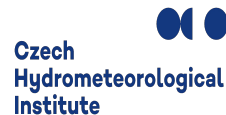


Assimilation of radial winds from radars

(output from RC LACE stay supervised by Alena Trojáková)
Data Assimilation Working Days 2020

Katarína Čatlošová (SHMU)



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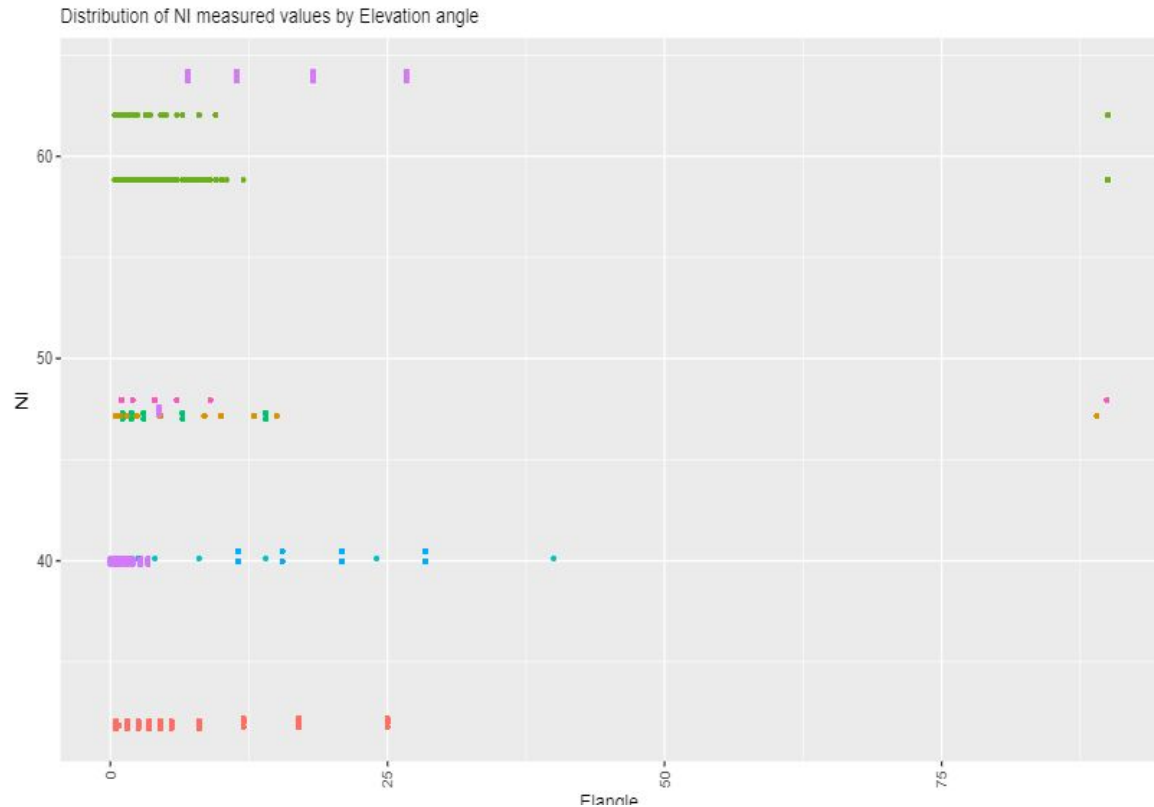
Outline

- OPERA OIFS radar data
 - VRAD (radial wind velocity)
 - NI (Nyquist velocity) $>30\text{m/s}$
- Assimilation experiments
 - methodology of radial wind DA (Montmerle, Faccani 2009)
- NWP setup
- innovations statistics (OMG, OMA)
- case study
- conclusions

