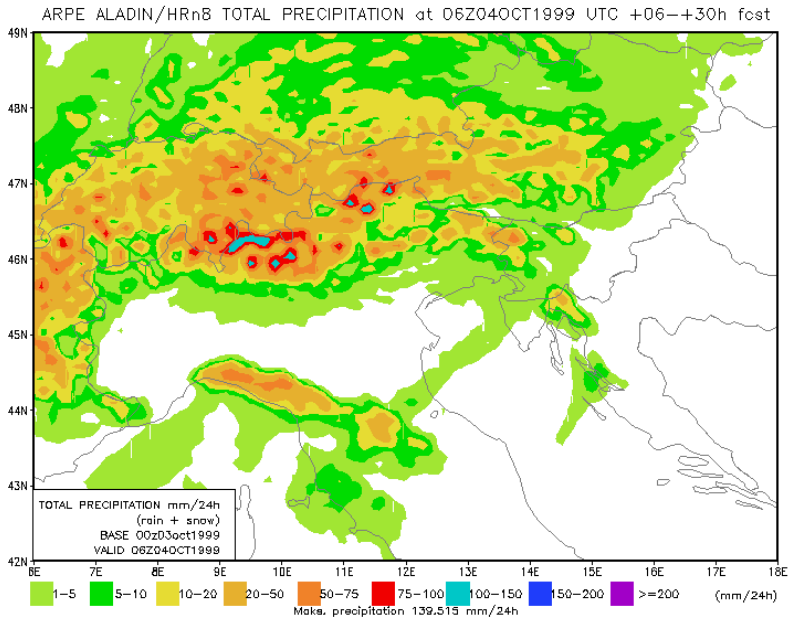
http://radar.dhz.hr/~rclace

Experience from MAP Re-Analysis (II)

