



High resolution modelling of extreme precipitation and evaluation of its variability for the flood risk management using the Lokal-Modell

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Topics

- ❖ Structure of the project
- ❖ Reconstruction of precipitation events
- ❖ Estimation of the variability of precipitation by
 - ❖ modifying humidity and temperature
 - ❖ shifting weather conditions against orography



Project

Joint Research Project (granted by BMBF)

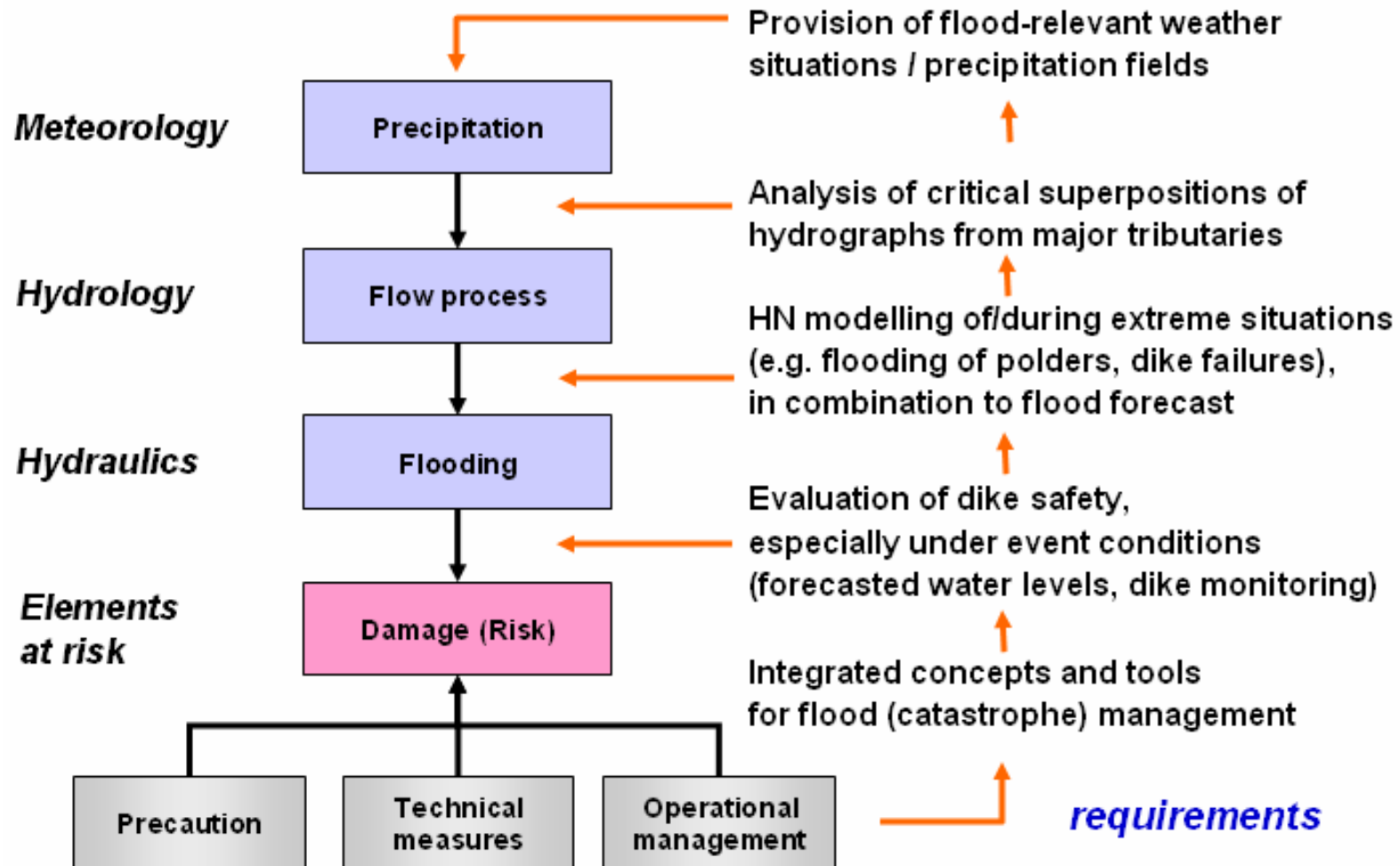
Risk management of extreme flood events (RIMAX)

