Regional Cooperation for
Limited Area Modeling in Central Europe

LACE
nwp central europe

Data assimilation status at DHMZ
DAWD 19-21.09.2018.

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Overview of activities.

B matrix comparison.

- to compare NMC vs. ENS diagnostics,
- to evaluate influence on forecast and analysis,
- to evaluate impact of LBC errors on ENS statistics.

Status*: done.*

Radar data assimilation.

Comparison of national ODIM HDF5 file contents.
- Informational content.
- Scanning strategies.

Status*: done.*

Radar data assimilation case studies.
- To check available preprocessing tools.
- To see influence on different scales.

Status*: not finished*

ALADIN-HR4 data assimilation

ALADIN-HR 4

- ALARO-0 (cy38t1)
  - Domain: Δx=4km, 73 vertical level, time step 180s, 432x480 GP, quadratic trunc.
  - 3h space consistent coupling
  - lagged LBC from ECMWF
  - 00, 06, 12 and 18 UTC +72h forecast
  - DFI initialization
- Upper air analysis
  - 3DVar (cy38t1)
  - 3h cycle no DFI
  - NMC B matrix (tests with EDA B)
  - VarBC – 3h cycling; REDNMC=1.4
  - Assimilated observations – SYNOP,(Ps), TEMP(T, q, u, v), AMDAR(T, u, v), AMV, SEVIRI (ch 2,3), Mode-S MRAR SI
- Surface analysis
  - OI based on SYNOP (T2m, RH2m)
 - MESCAN correlation function
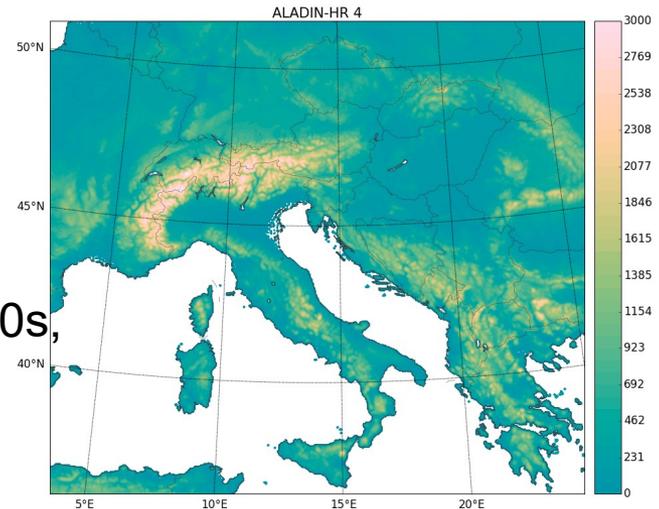
B matrix comparison

- Main findings:
  - Influence on B matrix characteristics
    - Correlation function shape shifted towards smaller scales for ENS vs. NMC; smaller std; shorter horizontal and vertical length scales
    - Influence of LBC perturbations on B matrix characteristics clearly visible for all control variables but smallest for humidity (influenced more by analysis perturbations inside EDA)
  - Influence on analysis:
    - Better balances obtained by using ENSLBC vs NMC
    - Largest differences found for humidity in single obs experiments and by looking into mean increments
  - Influence on forecast:
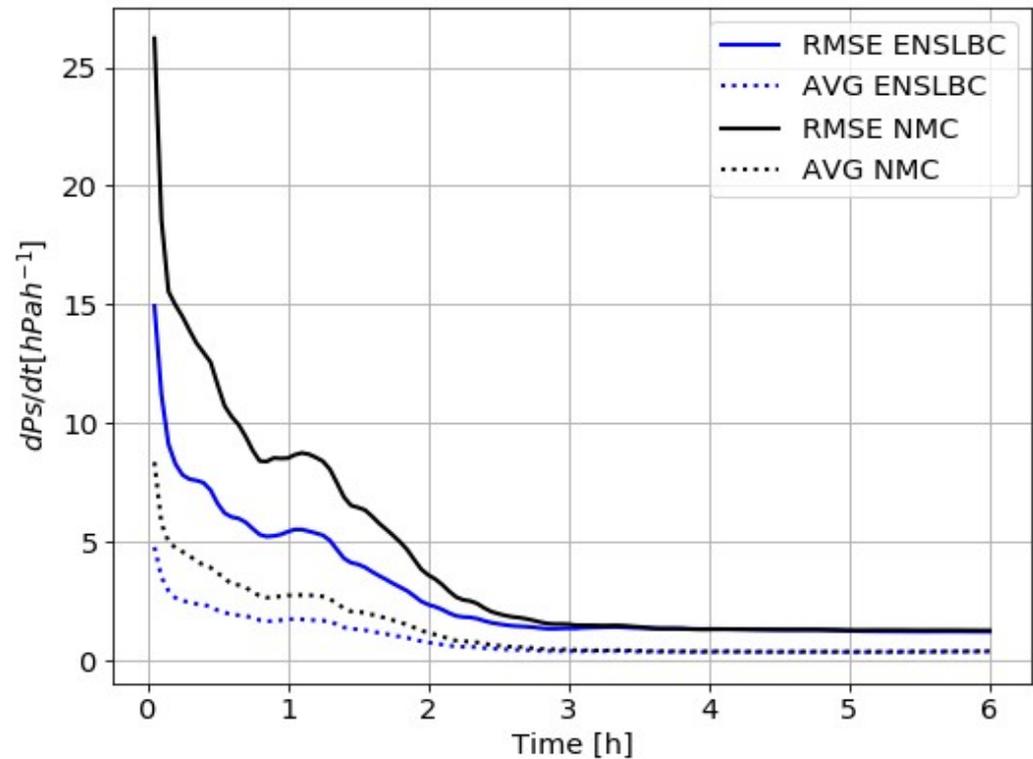   - Slightly better results for ENSLBC (for humidity related variables)