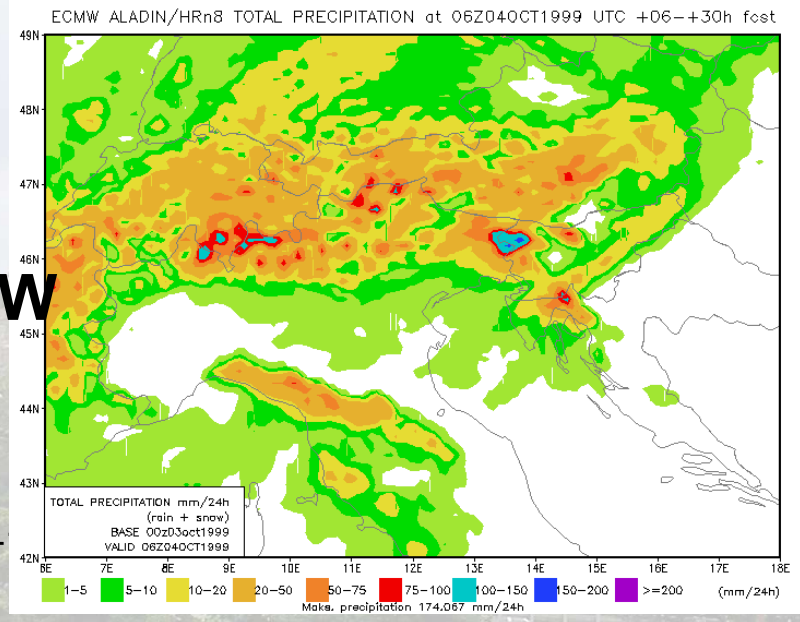
meas



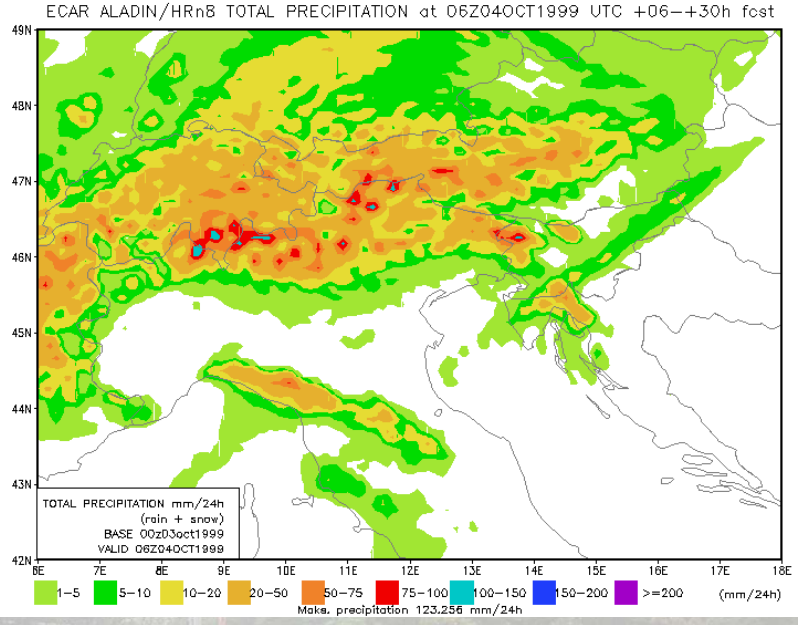
ARPE



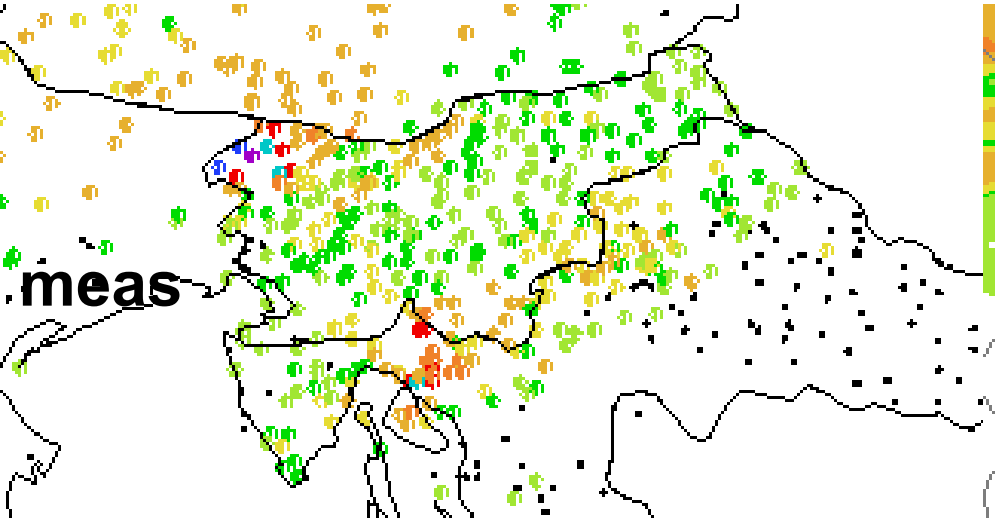
ECMW

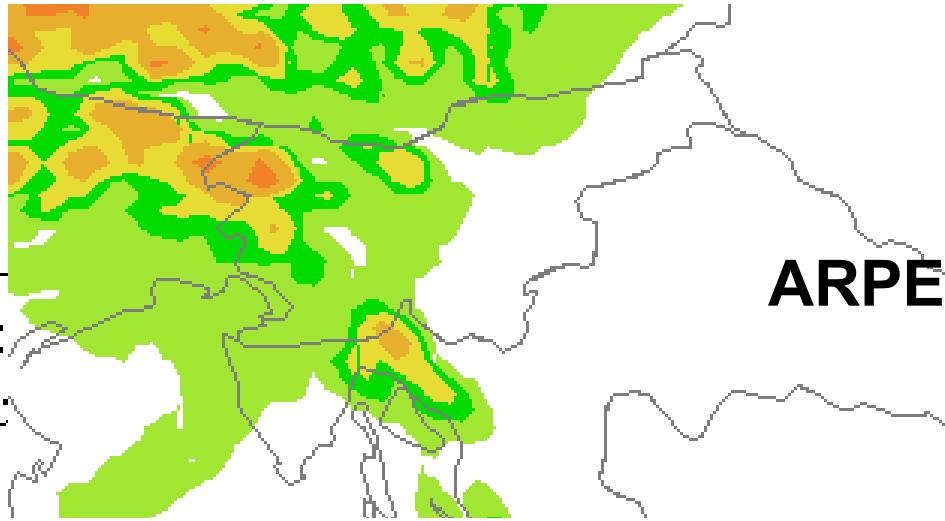


ECAR

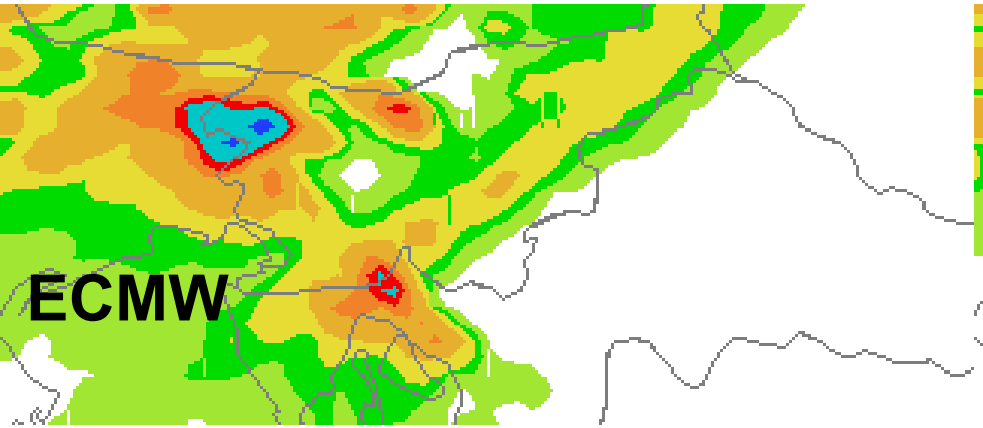


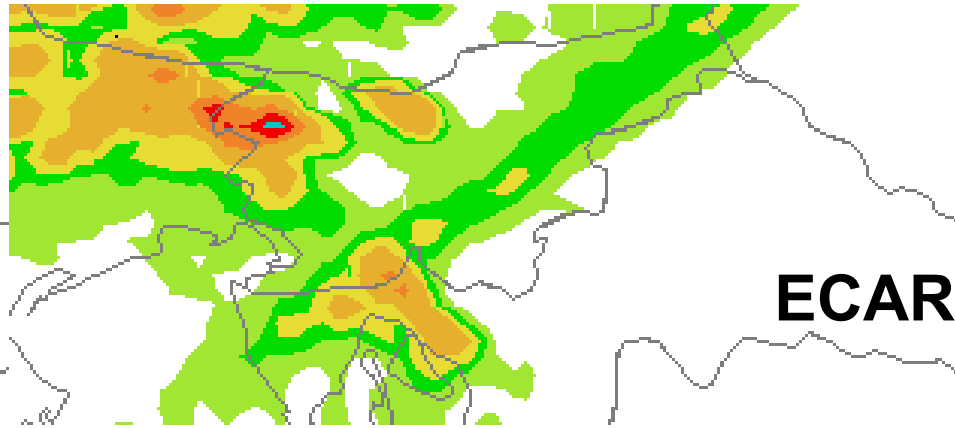
Experience from MAP Re-Analysis (III)





Forecasted precipitation amounts in ECMW and ECAR experiments are better for the area of western Slovenia and Slovenia/Croatia border.





Coupling files and blending initial files for MAP RA done during RC LACE stay in Prague are on delage: ~mrpm620/MAP_e9mi/YYYY/MM/DD/TE COUPLECAR+00xx & ICMSHECARINIT

To use downscaled EPS, what for?

Characteristics of the ECMWF EPS:

- **T255 ~ 80 km horizontal resolution on 40 levels in the vertical**
- **Representation of the orography spatially not satisfactory for Croatian seaside,**
- **ECMWF EPS target range days +5 - +7.**

Which forecast period is not covered with (GM) LAM?

- **PEACE for day 0 to day 3,**
- **ECMWF EPS for range 5 to 7 days (10-14),**
- **days +3 (4) – +5 (will not be covered with PEACE),**