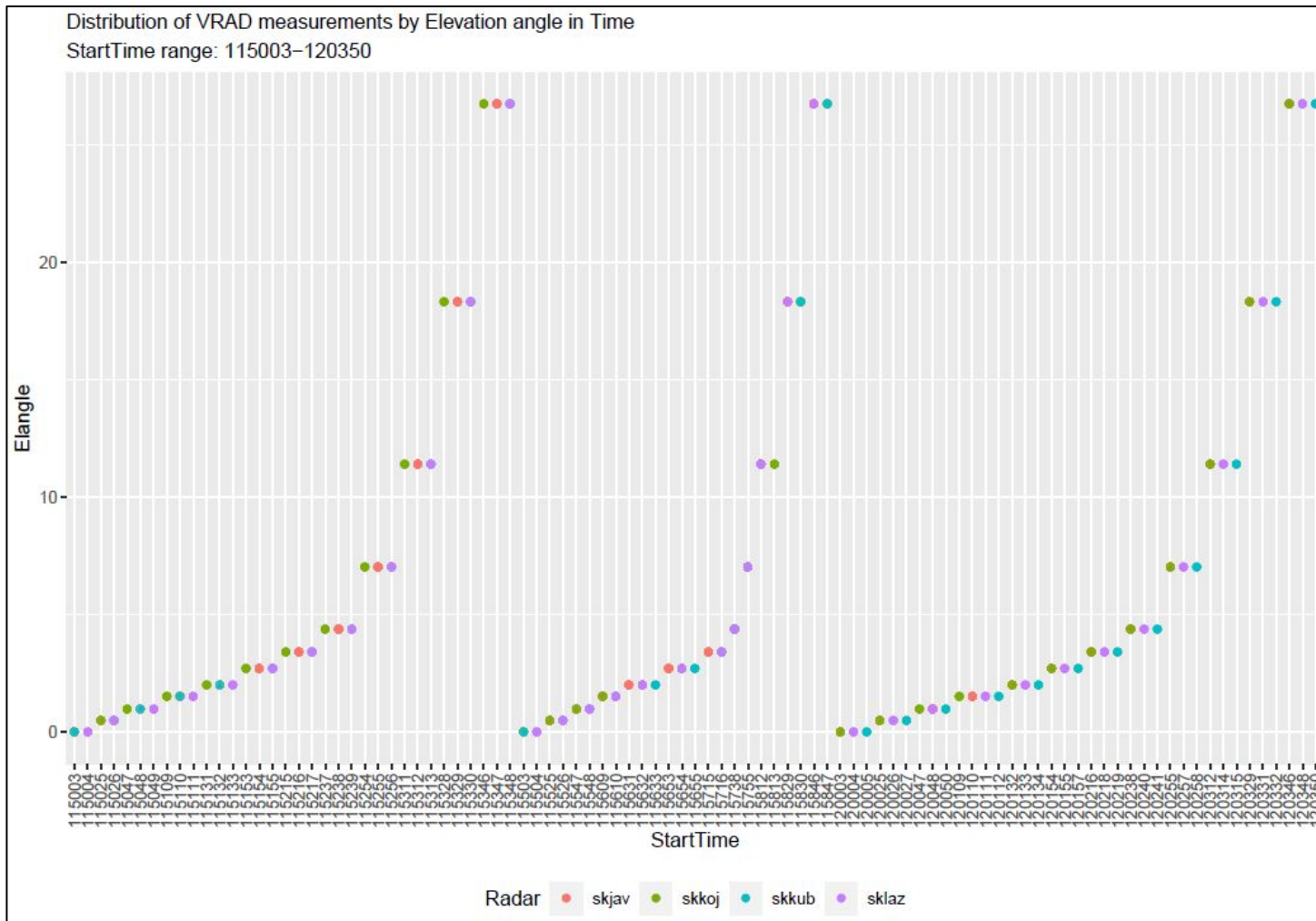
OPERA radar data

- OPERA data (OIFS)
- test: 2020-07-10
- available VRAD
- NI > 30 m/s

Montmerle, T. - Faccani, C. (2009): Mesoscale assimilation of radial velocities from Doppler radars in a preoperational framework Mon. Wea. Rev., 137, 1939-1953 [Available online <https://doi.org/10.1175/2008MWR2725.1>]