B matrix comparison – some results

- Mean vertical increment for month June 2017

Mean vertical increment
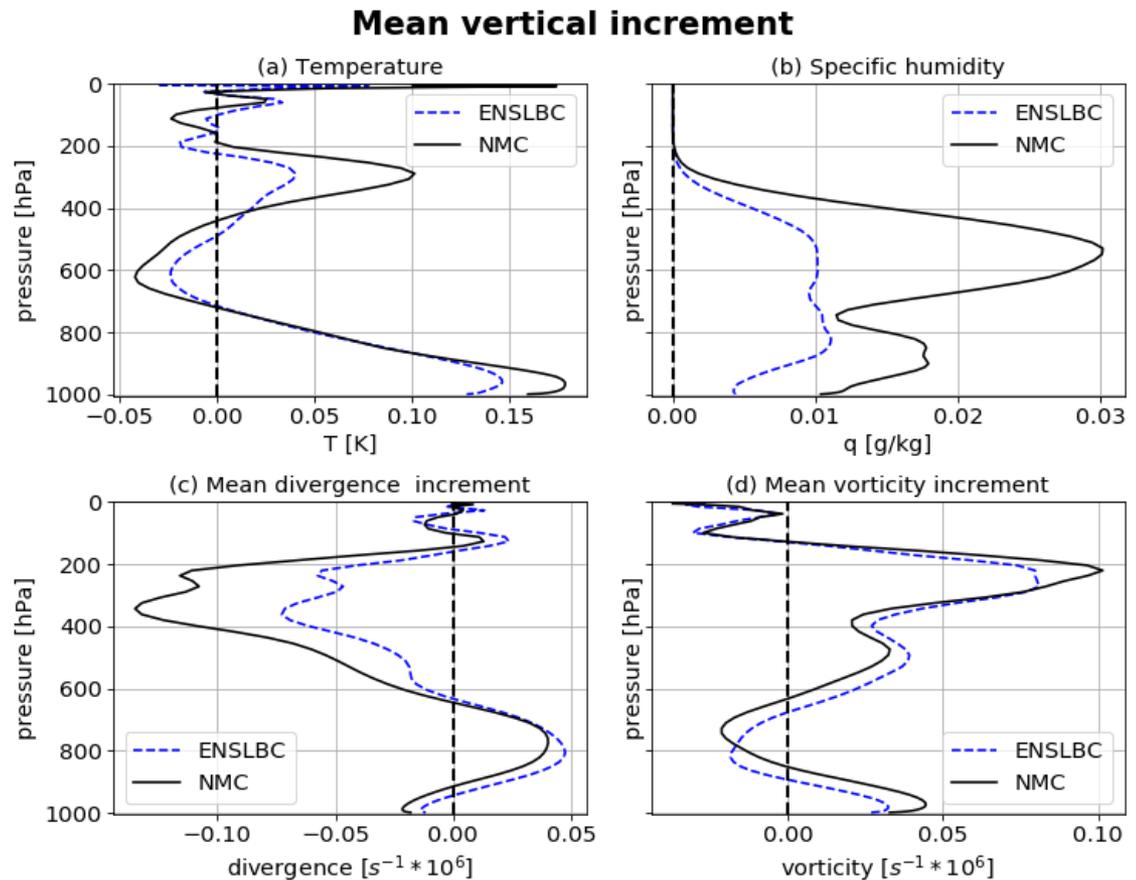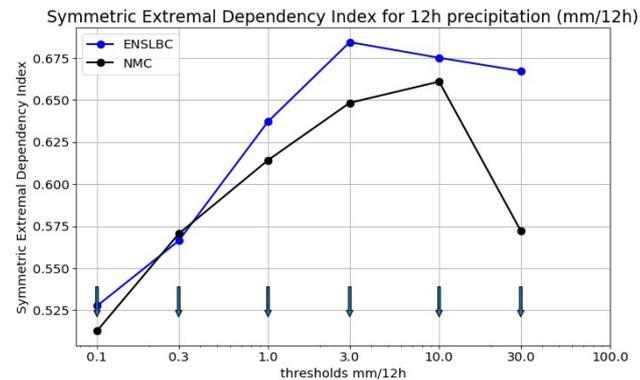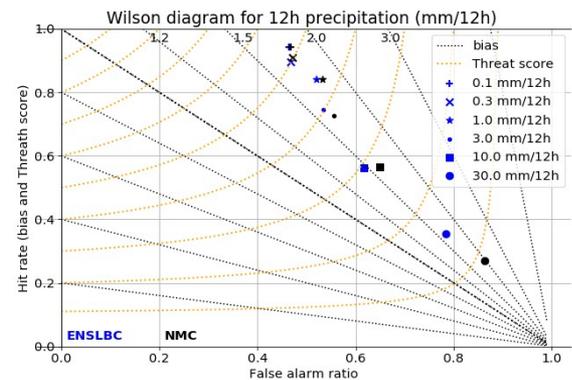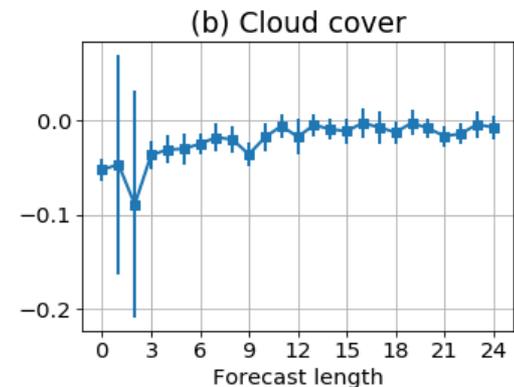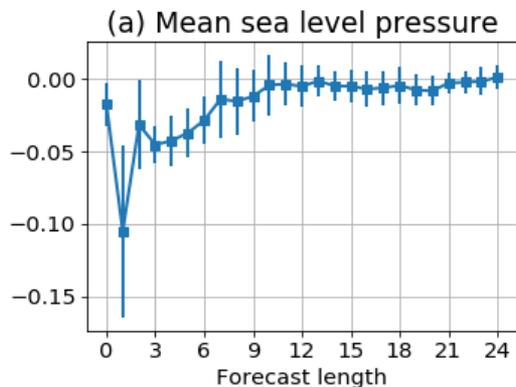
B matrix comparison – some results

- Model domain mean surface pressure tendency time evolution
- Better balances with ENSLBC B matrix

B matrix comparison – some results

- Verification results for upper air mixed
- Better results for ENSLBC for surface pressure, cloudiness and 24h precipitation

RMSE diff (95% conf) ENSLBC - NMC

(a) Mean sea level pressure

(b) Cloud cover

Wilson diagram for 12h precipitation (mm/12h)

Symmetric Extremal Dependency Index for 12h precipitation (mm/12h)

Radar data assimilation.