- **Why not to try to downscale ECMWF EPS?**

Conversion GRIB to FA format

Conversion of EPS forecasts on model levels and surface GRIB files to ARPEGE/ALADIN format (ARPEGE configuration 901):

- **Upper air field (temperature, specific humidity (GP), divergence , vorticity, geopotential);**
- **Surface fields (soil temperature, soil moisture, snow depth, land-sea mask, orography);**
- **All other surface fields are copied from ARPEGE climatology file!**
- **Just one subroutine for conversion GRIB →FA file format >> cprep1.F90**

Soil problems (I)

Different Soil Parameterisation:

- ECMWF (IFS):

- **4 layers with constant depth**
  (0-7, 7-28, 28-100 & 100-289 cm)
- **Parameters: soil temperature, soil moisture**

- ALADIN/ARPEGE:

- **2 layers (1st layer 1 cm deep)**
- **2nd layer depth depends on soil type!**
- **Almost the same parameters.**
- **How to combine different Soil parameters with different depth (cprep1.F90)?**

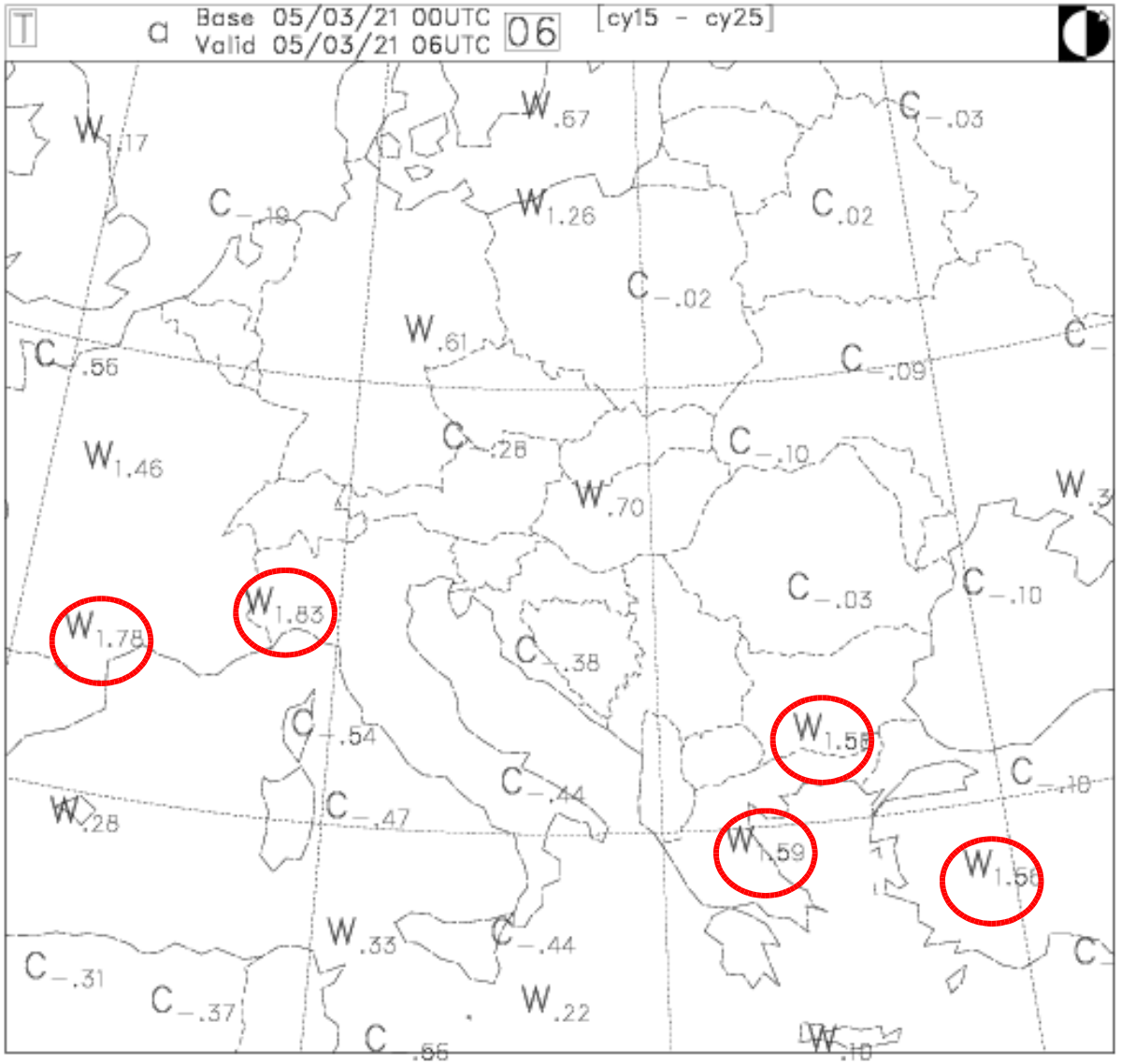
This spring - RC LACE financed 1 visit to Budapest to make common strategy for EPS downscaling.

