Data assimilation activities at RC LACE

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DHMZ
With contribution from all peple working on DA at RC LACE countries.

Data assimilation activites at RC LACE

Overview

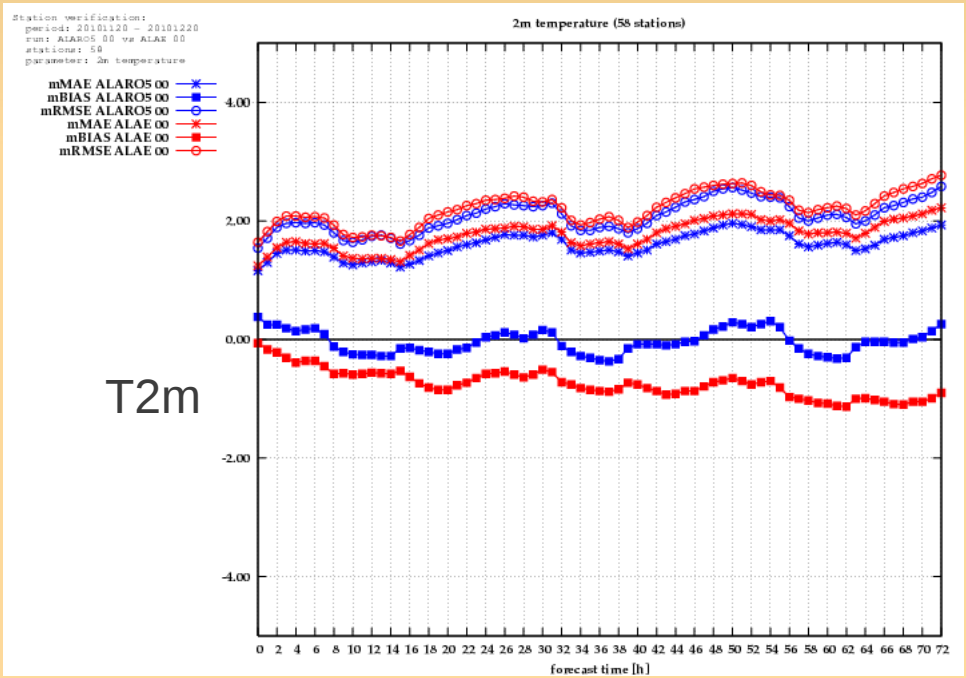
- Evaluation, testing and setting up of DA systems at RC LACE countries.
  - Web page: http://www.rclace.eu/?page=11
    - 18-21 June 2012, Prague, Data Assimilation Working Days
- Background error sempling.
- New data implementation and testing.
- Future plans.

Data assimilation activites at RC LACE

Evaluation, testing and setting up of DA systems at RC LACE countries.

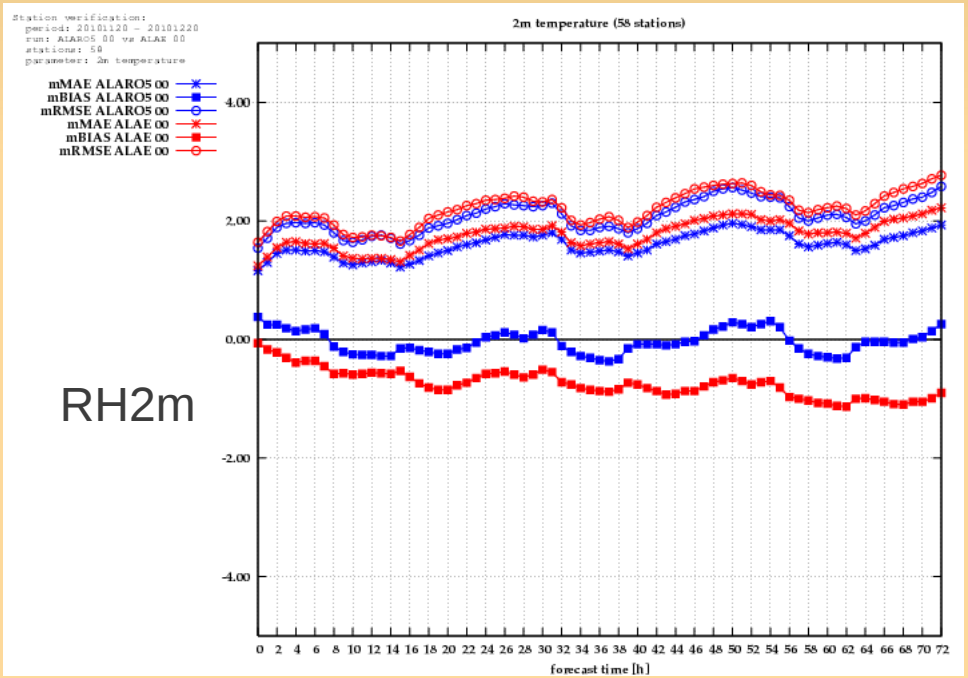
- Comparison of T2m and RH2m (AU)

Alaro 4.5 km + CANARI



T2m

ALADIN Europe without CANARI



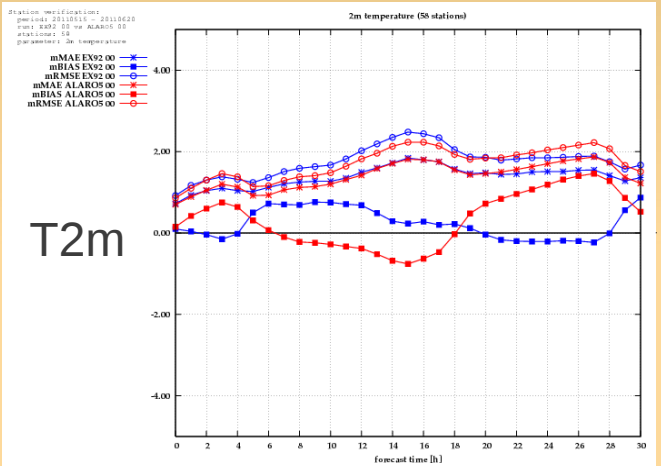
RH2m

Data assimilation activites at RC LACE

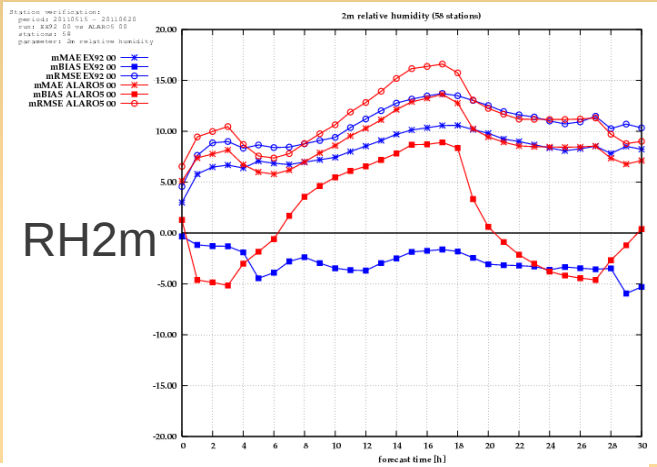
Evaluation, testing and setting up of DA systems at RC LACE countries.