Comparison of national ODIM HDF5 file contents.

The report is sent to participants of hangout meeting on LACE radar DA stays.

Countries*: be, cz, de, es, fr, hr, hu, pl, si, sk*

- Information content.

  Radar reflectivity.
  - Reflectivity data are provided by all countries.
  - The radar reflectivity is represented in uniform way by all countries.
  - All information needed for data assimilation is present.
  - The exception is the minimum detectable energy. It is provided only by Croatia and Slovenia.

  Radial velocity.
  - Provided by *be, cz, de, fr, hr, si.*
  - Radial velocity data from Croatia and Slovenia, are slightly differently coded.
  - Nyquist velocity is provided by *be, cz, hr, si.* It is not needed in BATOR but for dealiasing that can be done in data preprocessin.
  - Some Nyquist velocities are to low.

Radar data assimilation.

Comparison of national ODIM HDF5 file contents.

- ## Information content.
  ### Radial velocity. *(cont.)*

Nyquist velocities, NI (m/s).

be	cz	cz	cz	hr	si
53,30	7,67	19,85	13,19	16,60	8,10

- In geramn and french files Nyquist velocities are not given but very high velocities can be found in data and we can suppose that Nyquist velocities are high too.
- Radial wind decoding: Vr = gain*value + offset, like in BATOR.
- Radial wind decoding for HR and SI: Vr = NI*(gain*value + offset).

Radar data assimilation.

Comparison of national ODIM HDF5 file contents.

- Scanning strategies.
  - The description of individual PPIs in given in group /dataset*n*/data*m*/what
  - Datasets are not always sorted by time.
  - Some data sets have more data types and some only one type. - need to be sorted by time.
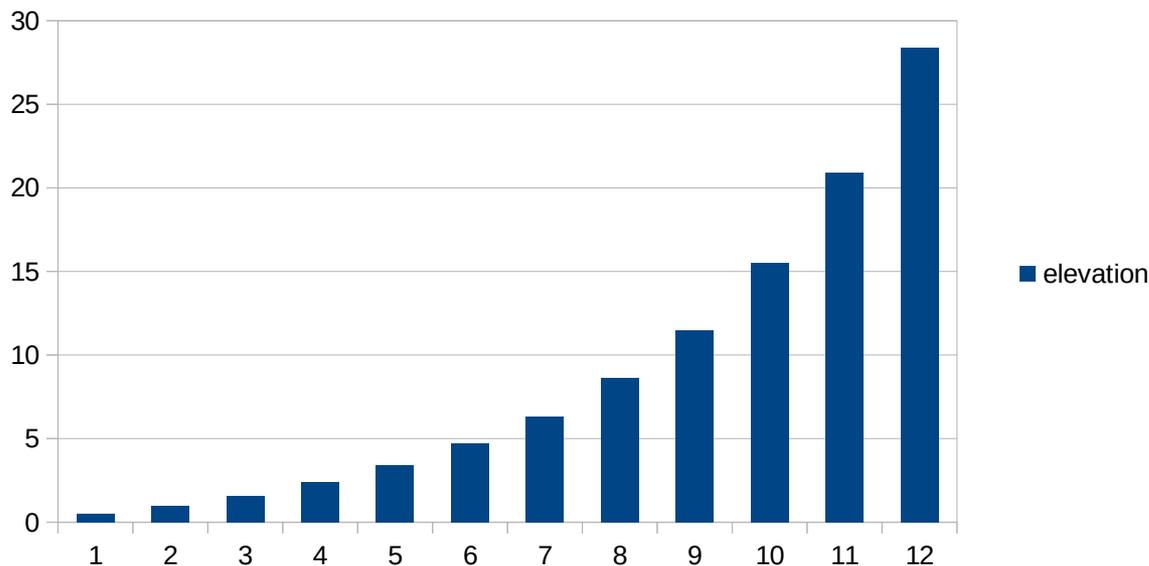 - Some files contain one volume scan and others contain more scans.

Radar data assimilation.

Comparison of national ODIM HDF5 file contents.

♦ Scanning strategies.
Slovenia.

elangle	quantity
0,5	DBZH
1	DBZH
1,6	DBZH
2,4	DBZH
3,4	DBZH
4,7	DBZH
6,3	DBZH
8,6	DBZH
11,5	DBZH
15,5	DBZH
20,9	DBZH
28,4	DBZH

Radar data assimilation.