Soil problems (II)

- **Comparison of FR & HU versions (AL25 & AL15) !**
- **What to do with Frozen Soil moisture?**

  Should we care about liquid and frozen soil moisture or not?

- **Difference after 6 hrs forecast more than 1.5 °C!**

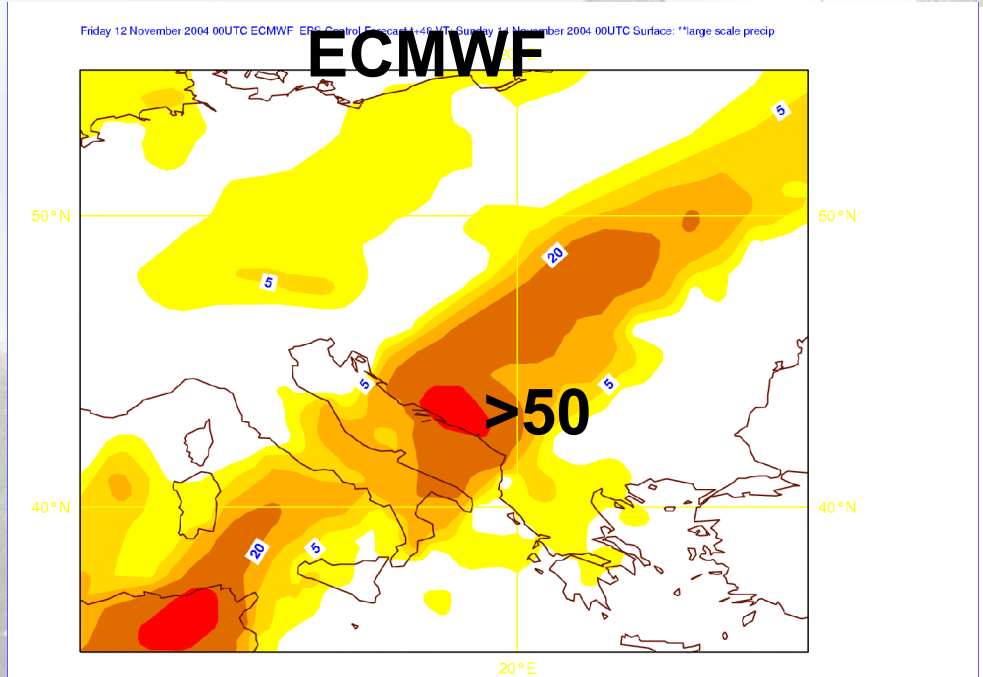


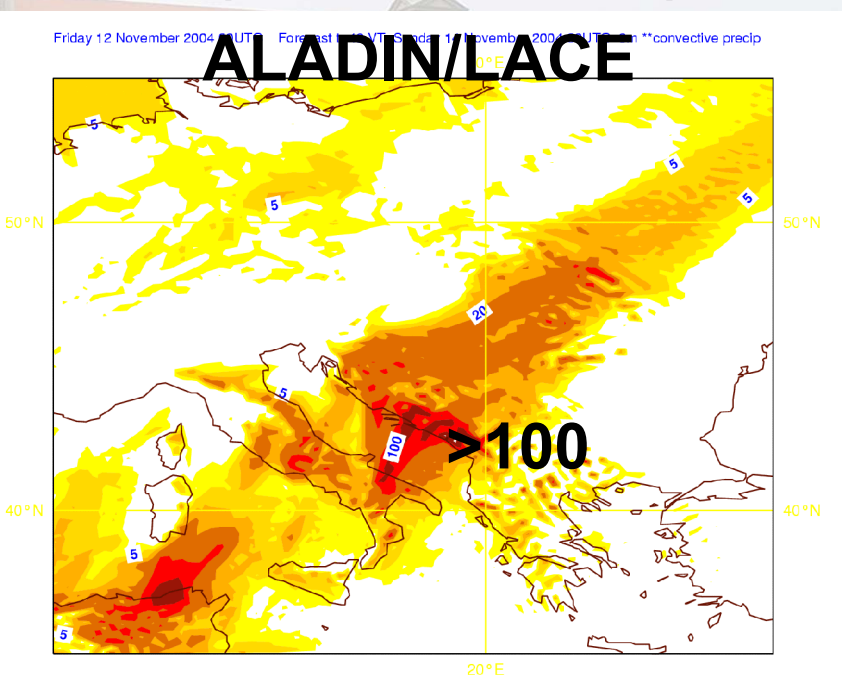
Preliminary results (I)