- ALARO (4.6 km) vs AROME (2.5 km), over Austrian stations

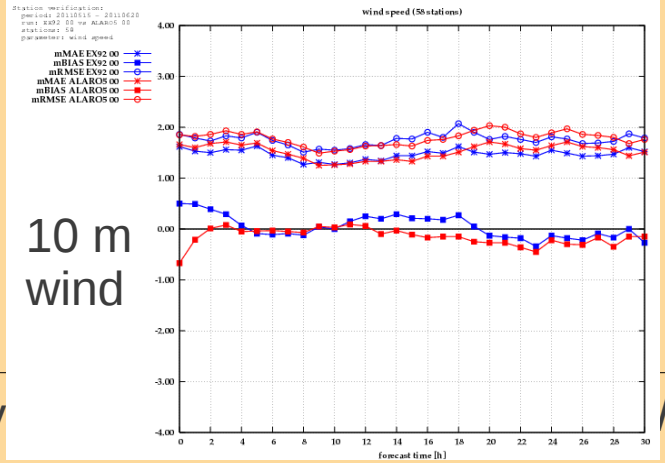
T2m



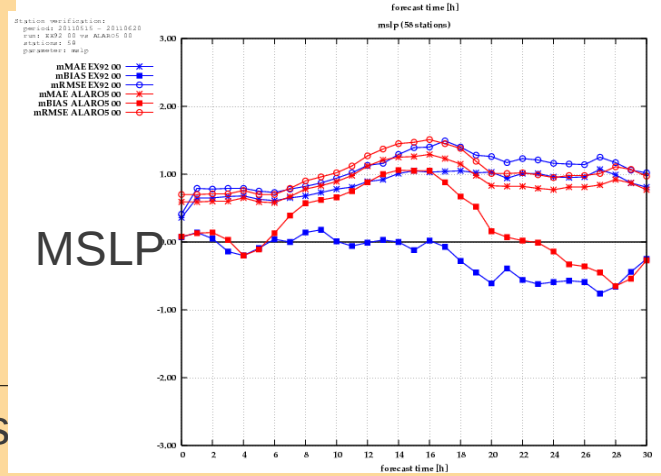
RH2m



10 m wind



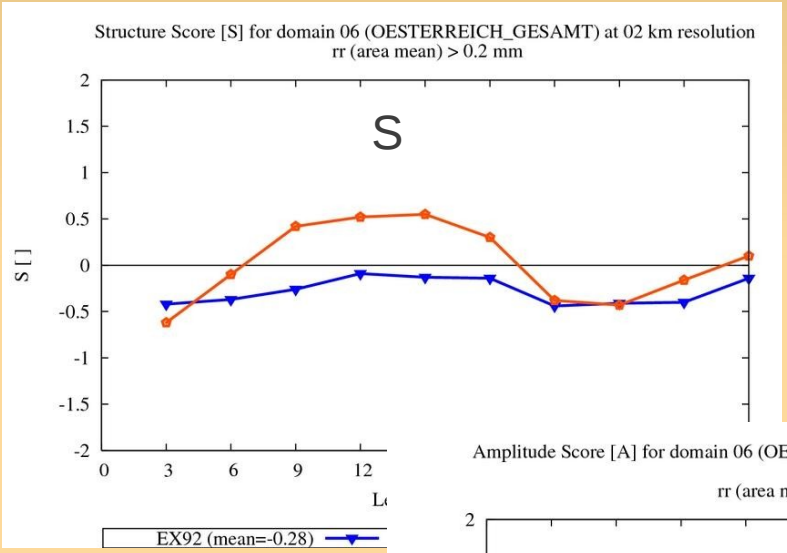
MSLP

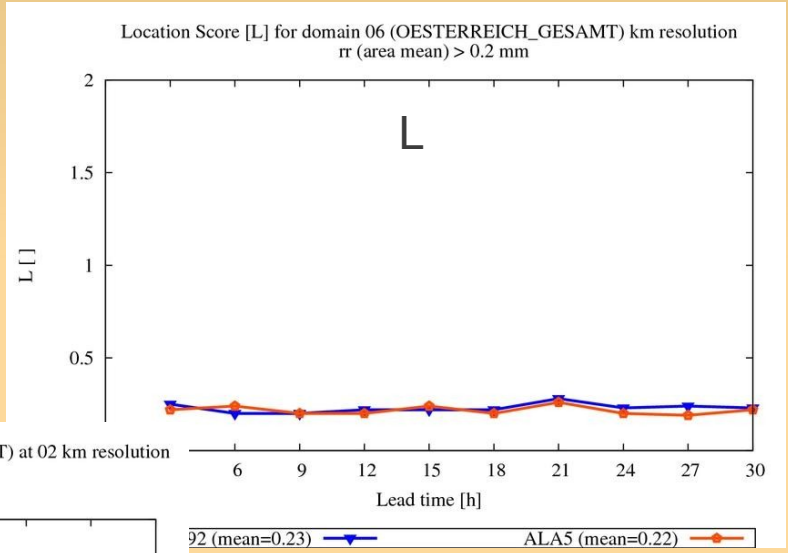


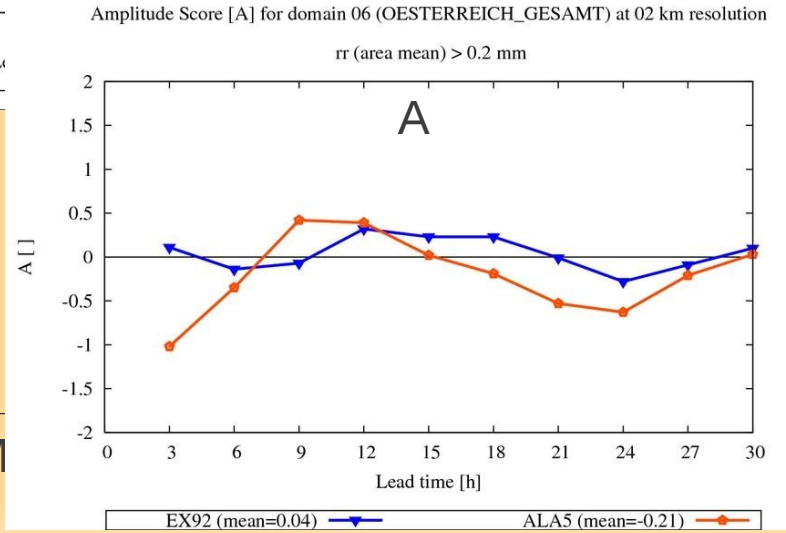
Data assimilation activites at RC LACE

Evaluation, testing and setting up of DA systems at RC LACE countries.

- Precipitation – SAL: threshold=0.2mm, domain=Austria







AROME

ALARO

Perfect score:
S=0
A=0
L=0

Data assimilation activites at RC LACE

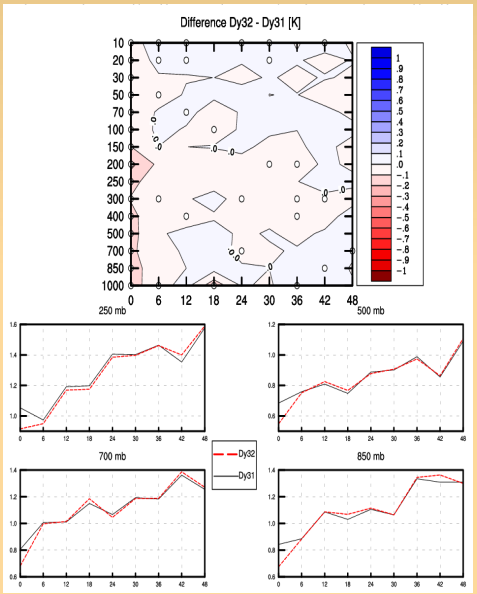
Evaluation, testing and setting up of DA systems at RC LACE countries.

- Experiments with blending and 3DVAR (CZ)
- Operational: upper air blending, surface CANARI (OI)
- ALADIN 4.7 km, 87 levels
- Methods:
  - Blending: digital filter spectral blending of the upper air fields of ARPEGE analysis and ALADIN first guess.
  - BlendVar: blending+3DVAR
  - VARblend: 3DVAR+blending
- Observations: SYNOP and TEMP
- 2 week period: 1-14 June 2011

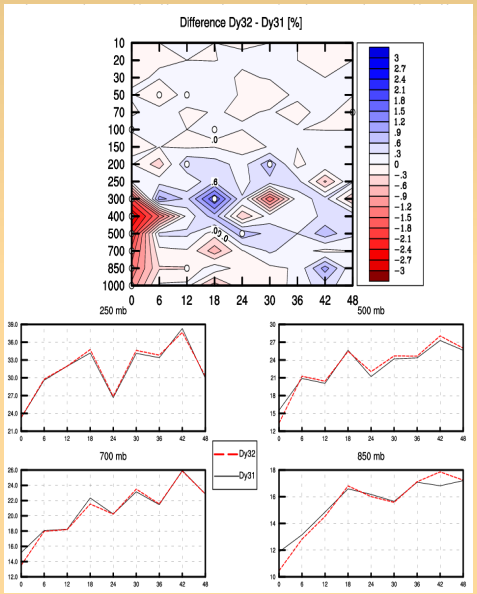
Data assimilation activites at RC LACE

Experiments with blending and 3DVAR (CZ)