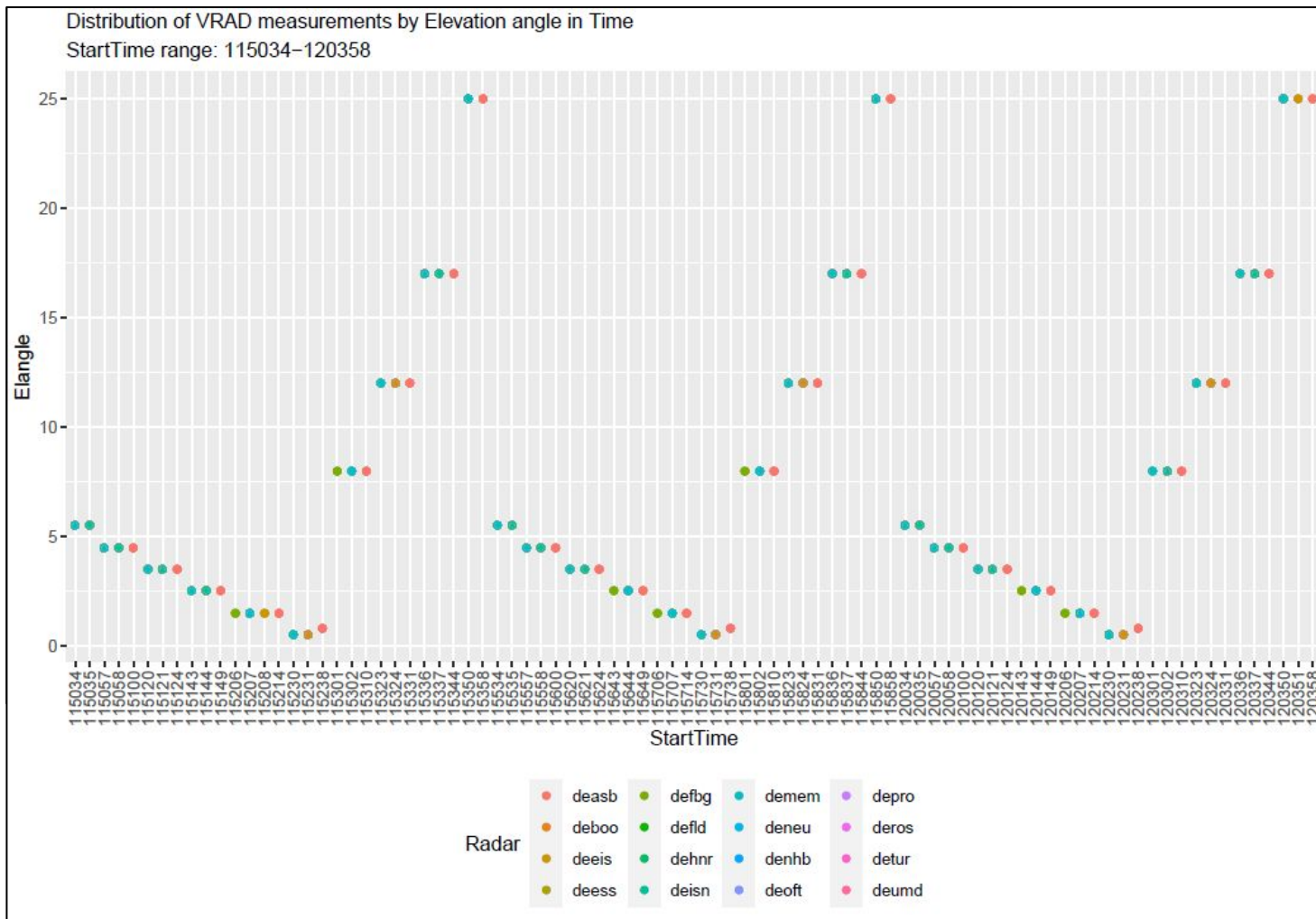


Scanning strategy



SK

Scanning strategy



DE



5

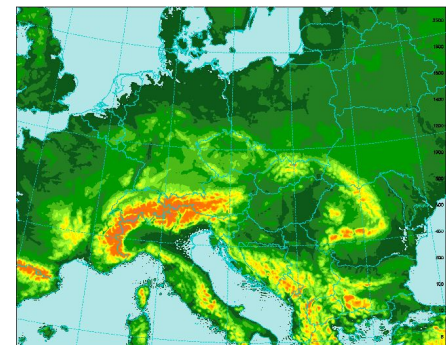


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Radial winds assimilation

- HOOF setting
 - fixed error: splitMeasurements=False ⇒ corrupted quantity name
 - reported error: dataset with TH but no DBZ ⇒ HOOF crashed (German radars)
 - ⇒ fixed in HOOF_v1.9
 - reported error: uncorrect volume scan separation for complicated scanning strategies
 - namelist: attribute NI=0; attributes highprf and lowprf not used
- bator (modset_Bator43t2_bf10+op4.03.tar)
 - sampling and median filter, filter cleaner
- screening
- minimization (NOTVAR position 44)