- **Case Study 14/15 November 2004 – Extreme weather situation – extreme *Bura* on Adriatic coast when 2 sailors died, more than 50 persons were injured and many buildings got damaged.**
- **ECMWF provide LBC data not just for this Case.**

Example Downscaled 1 rand. chosen EPS member

24 hrs accumulated precipitation (13-14. 11.2004)



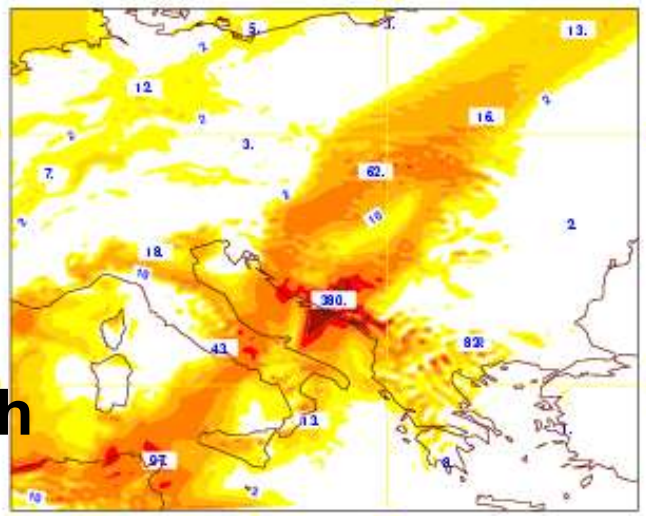


Preliminary results (II)

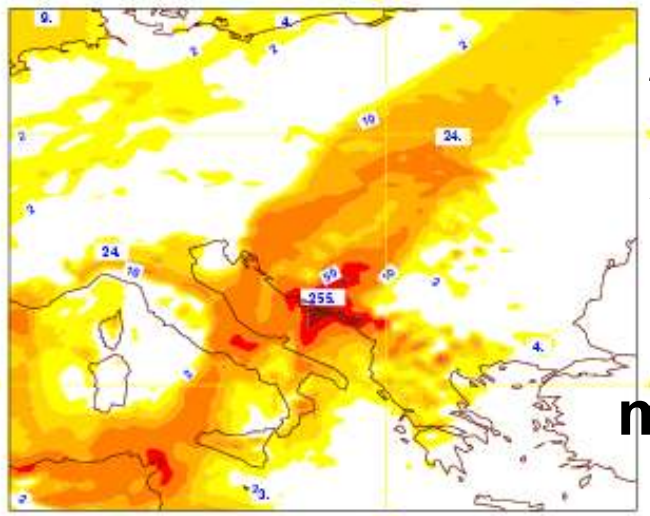
- **Sensitivity of the 24 hrs precipitation to model resolution**