Operational management of large-scale extreme flood events - the example of the middle Elbe river





Overall project concept: intended improvements (integrated approach)



Bücheler et al. (2005)



Goals

❖ Objective 1

- ❖ Provision of innovative modules for operational flood management
- ❖ „Online-suitable model components“ for flexible further use

❖ Objective 2

- ❖ Coupled scenario simulation starting from extreme precipitation events with varying (but reasonable) precipitation

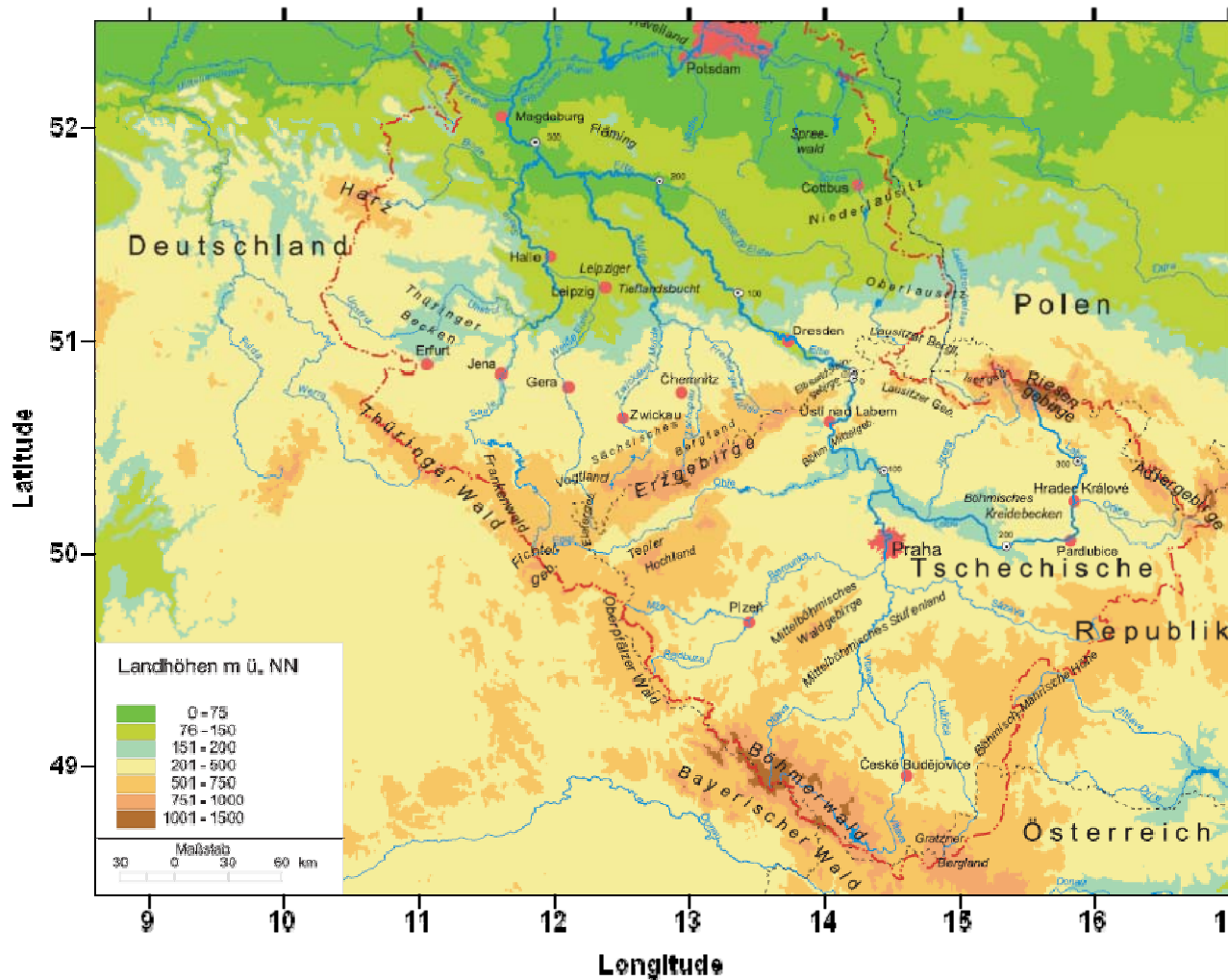


Identification of four basic types of flood events

types	selected events
winter events with pluvial characteristics	1988, 2003
winter events with significant fraction of snow melt	1987, 2005, 2006
summer events due to Vb-patterns	1981, 1997 (Oder), 2002
summer events due to persisting cyclonic west patterns	1980