Statistical analysis



Model - operational setup at CHMI

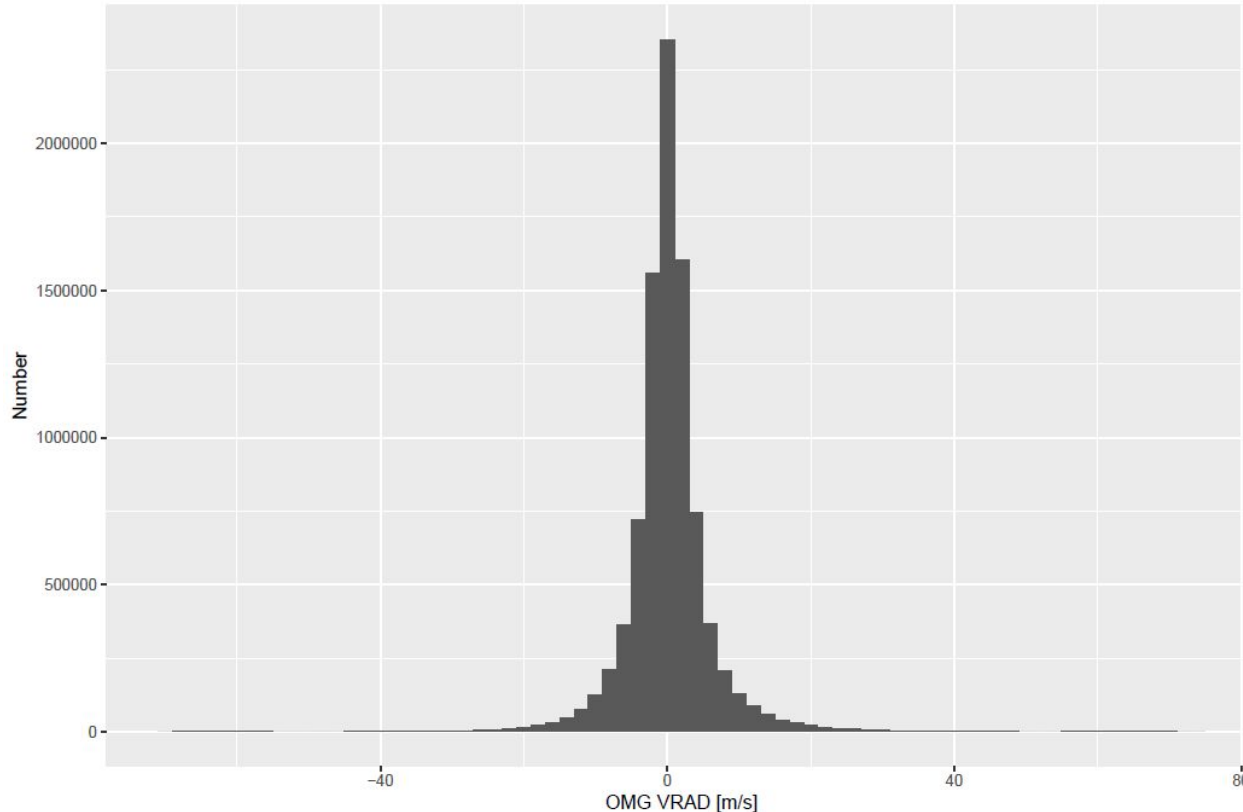
ALARO NH-v1B cy43t2pt op1

- domain: $dx \sim 2.3\text{km}$, $1069 \times 853\text{GP}$, time step 90s
- 87 vertical levels
- BlendVar = DF Blending (filter at trunc. $E102 \times 81$) followed by 3D-Var
- 6h assim cycle
- assimilated observations: SYNOP, TEMP, AMDAR, SEVIRI, Mode-S MRAR CZ, Mode-S EHS from KNMI, AMV

Statistical analysis

OMG VRAD distribution for 2020-05-22_00 – 2020-06-13_18

Total No data: 8910331; Total No radars: 56; Mean omg vrad: 0.17 m/s; Sd omg vrad: 5.87 m/s

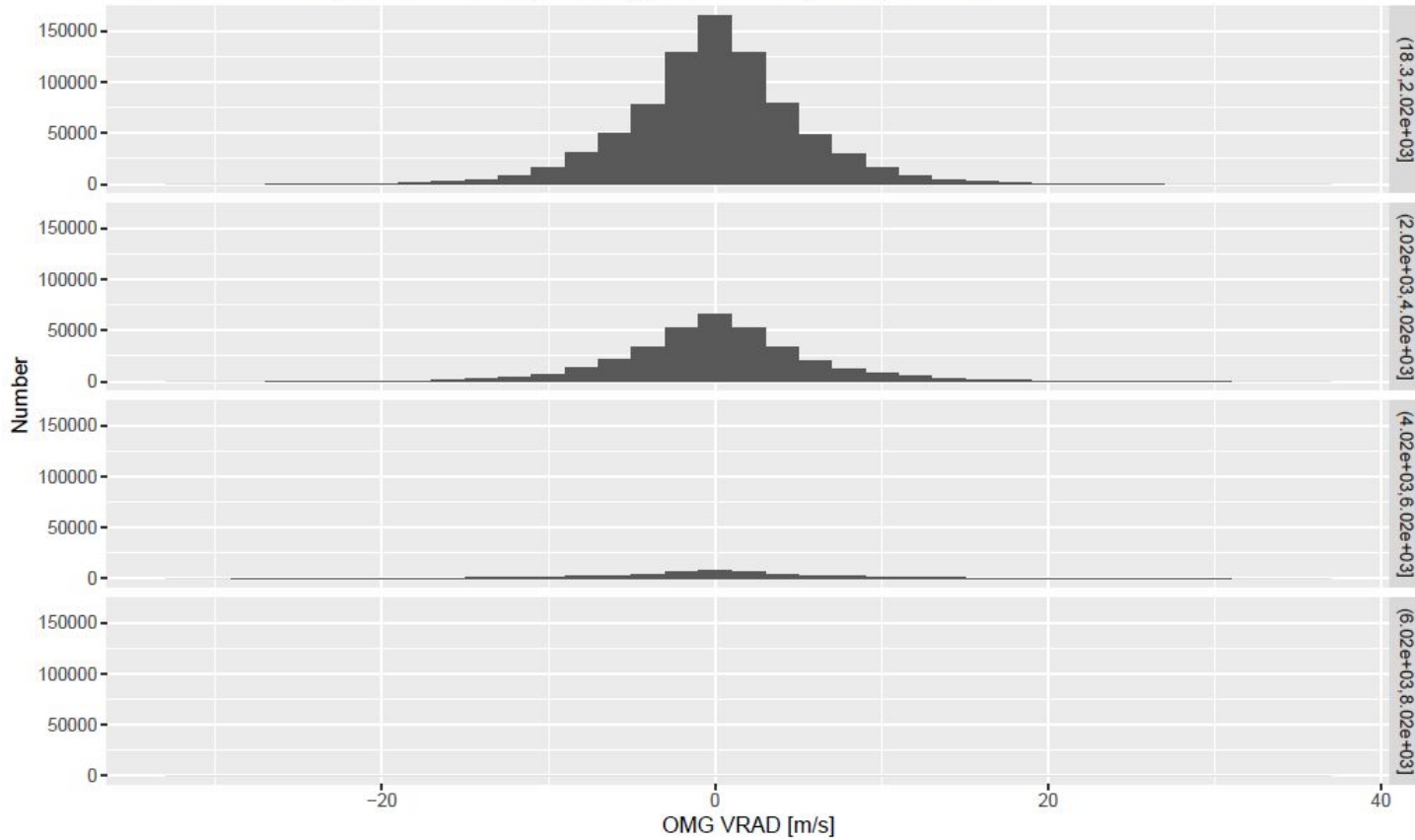


- **VRAD OMG** departures all data over 24 days

Statistical analysis

OMG VRAD distribution for 2020-05-22_00 - 2020-06-13_18
per vertical layer of 2 km
and distance from radar 0 to 30000 meters
for fr radars