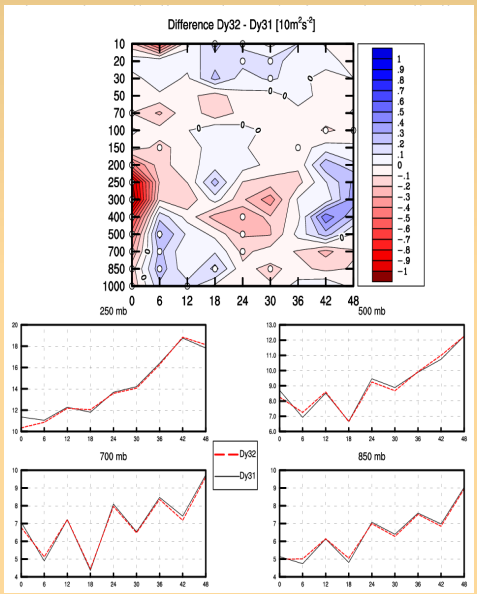
- Results: BlendVAR vs blending (RMSE)



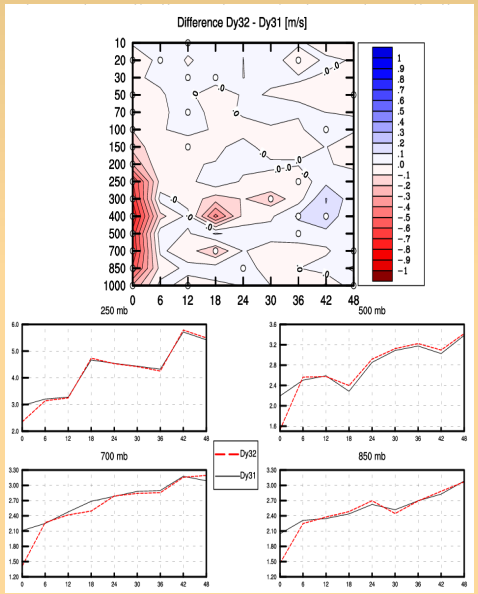
T [K]



RH [%]



H [10 m^2s^{-2}]

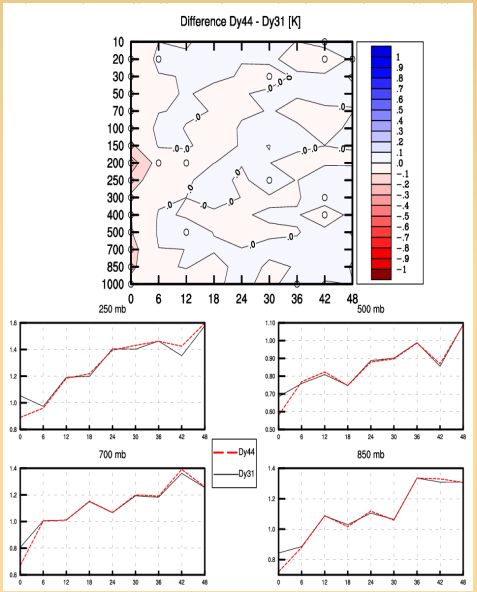


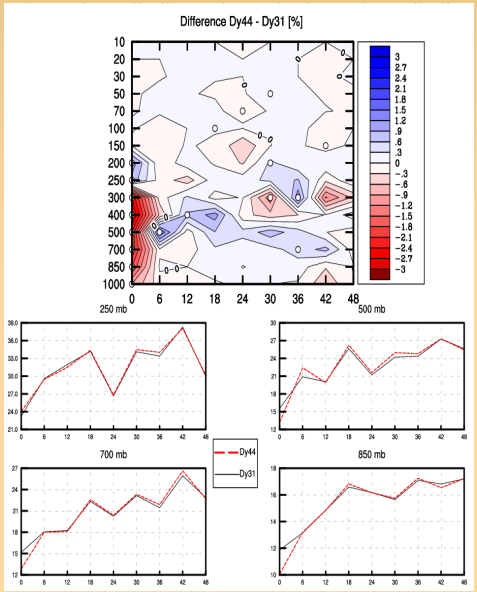
W [ms^{-1}]

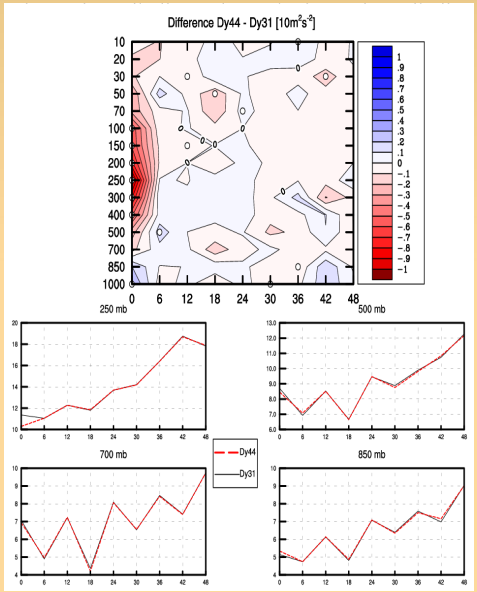
Data assimilation activites at RC LACE

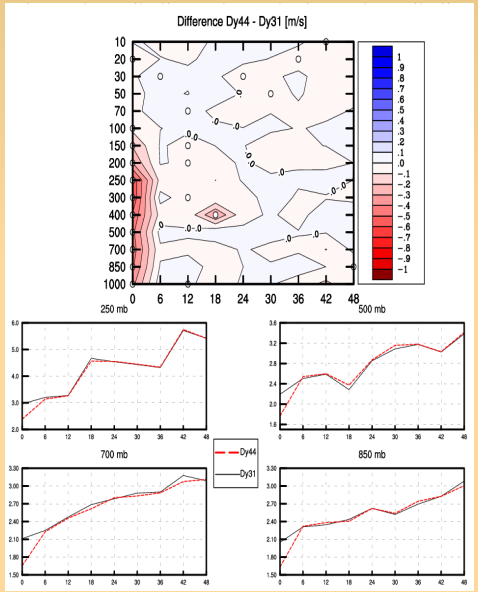
Experiments with blending and 3DVAR (CZ)

- Results: VARblend vs blending (RMSE)







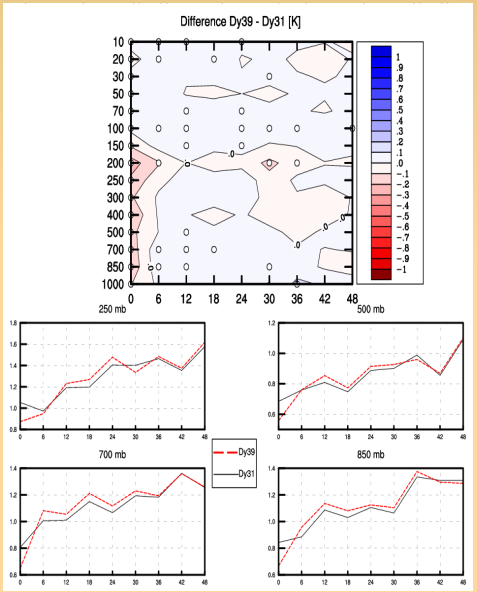


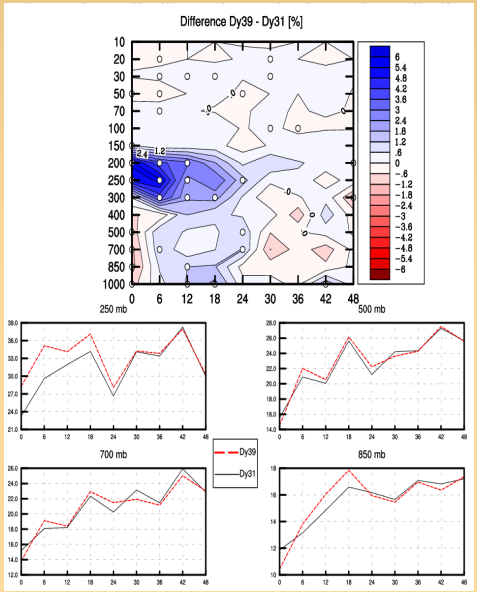
T [K] **RH [%]** **H [10 m^2s^{-2}]** **W [ms^{-1}]**