Comparison of national ODIM HDF5 file contents.

elangle	quantity	quantity	quantity
0,40	DBZH	TH	VRAD
9,50	DBZH	TH	VRAD
6,50	DBZH	TH	VRAD
0,90	DBZH	TH	VRAD
1,51	DBZH	TH	VRAD
3,50	DBZH	TH	VRAD
0,40	DBZH	TH	VRAD
8,50	DBZH	TH	VRAD
5,50	DBZH	TH	VRAD
0,90	DBZH	TH	VRAD
1,51	DBZH	TH	VRAD
2,50	DBZH	TH	VRAD
0,40	DBZH	TH	VRAD
90,00	DBZH	TH	VRAD
7,50	DBZH	TH	VRAD
0,90	DBZH	TH	VRAD
1,51	DBZH	TH	VRAD
4,50	DBZH	TH	VRAD
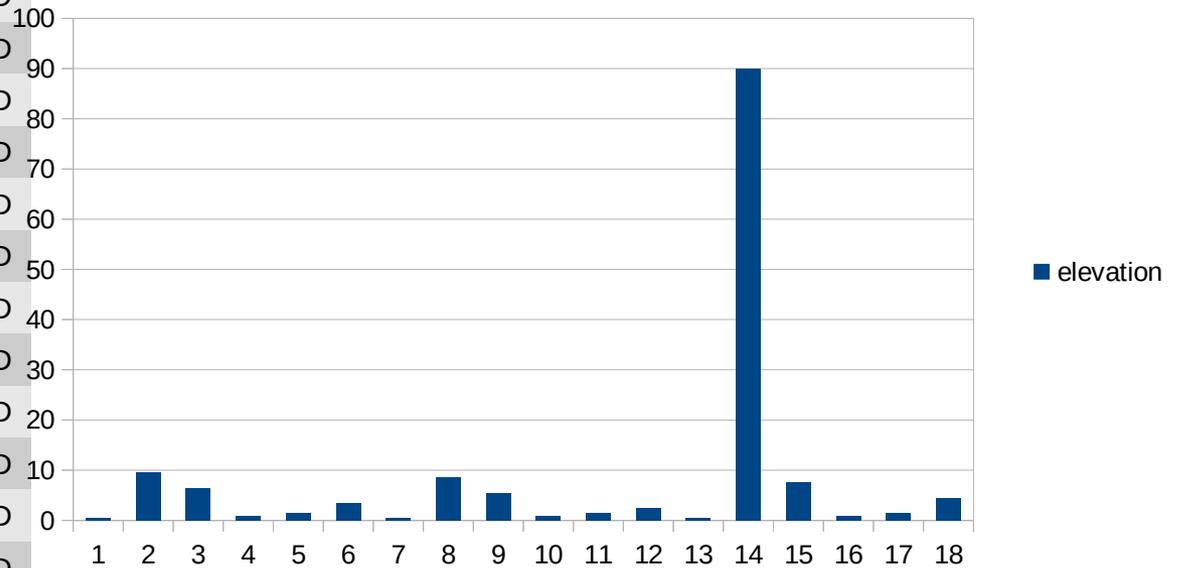
Radar data assimilation.

Radar data assimilation case studies.

- To check available preprocessing tools.
  - prepopera.py – to arange data in HFD5 files for BATOR.
  - BATOR – modified to allow correct useg of data at higher elevations.
  - This combination worked well with data from HR, HU, SI.
    All files are simple:
            one elevation – one dataset, elevations sorted by time.
  - It didn't work with greater number of radars.
  - Testing was stopped because of new LACE development of radar data preprocessing.

Radar data assimilation.

Radar data assimilation case studies.
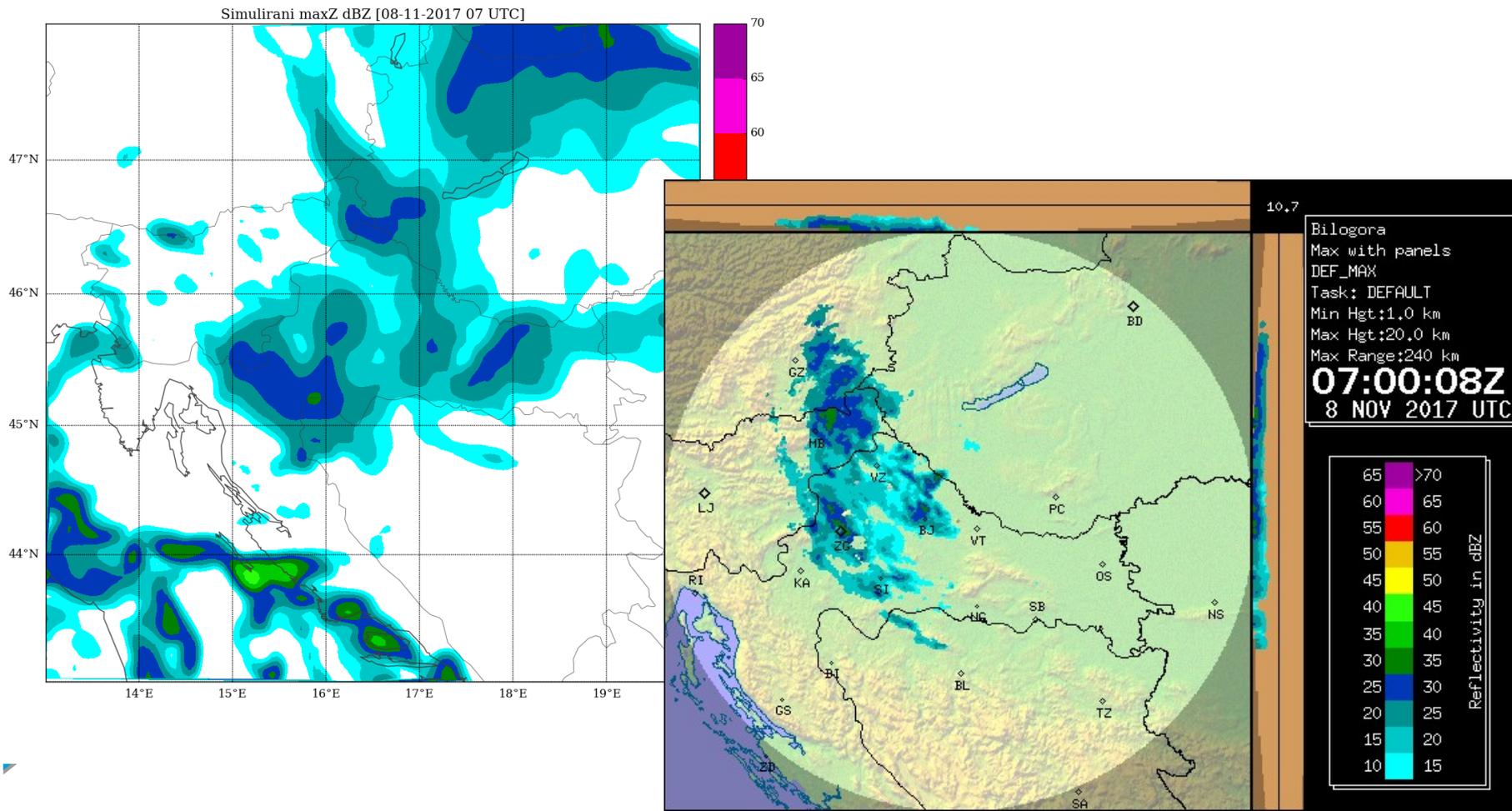
- Date: 8th Nov 2017

Radar data assimilation.