Total No data: 1196674; Total No radars: 21; Mean omg vrad: -0.01 m/s; Sd omg vrad: 5.37 m/s



FR

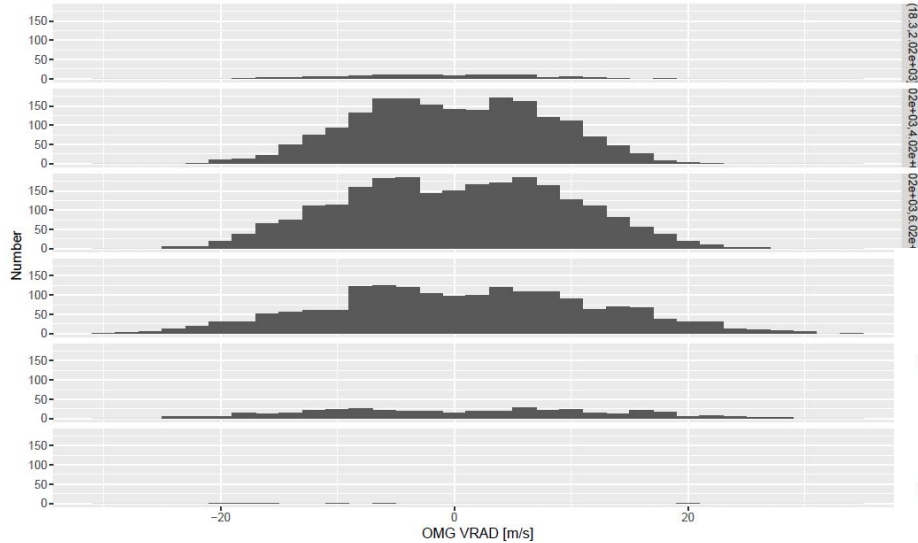


Statistical analysis

OMG VRAD distribution for 2020-05-22_00 – 2020-06-13_18
per vertical layer of 2 km
and distance from radar 0 to 30000 meters
for si radars

Total No data: 6504; Total No radars: 2; Mean omg vrad: 0.21 m/s; Sd omg vrad: 9.71 m/s