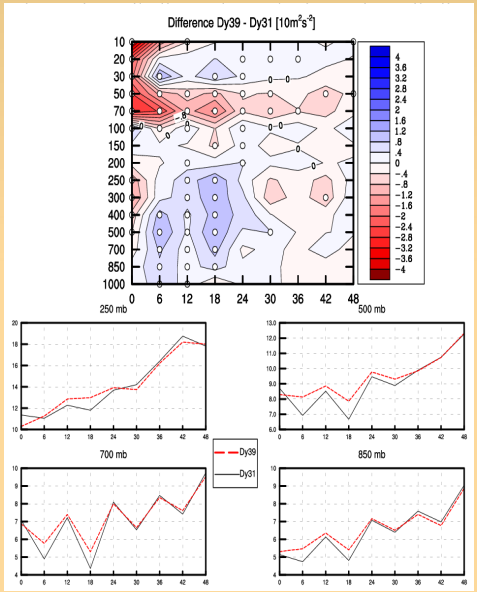
Data assimilation activites at RC LACE

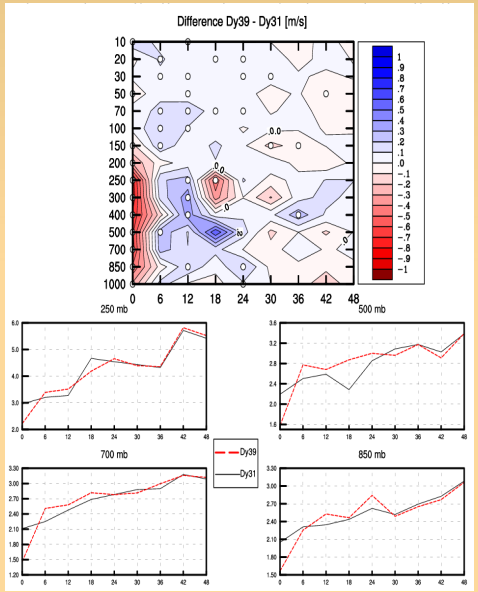
Experiments with blending and 3DVAR (CZ)

- Results: 3DVAR vs blending (RMSE):







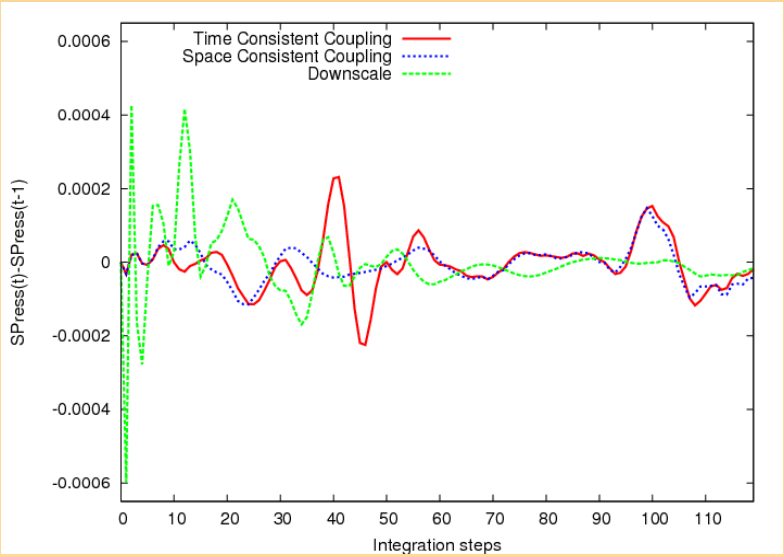


T [K] **RH [%]** **H [10 m^2s^{-2}]** **W [ms^{-1}]**

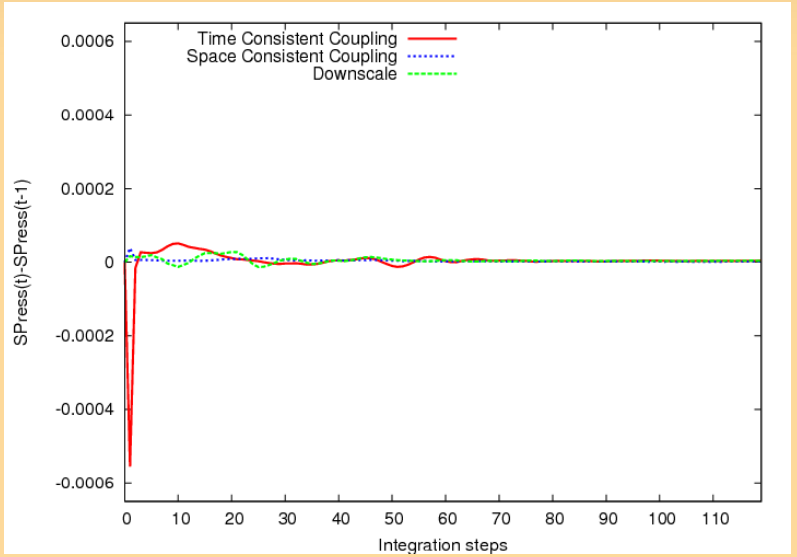
Data assimilation activites at RC LACE

Evaluation, testing and setting up of DA systems at RC LACE countries.

- Spin-up in the short time weather forecast: useful for 3h RUC. (HU)
  - 3DVAR reduses noise compared to dynamical adaptation
  - With 3DVAR space consistant coupling is better than time consistant coupling



Mountain point.

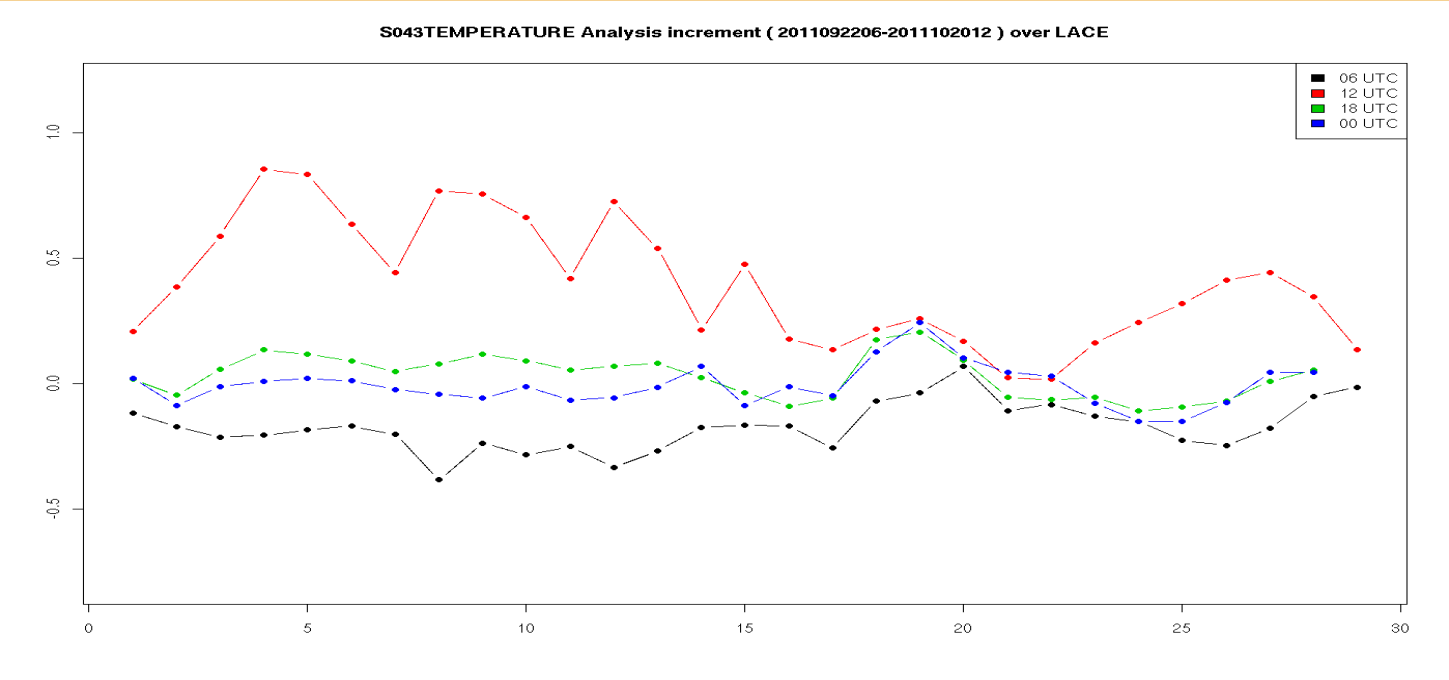


Point near domain border.

Data assimilation activites at RC LACE

Evaluation, testing and setting up of DA systems at RC LACE countries.