Radar data assimilation case studies.
- Date: 8th Nov 2017
  - Initial time: 8th Nov 2017 06 UTC
  - Assimilation
  - Reference: operational data
  - Radar: radar reflectivity + operational data
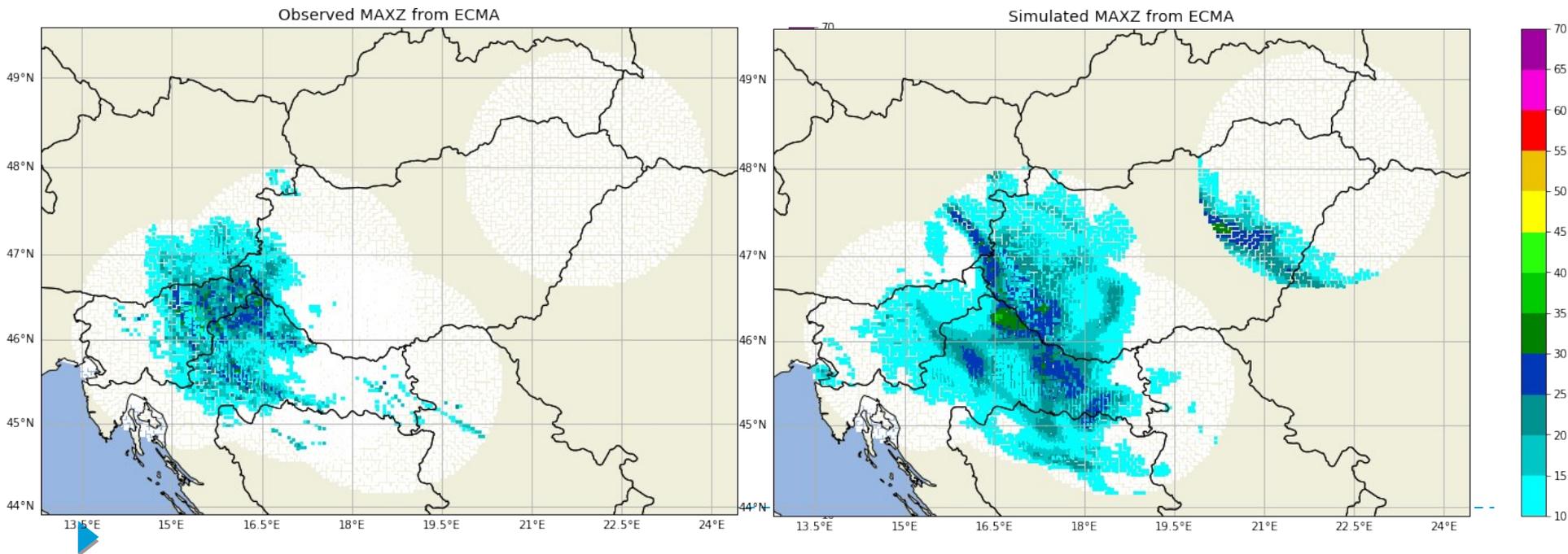
Radar data assimilation.