13-14

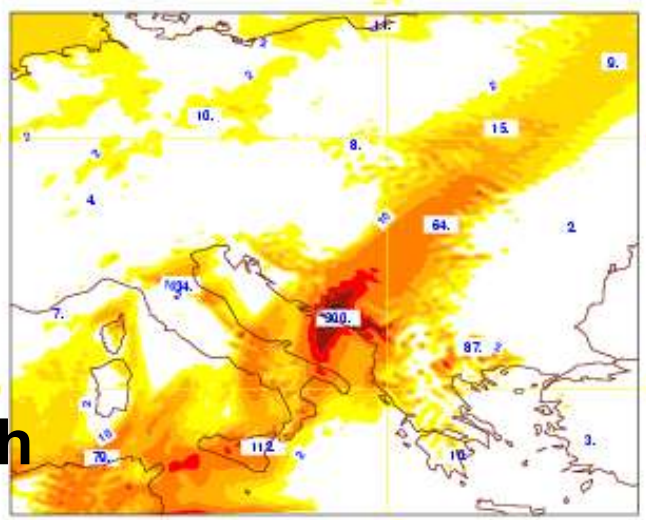
12 km ARPE 380 mm/24h



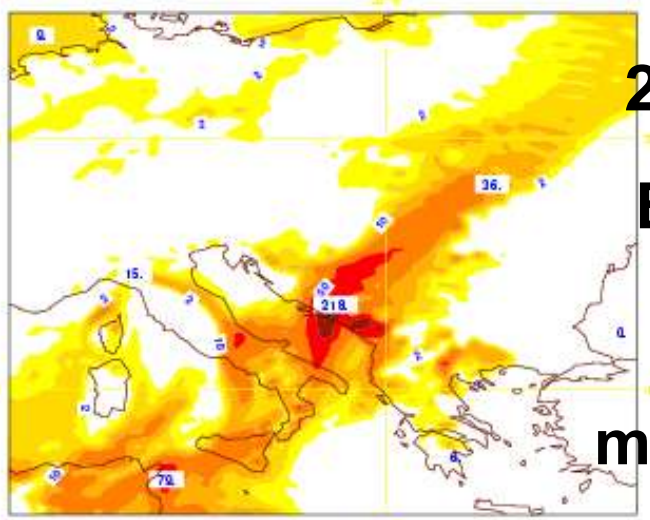
20 km ARPE 255 mm/24h



12 km EC19 300 mm/24h



20 km EC19 218 mm/24h

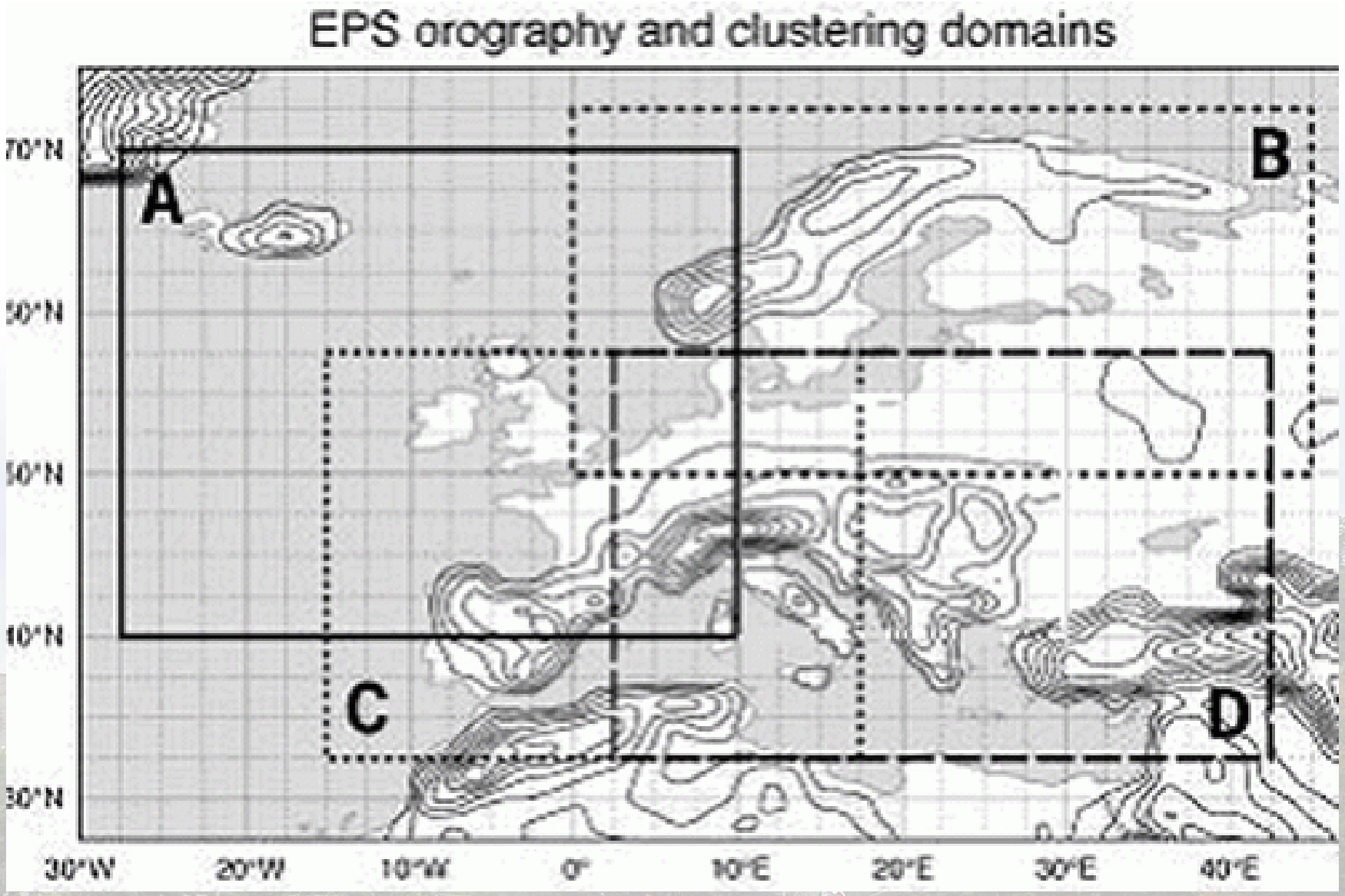


Sensitivity to clustering methods for the ECMWF EPS

Problem in Croatian Met. Service:

- **Operational cluster domain for whole Europe,**

Sensitivity to clustering methods for the ECMWF EPS



Sensitivity to clustering methods for the ECMWF EPS

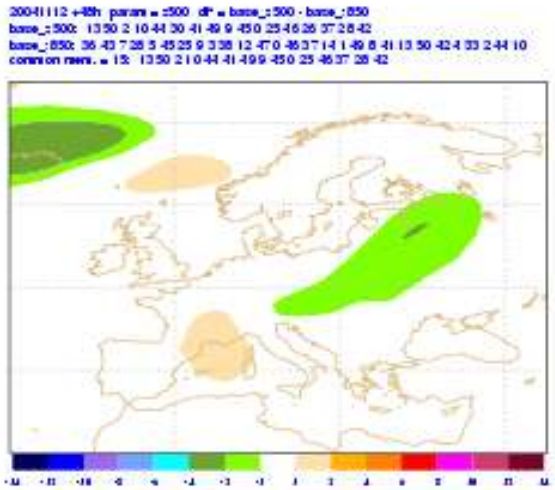
Problem in Croatian Met. Service:

- **Operational cluster domain for whole Europe,**
- **A,B,C,D domains are not suitable for CE,**
- **In operational usage lot of the cases there is just one Cluster. Why than to use EPS?**

How to improve EPS?

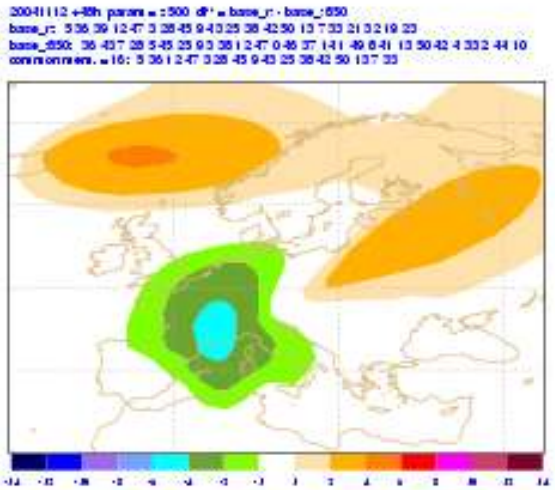
- **Sensitivity experiments:**
  - **clustering domain,**
  - **clustering parameter(s) (oper. parameter z500),**
  - **tested cl. param. z500, t850, ω500 & RT500/1000.**

Clustering based on different parameters ECMWF (cl. means of most populated cluster)