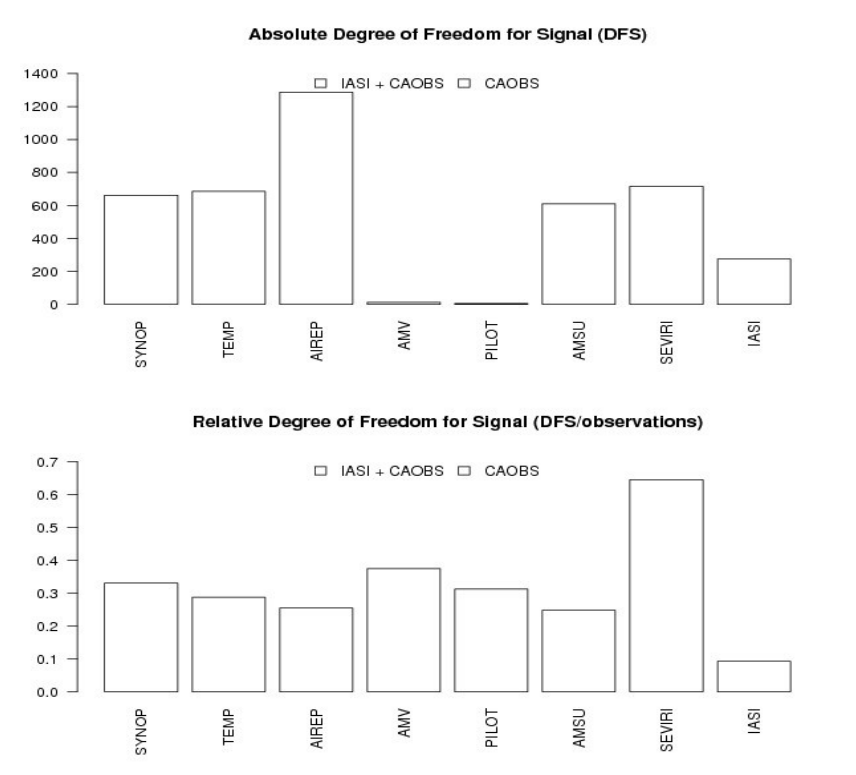
- Diagnosis by mean analysis increments (SL)
- Model: ALARO, 4.4 km, 43 levels, 3DVAR + CANARI

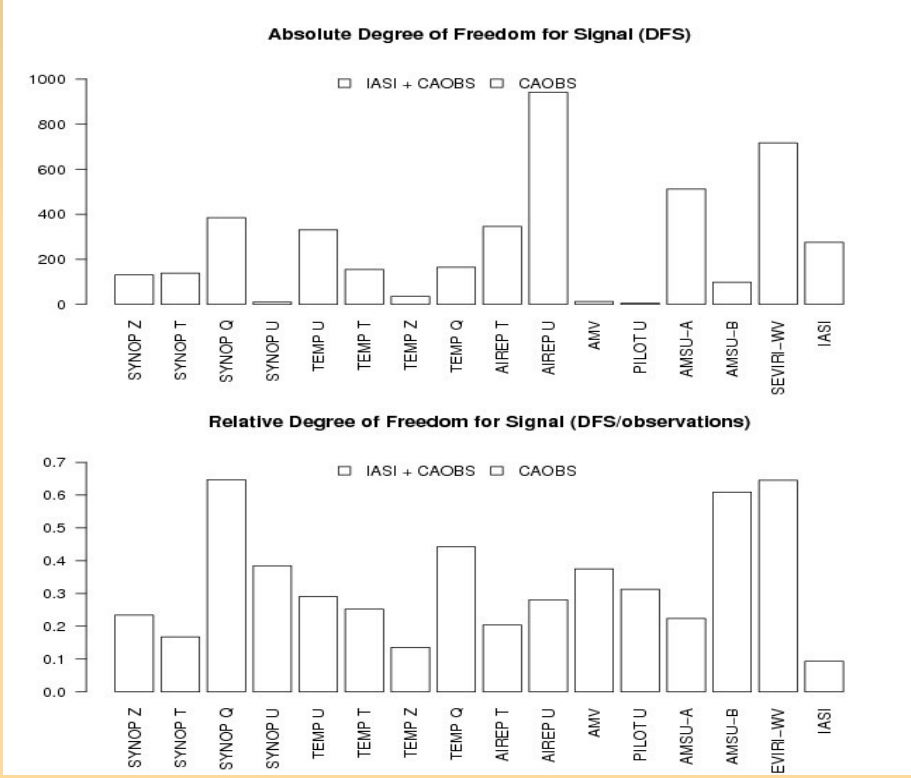


Data assimilation activites at RC LACE

Evaluation, testing and setting up of DA systems at RC LACE countries.

- Data impact using DFS. (SL)