Radar data assimilation case studies.
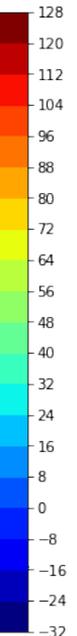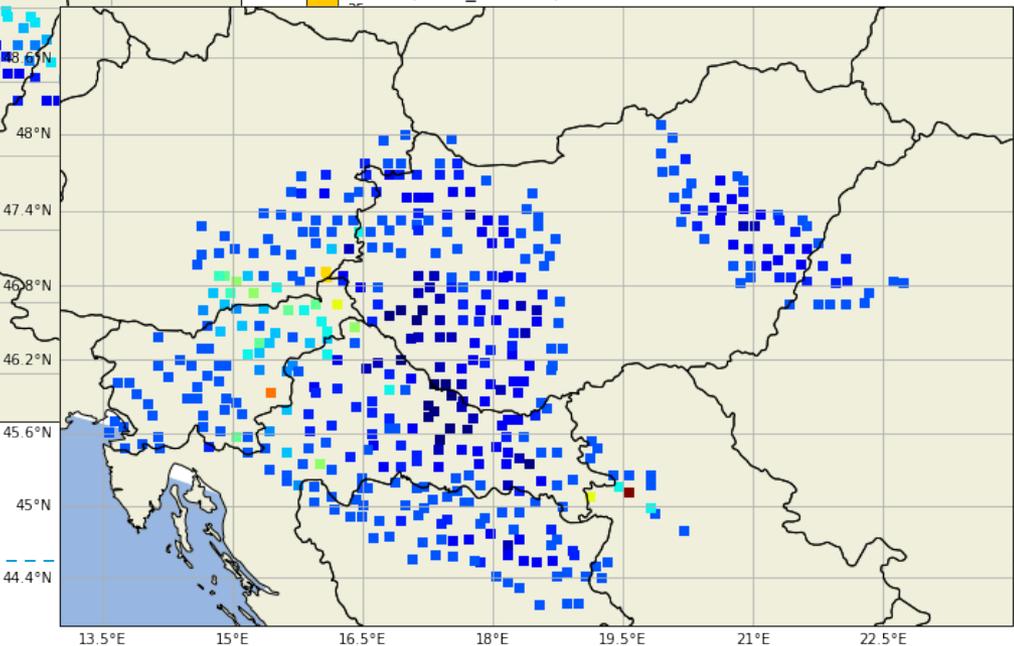- Date: 8th Nov 2017, radar data in CCMA at 06 UTC.
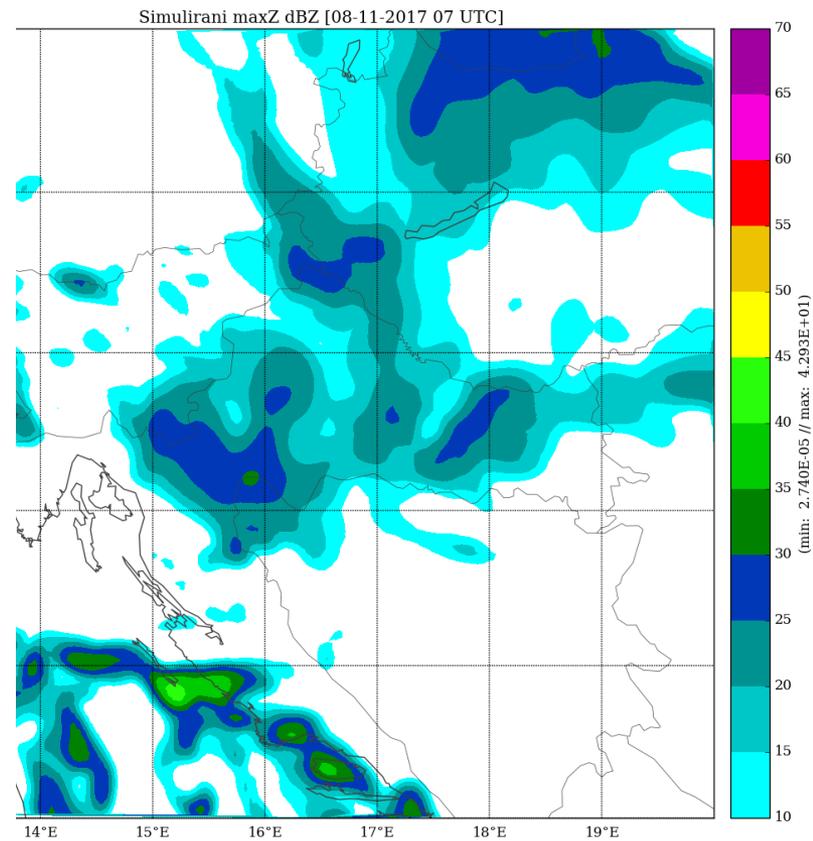
(o-fg) dBZ

elevation<2°
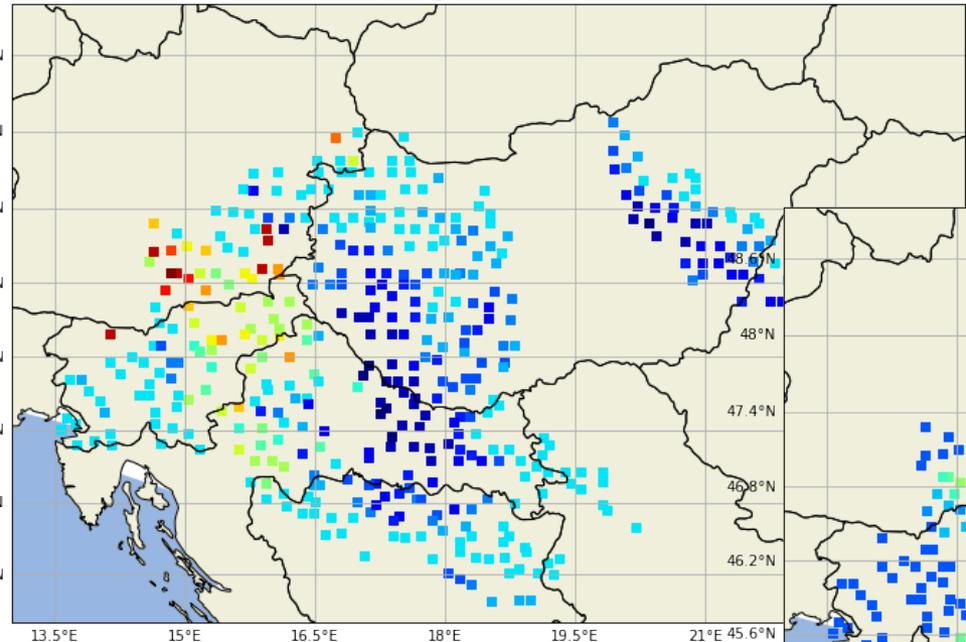
2°<elevation<4°

Radar data assimilation.