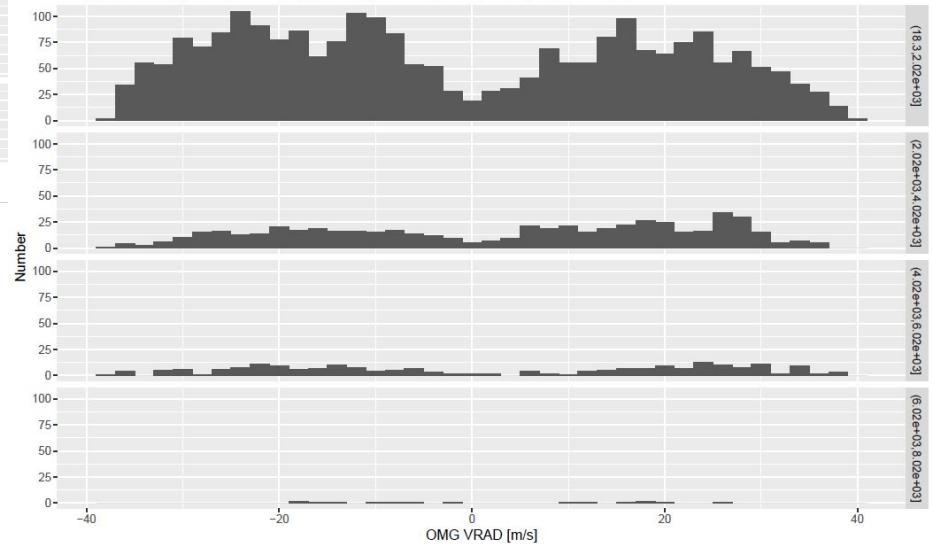
SI



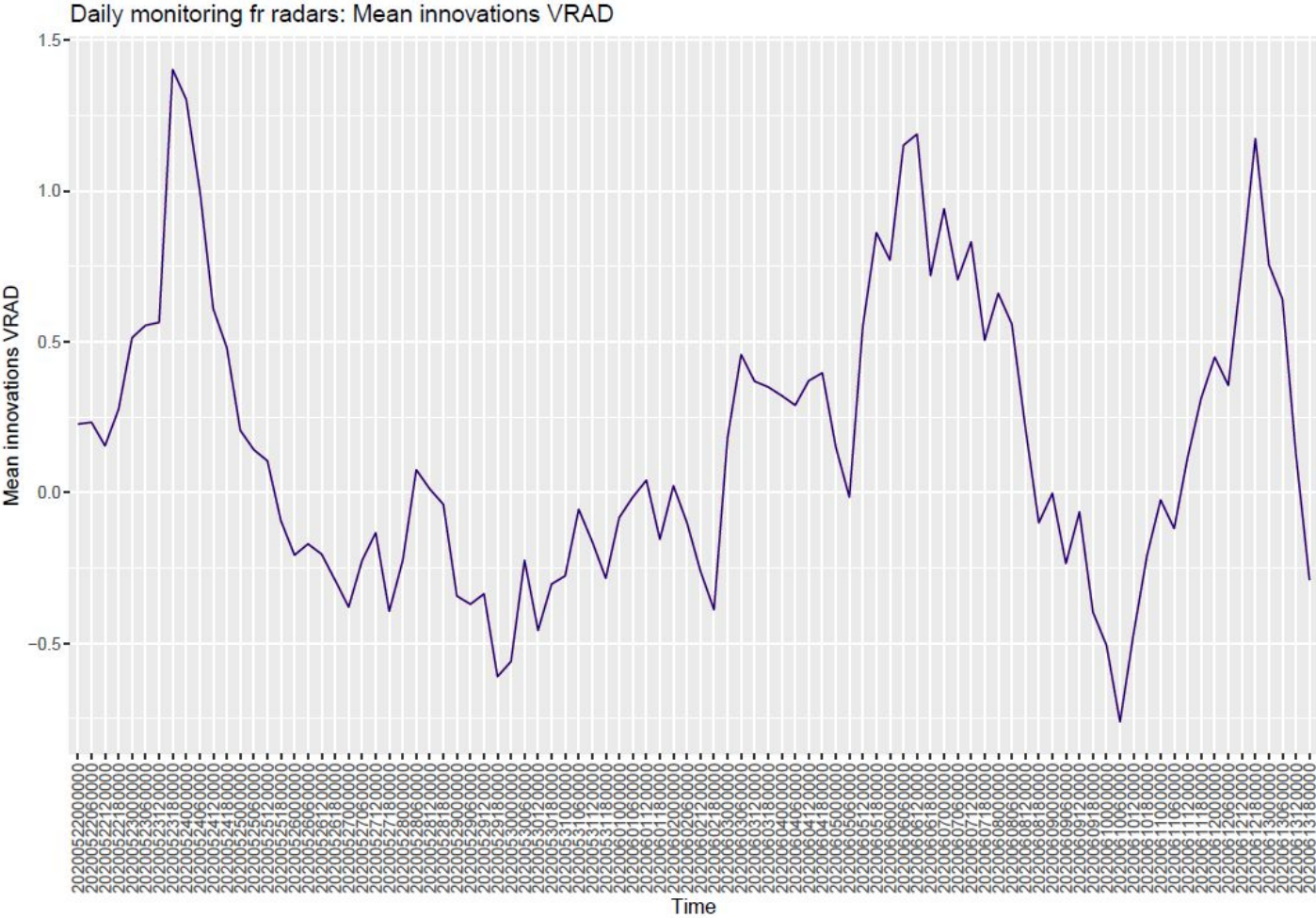
OMG VRAD distribution for 2020-05-22_00 – 2020-06-13_18
per vertical layer of 2 km
and distance from radar 0 to 30000 meters
for dk radars

Total No data: 3137; Total No radars: 2; Mean omg vrad: -0.71 m/s; Sd omg vrad: 20.97 m/s