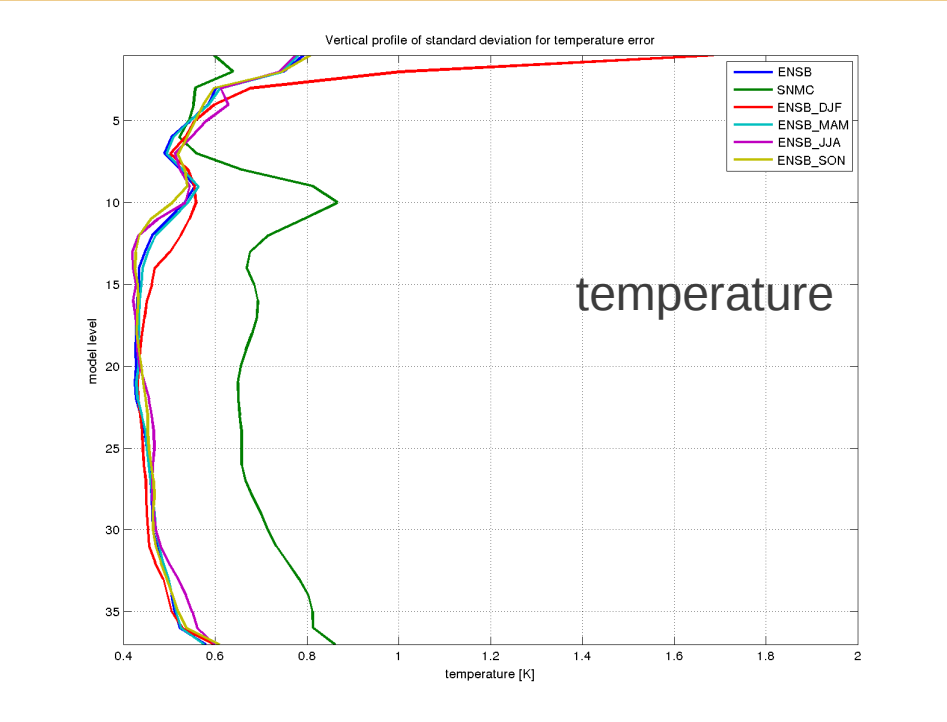


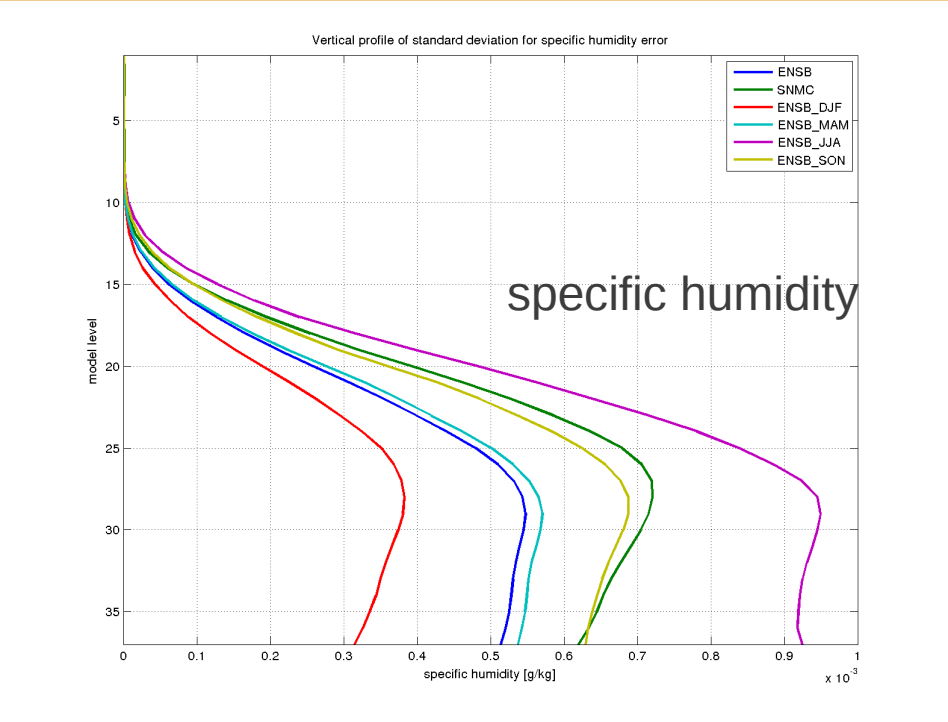


Data assimilation activites at RC LACE

Background error sempling

- Seasonal B matrix (CRO), ALARO 8.8 km





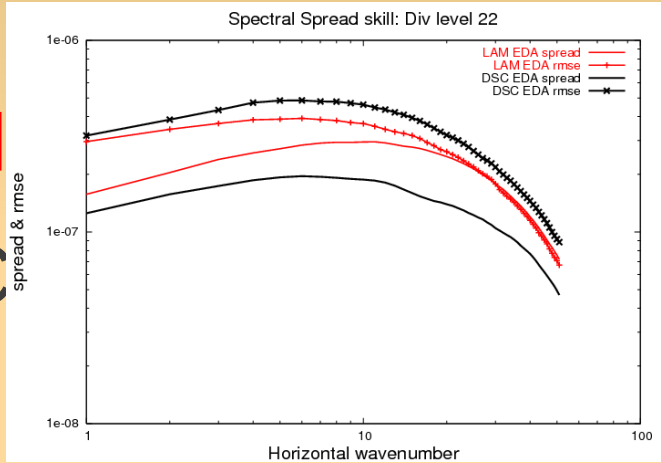
Data assimilation activites at RC LACE

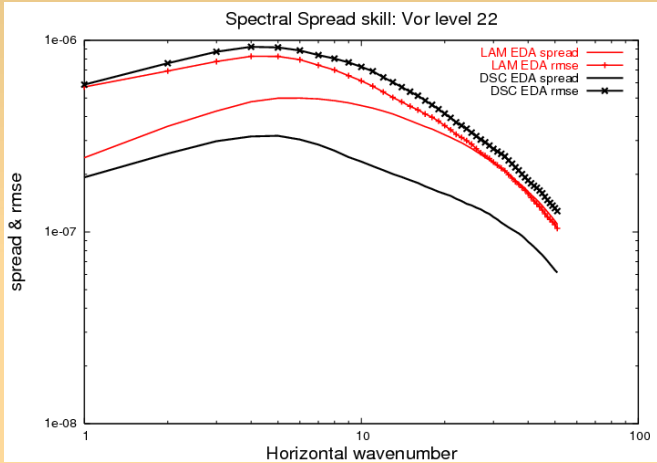
Background error sempling

- Background error sampling (HU)

LAM

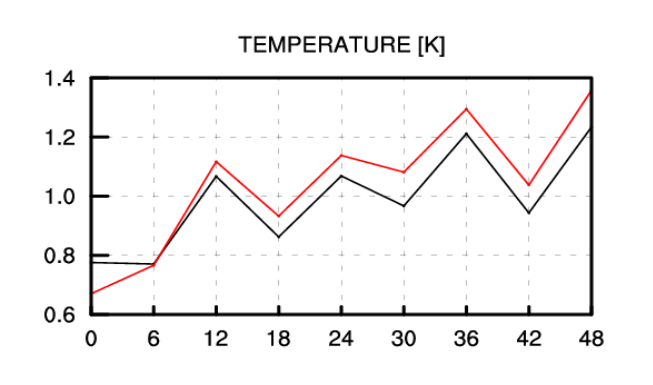
DSC

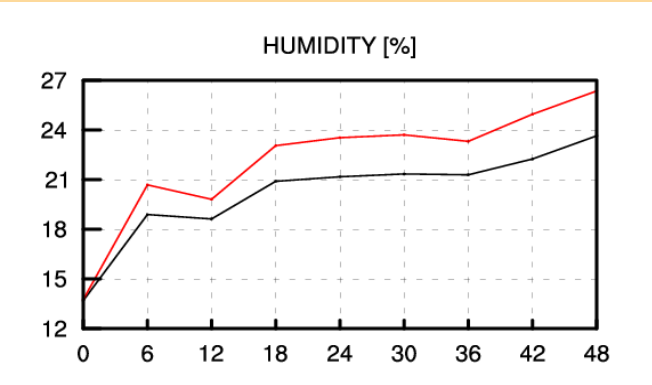




LAM

DSC

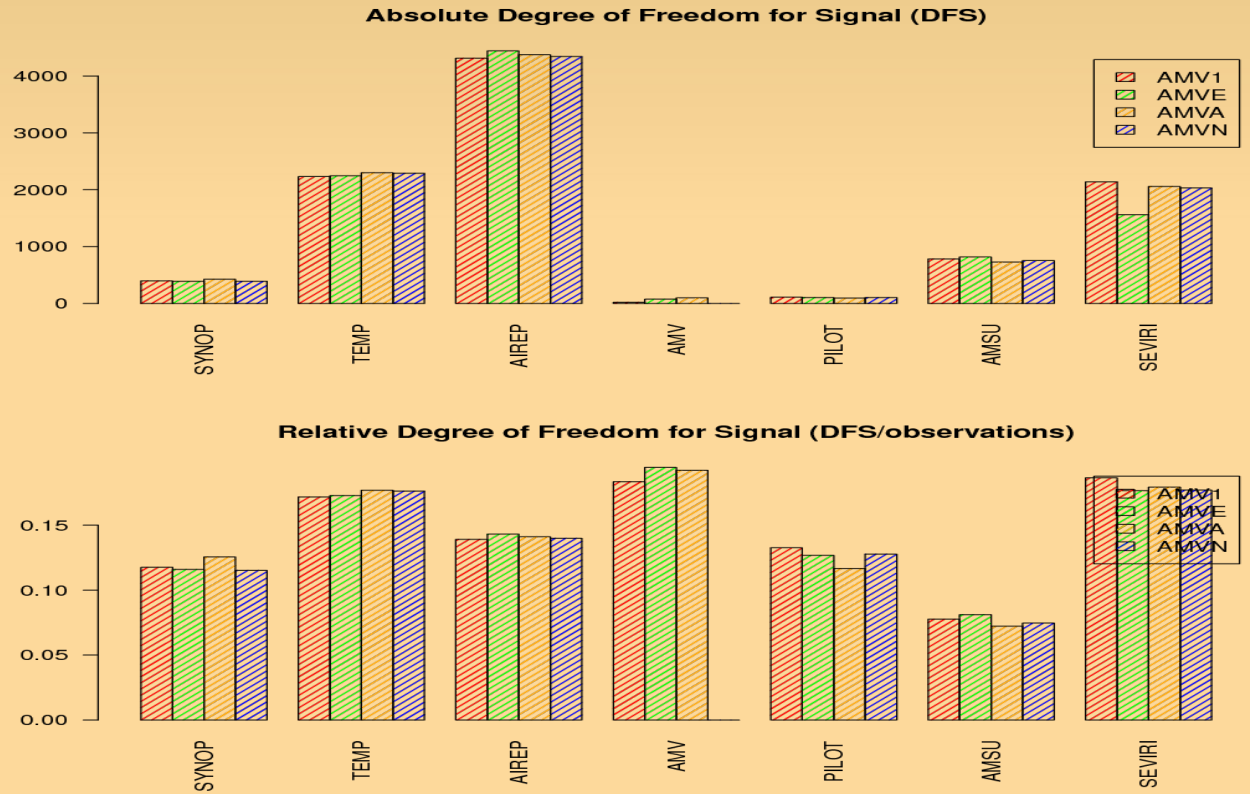




Data assimilation activites at RC LACE

New data implementation and testing.