Radar data assimilation case studies.
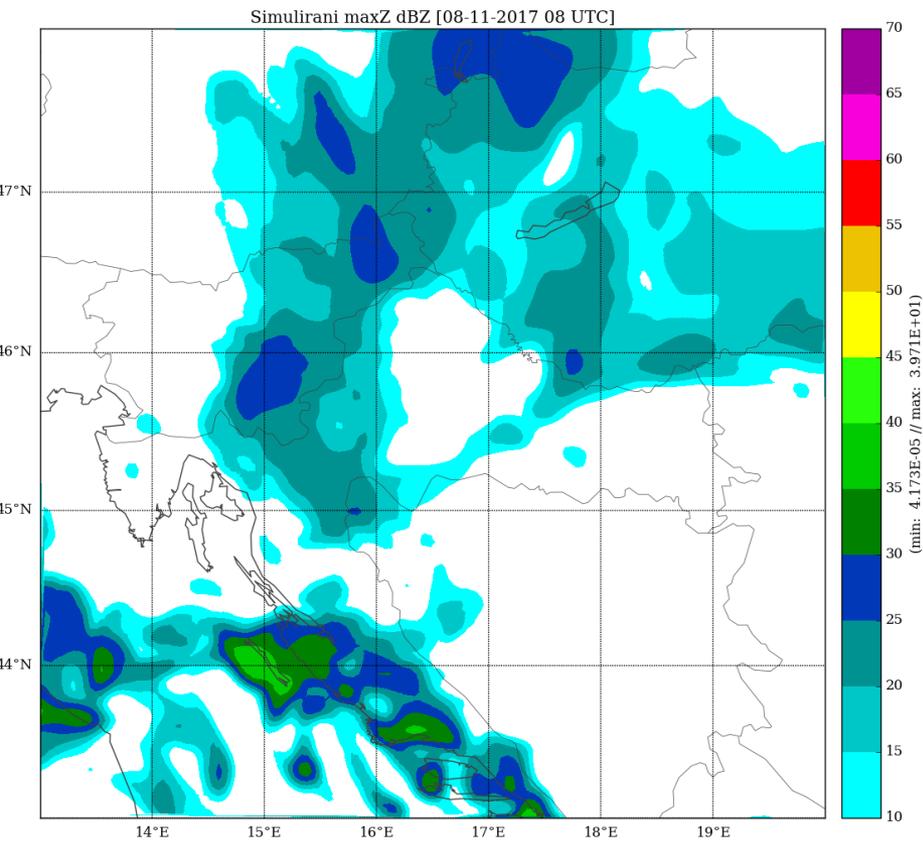- Date: 8th Nov 2017. forecast 06UTC + 01H
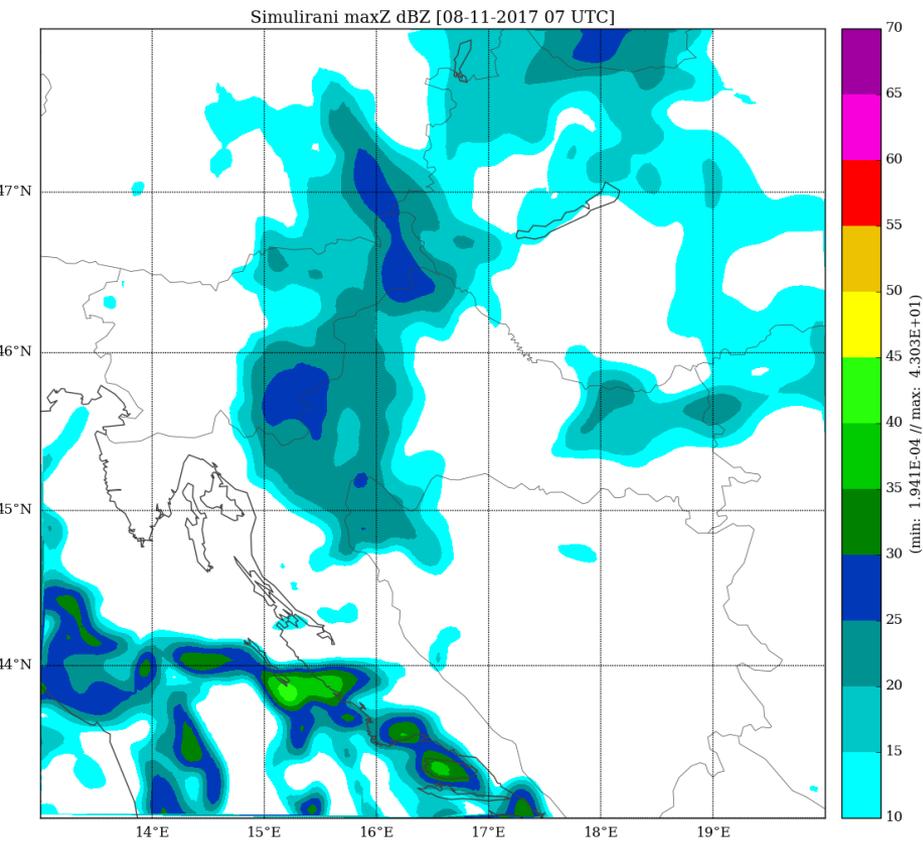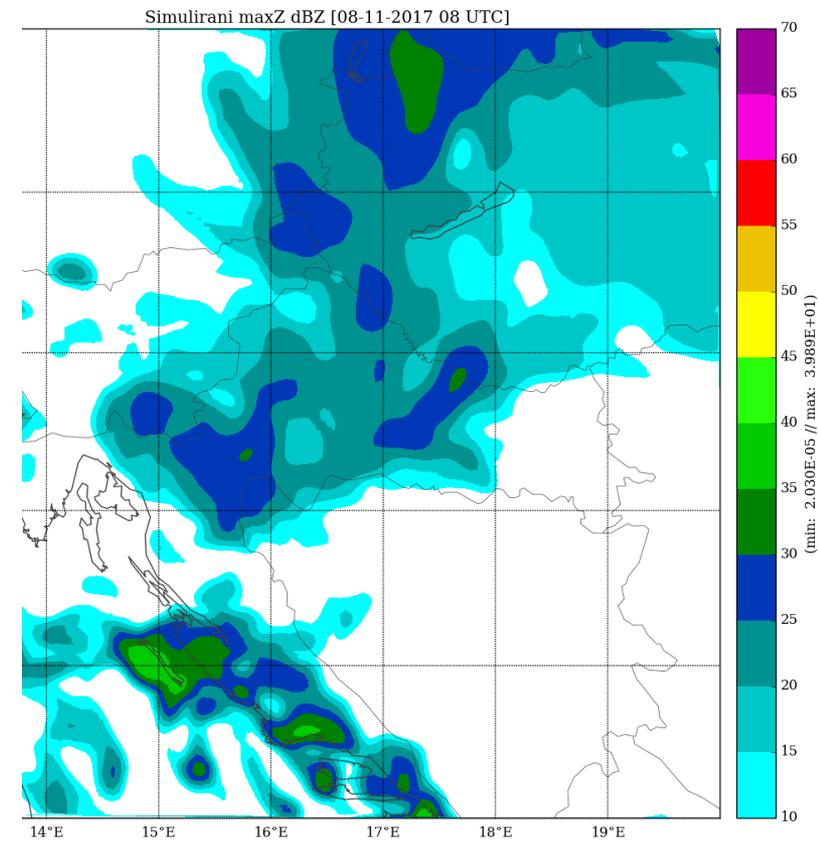

RADAR

REFERENCE

Radar data assimilation.