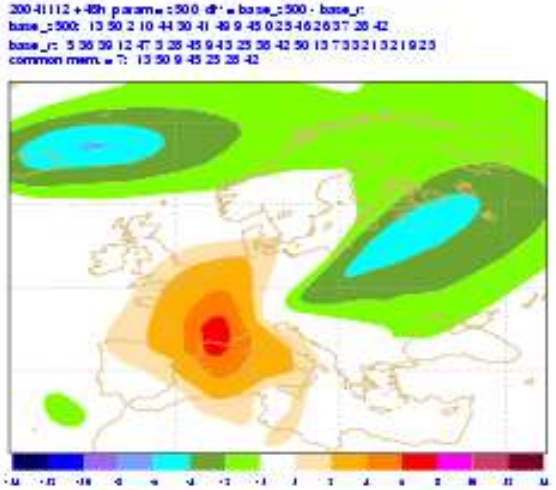
z500-t850

z500 & ana



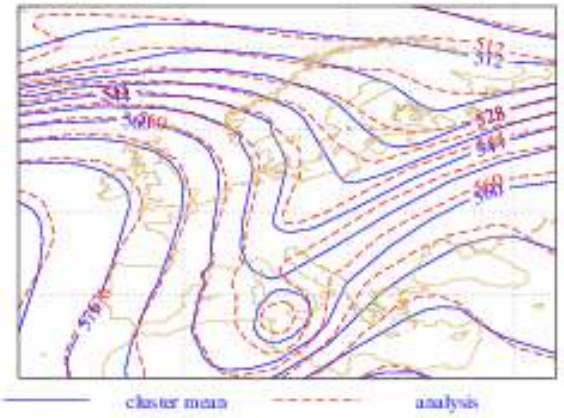
RT500/1000-t850

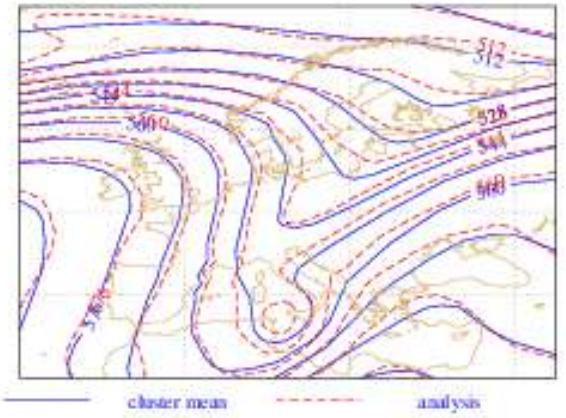
t850 & ana

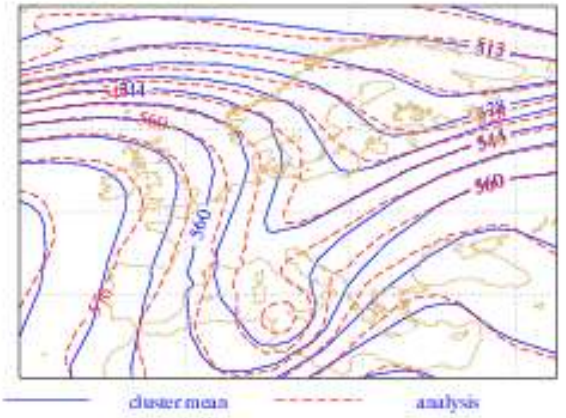


z500-RT500/1000

RT500/1000 & ana



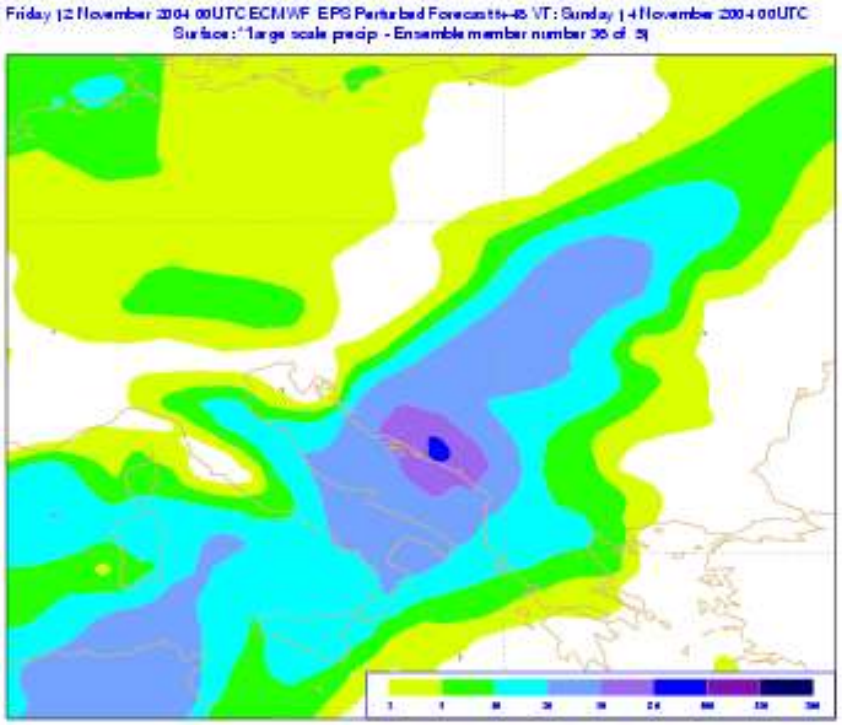


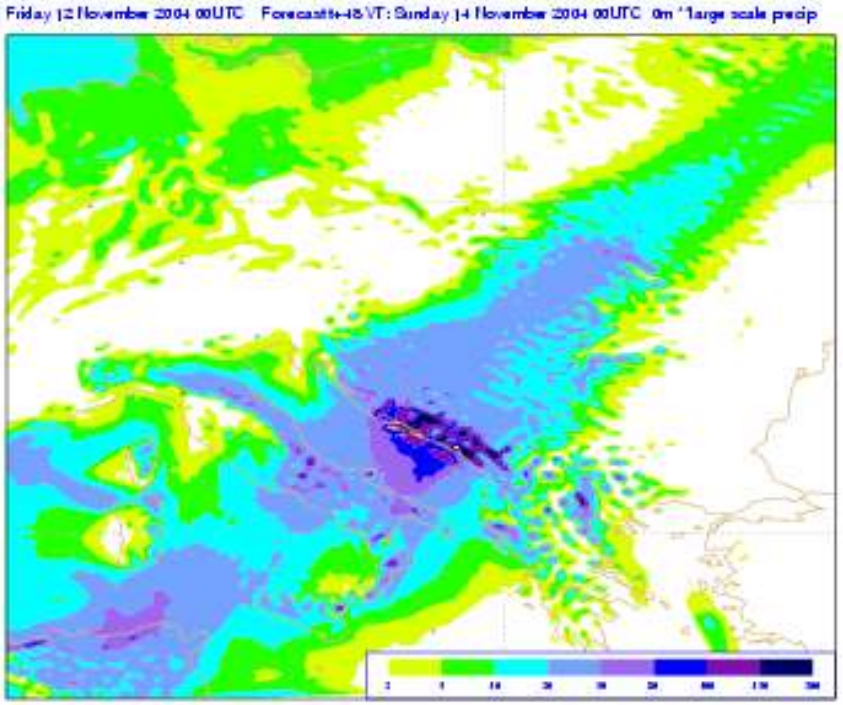


Results for ALADIN downscaled EPS

Example, Case Study 13/14.11.2004 :

- **48 hrs precipitation for common ensemble members from most populated clusters for clustering based on t850 and RT500/1000 (16 members)**





Conclusion

- **Ble & Ald/Arp/IFS MAP Re-Analysis good exercise for usage of ECMWF initial and coupling files,**
- **Precipitation maximums are to high when ECMWF surface fields are used, ARPEGE Re/Ana is needed?**
- **Soil moisture play an important role in T2m forecast,**
- **Different clustering methods give better results for ECMWF EPS,**
- **ALADIN produces forecast similar as ECMWF, with more details,**
- **More Case Studies and a lot of work connected with Clustering is needed (reduced No. for downscaling).**

Thanks for your attention!