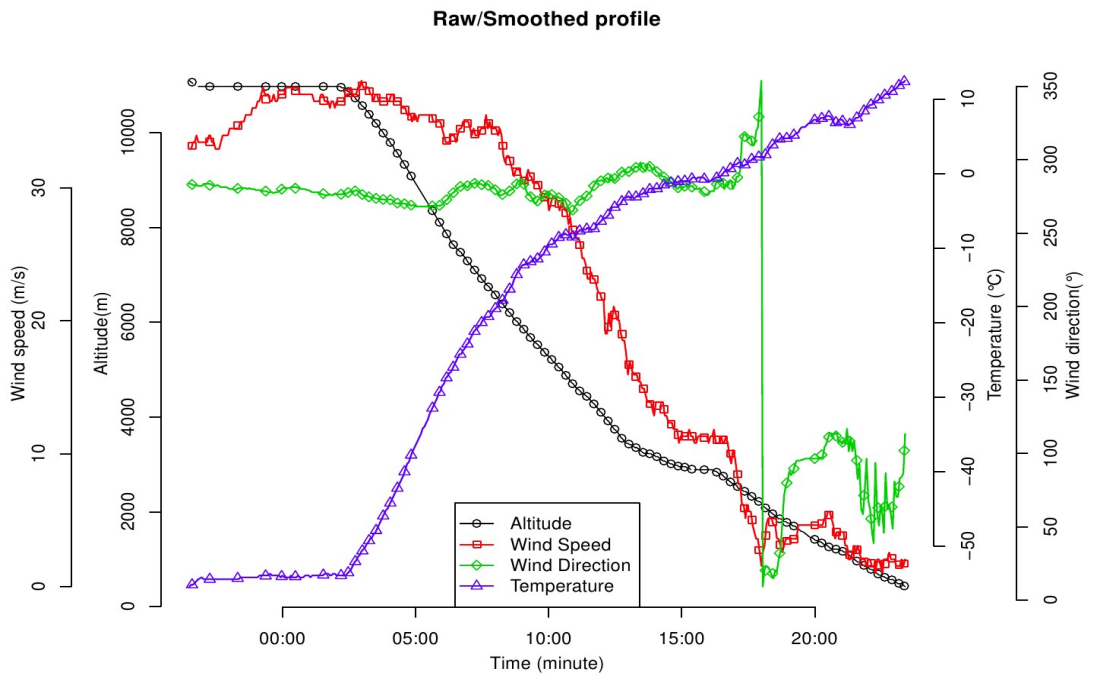
- AMV at higher resolution, from MSG, preproceesed applaing SAF NWC tools (Roger).



Data assimilation activites at RC LACE

New data implementation and testing.

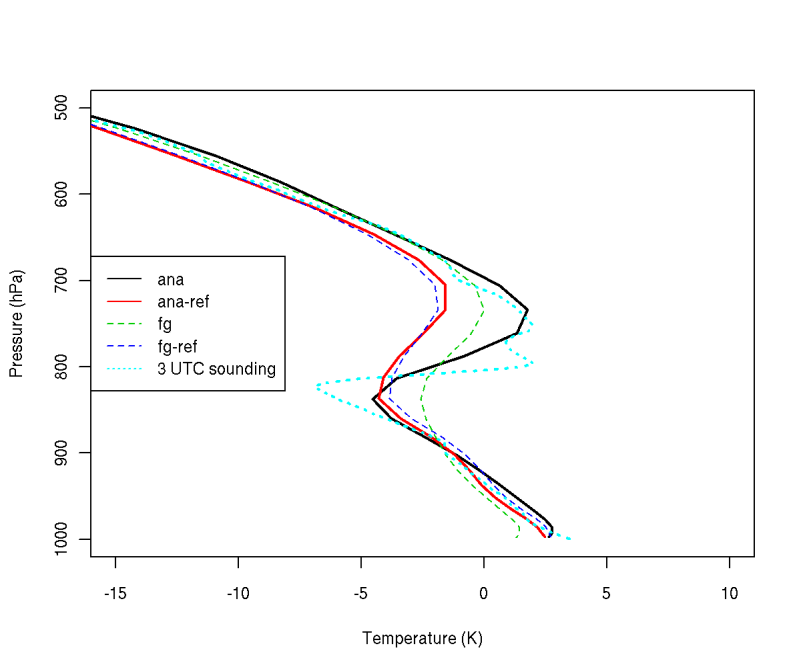
- Mode S data (B. Strajnar)
  - from TAR radar
  - Data: altitude, temperature,wind speed and direction

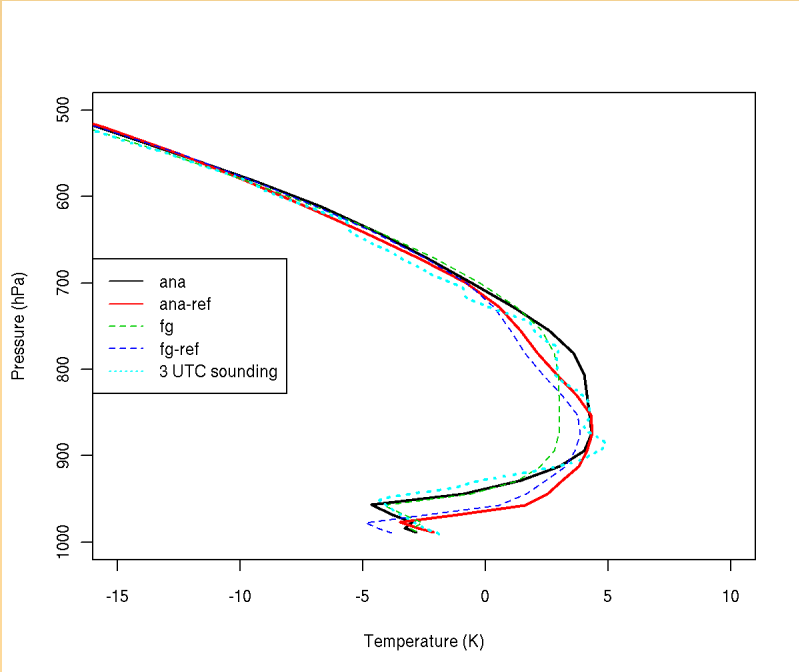


Data assimilation activites at RC LACE

New data implementation and testing.

- Mode S data (B. Strajnar)
  - Imapact was especaly important in cases with inversion.





Data assimilation activites at RC LACE

New data implementation and testing.

- IASI data
  - Removed problems of VarBC with colt start settings.
  - Impact of bias predictor 5 and 6 (layer thickness, 1-10 hPa and 5 – 50 hPa)

    - without predictor 5 and 6: slightly improoved analysis of 50 – 20hPa temperature bias and geopotential bias and 500 – 300 hPa relative humidity bias and RMSE and geopotential bias.
  - Channel selection: using NWP monitoring statistics and rejected channels with weight function peak over model top

    CO2 – impact to temperature profile (in high middle atmosphere)

    38, 49, 51, 55, 61, 63, 70, 83, 85, 87, 104, 109, 116, 122, 128, 135, 141, 146, 148, 154, 159, 161, 165, 167, 173, 178, 179, 180, 185, 187, 191, 193, 195, 197, 199, 201, 203, 205, 207, 210, 212, 214, 217, 219, 222,, 224, 226, 228, 230, 232, 234, 236, 241, 242, 243, 249, 254, 256, 262, 299, 301, 303
  -

T. Kovačić, DHMZ, EWGLAM/SNRWP, Helsinki, 8 – 11 Oct 2012

- Thinning: 80 km.

Data assimilation activites at RC LACE

IASI data

- H2 O – impact to humidity profile (above 500hPa)

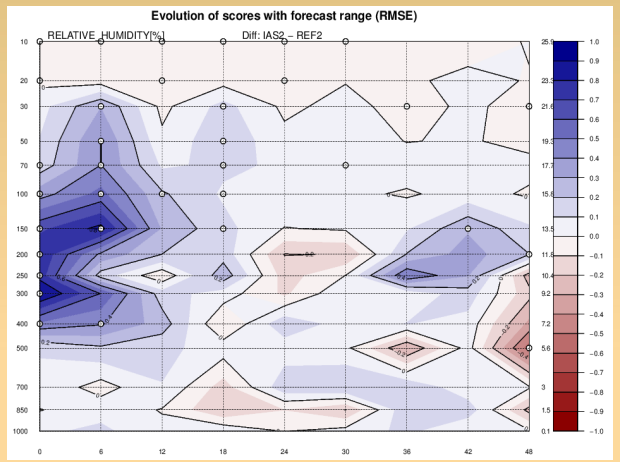
  3098, 3168, 3248, 3252, 3256, 3312, 3378, 3440, 3577, 3586, 3281, 3309, 3442, 3444, 3446, 3448, 3450, 3452, 3454, 3491, 3504, 3506, 3509, 3522, 3555, 3575, 3580, 3582, 3589, 3599, 3653, 3658, 3661, 4032,3105, 3136, 3175, 3207, 3263