DK



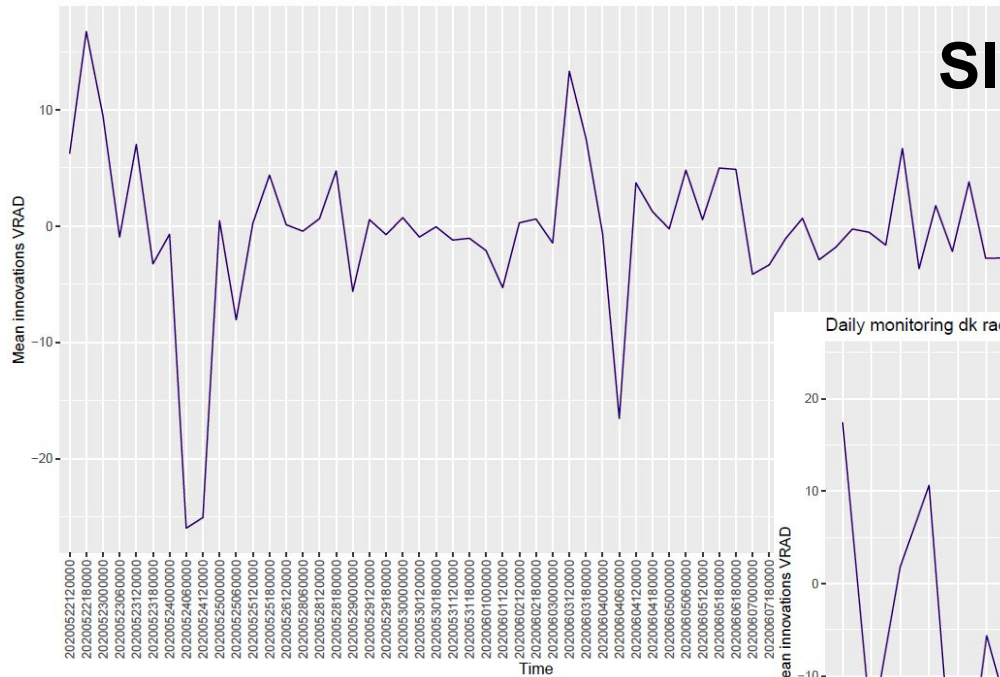
Statistical analysis



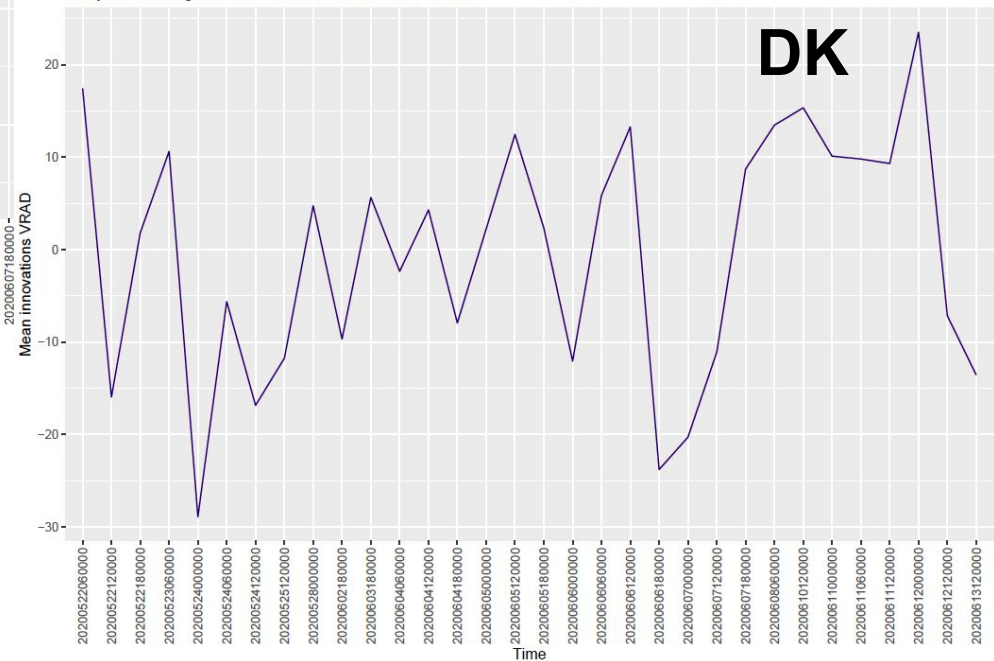
FR

Statistical analysis

Daily monitoring si radars: Mean innovations VRAD



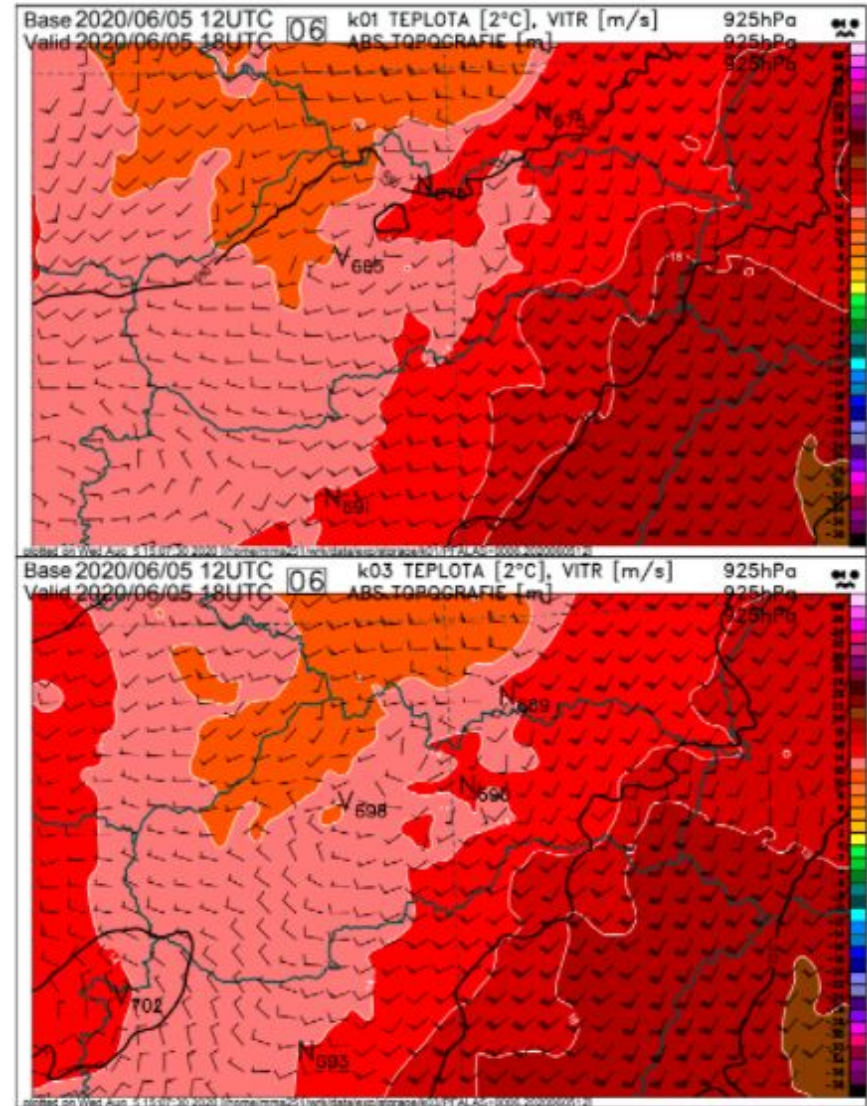
Daily monitoring dk radars: Mean innovations VRAD