Radar data assimilation case studies.
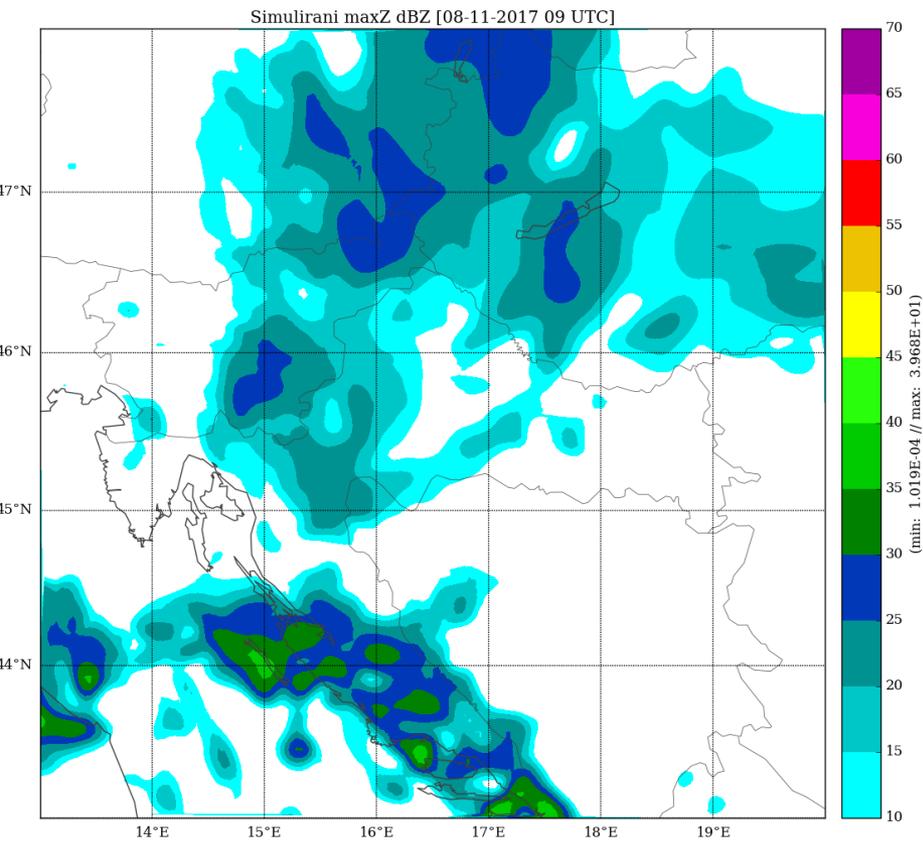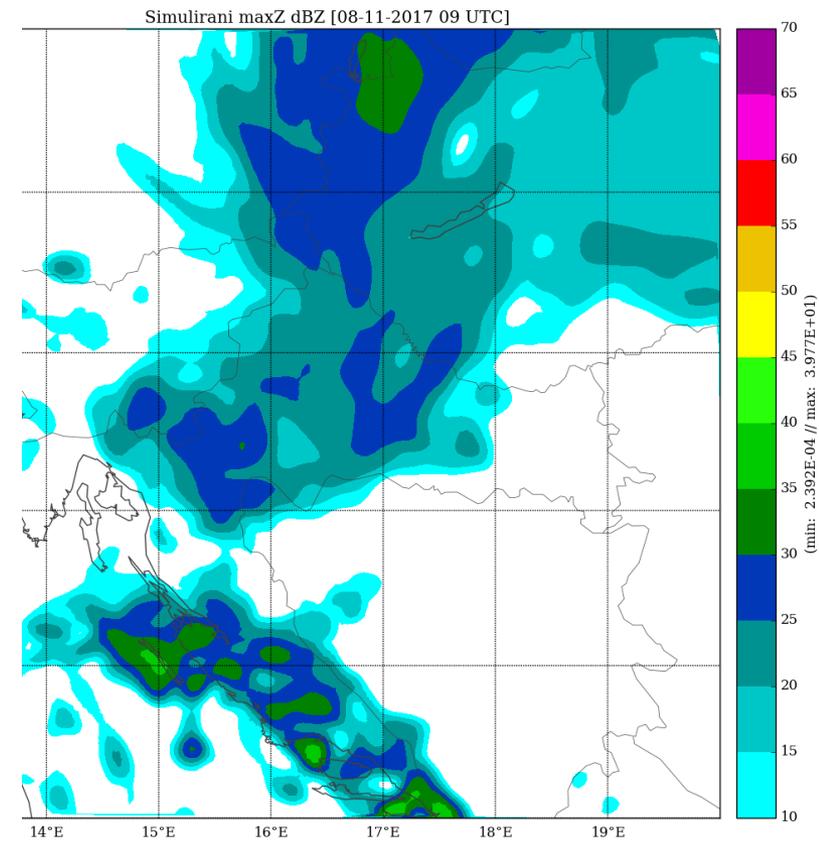- Date: 8th Nov 2017. forecast 06UTC + 02H

RADAR

REFERENCE

Radar data assimilation.

Radar data assimilation case studies.
- Date: 8th Nov 2017. forecast 06UTC + 03H

RADAR

REFERENCE

Plan

Plans:
- Continue tests with EDA
- Continue work on radar data assimilation
- Start tests with GNSS ZTD
- Test Jk
- New cycle for DA (most probably cy43)