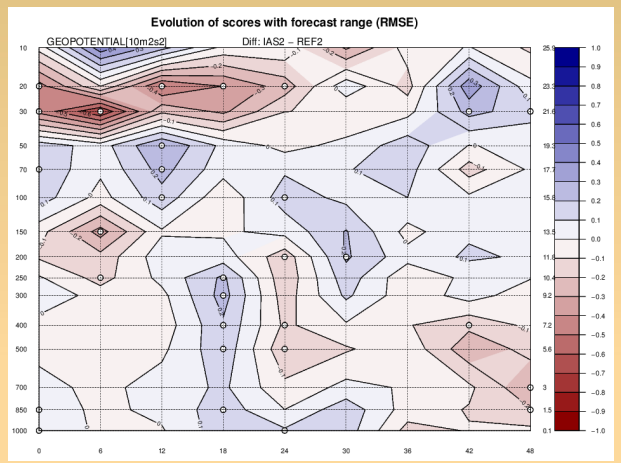
- Impact of IASI data on forecast
  - Data: IASI, AMSU-A,B, MHS, SEVIRI
  - Thinning for IASI: 80 km.
  - period 01.-15.10.2011
  - variational bias correction, 24h-cycling
  - initialization VARBC file from experiment IASI36a2 (not used predictors 5 and 6)

Data assimilation activites at RC LACE

Impact of IASI data on forecast (red is improvement)

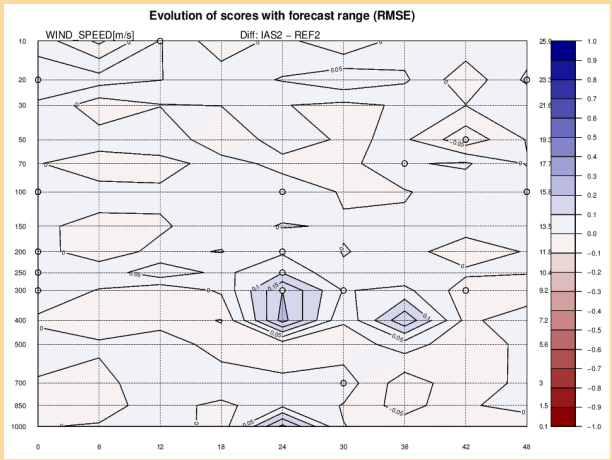
RH

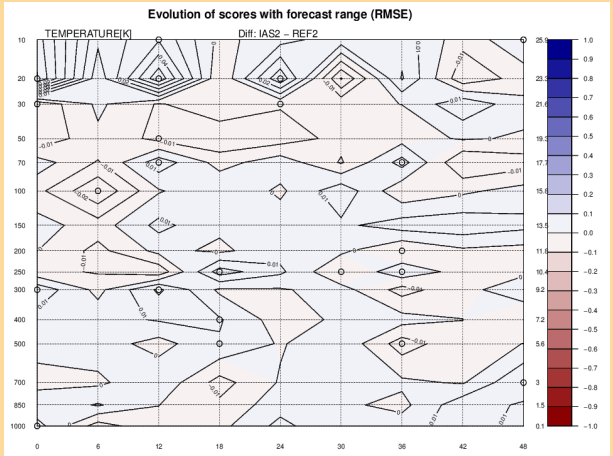




Geopotential

Wind speed





T

Data assimilation activites at RC LACE

New data implementation and testing.

- Radar data assimilation.
  - MF method developed for AROME
  - Implementation:
    - AROME: technicaly no problem
    - ALARO: technical problems
  - Data format conversion problem: radar data must be in MF BUFR format.
  - Quality control.
  - Exchange of radar data must be solved.

Data assimilation activites at RC LACE

Radar data assimilation: present status

- AROME:

  - in Hungary and Austria reflectivity was successfully assimilated

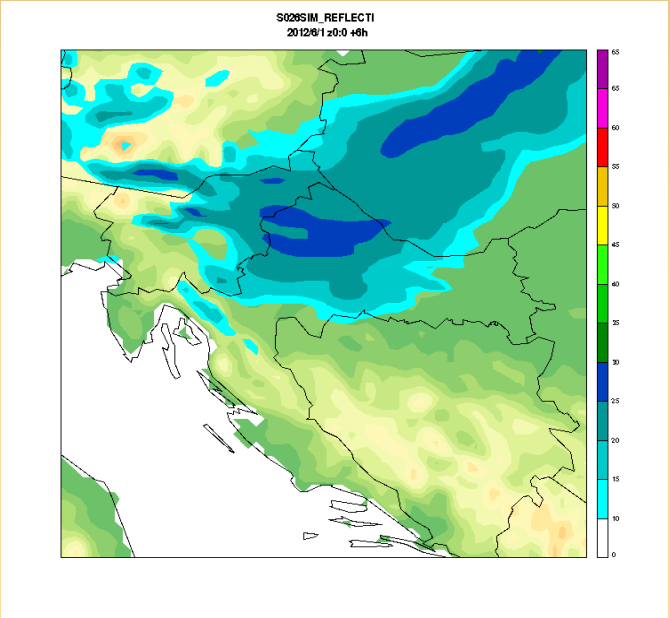
  - and radial wind in Hungary,

  - in Hungary impact tests are ongoing

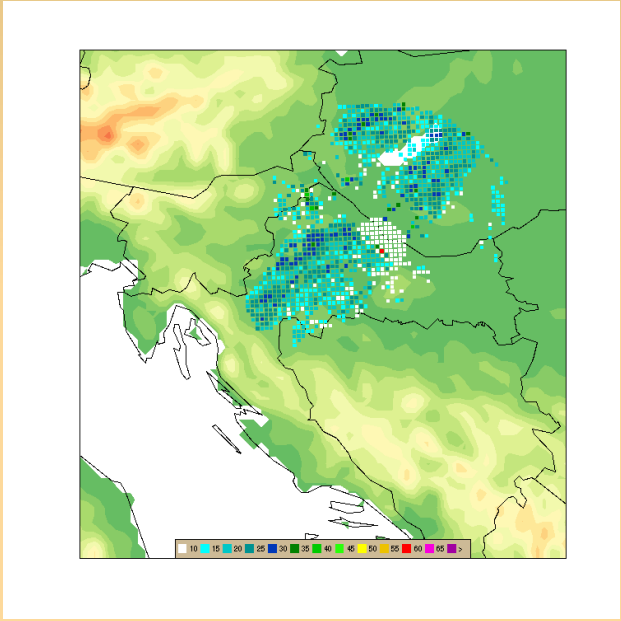
- ALARO: first success with observation operator for reflectivity is achieved.
- Quality control is missing.
- Data format conversion is not completly solved.
  - Conversion is based on CONRAD.
  - Extension of CONRAD is developed for easy implementation of all radar data formats.
- Data exchange: it is not yet decided how to do it.

Data assimilation activites at RC LACE

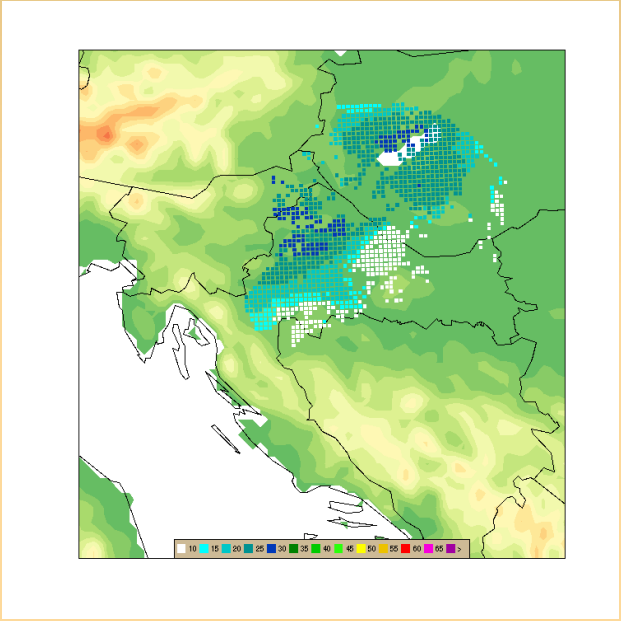
Observation operator for refllectivity in ALARO



Simulated radar reflectivity using fullpos.



Radar reflectivity from PPI at elevation of 0.5° after thinning.



Simulated radar reflectivity using observation operator in screening. Values are at observation points.

Future plans

- 3DVAR will be the basic method used in majority of national services.
- There will be a lot of efford to improve existing systems by:
  - Better usage of data and using more high resolution data.
  - RUC at 3h and experiments with 1h.
  - Better sempling of B matrix.
- Developement of DA based on ensemble.

Data assimilation activites at RC LACE

Thank you!