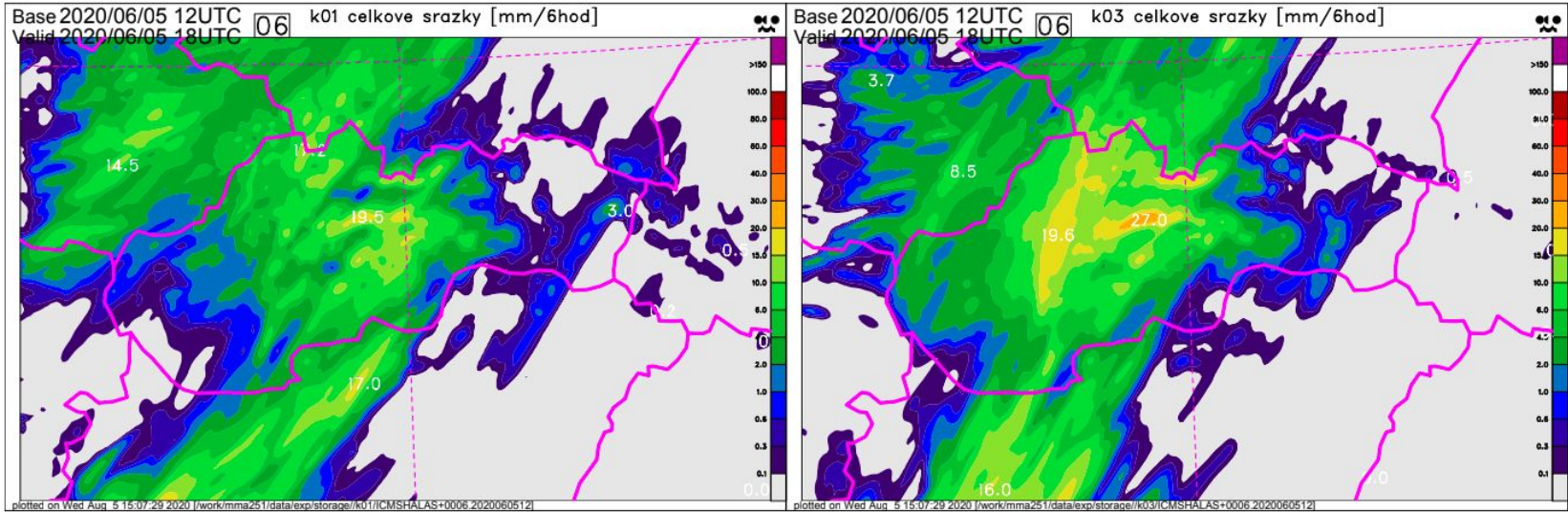
Case study

2020-06-05_12+06

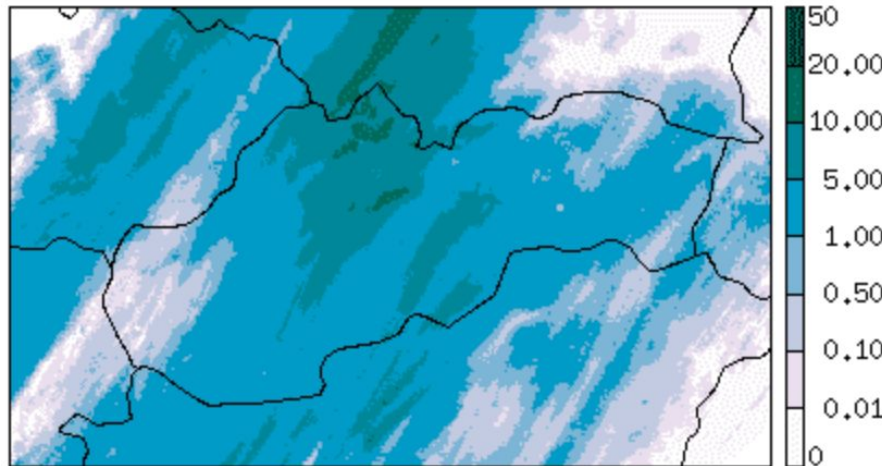
- k01: without VRAD assimilation
- k03: with VRAD assimilation



Case study



inca



- k01: without VRAD assimilation
- k03: with VRAD assimilation
- inca reference

Conclusions

- HOOF issues related to incorrect quantity name reading when `splitMeasurements=False` was fixed.
- An error which led to HOOF crash when a dataset contains only TH but no DBZ was reported and fixed in HOOF_v1.9.
- A bug in HOOF for radars with special scanning strategy was reported.
- Statistical characteristics of OMG, OMA departures for Slovenia, Denmark should be investigated further to understand the incorrect behaviour.
- The case study indicated a positive impact if radial wind assimilation but a quantitative analysis should be completed.

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Limited Area Modeling in Central Europe*



Thank you for your attention.



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