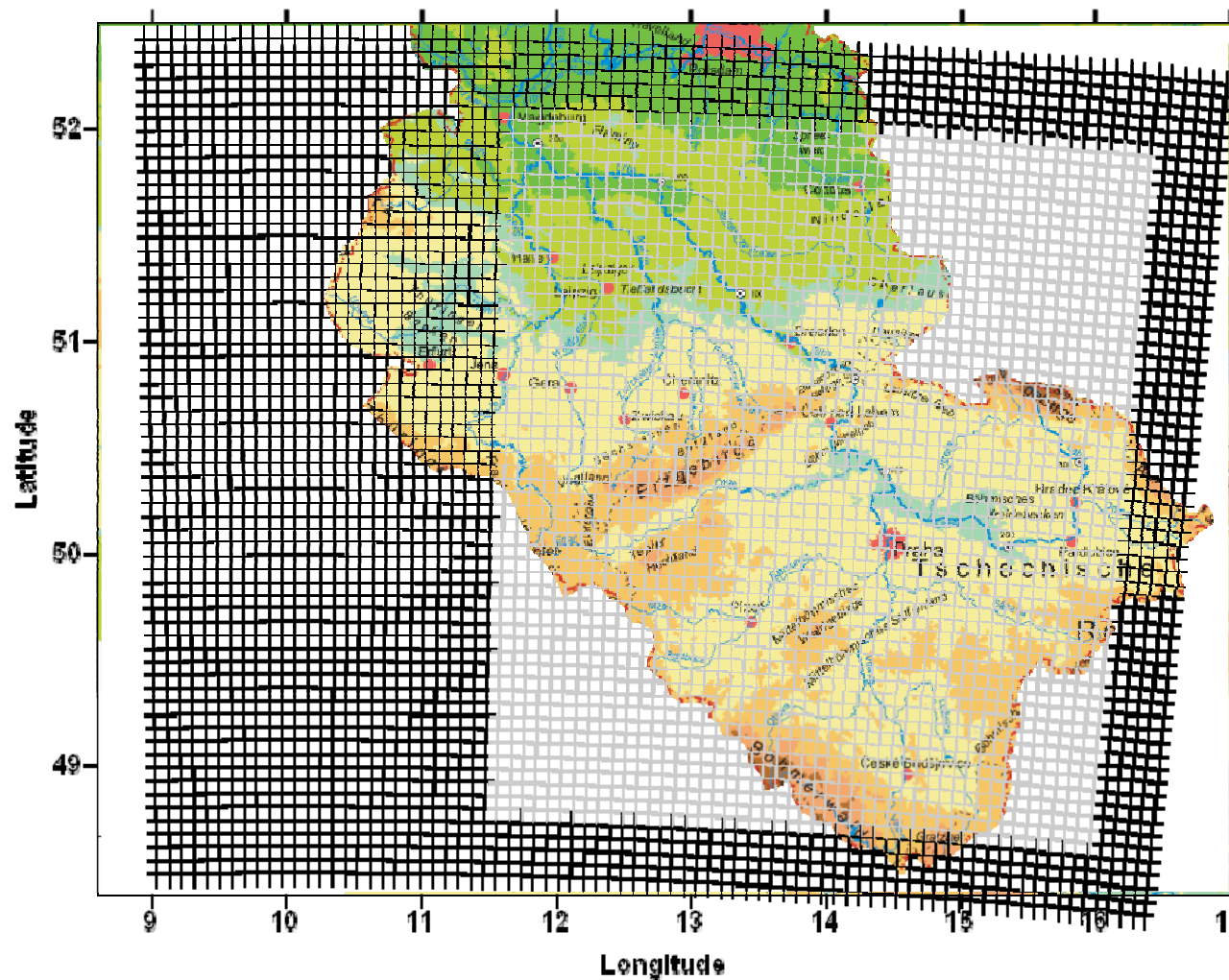


catchment area of the Elbe river



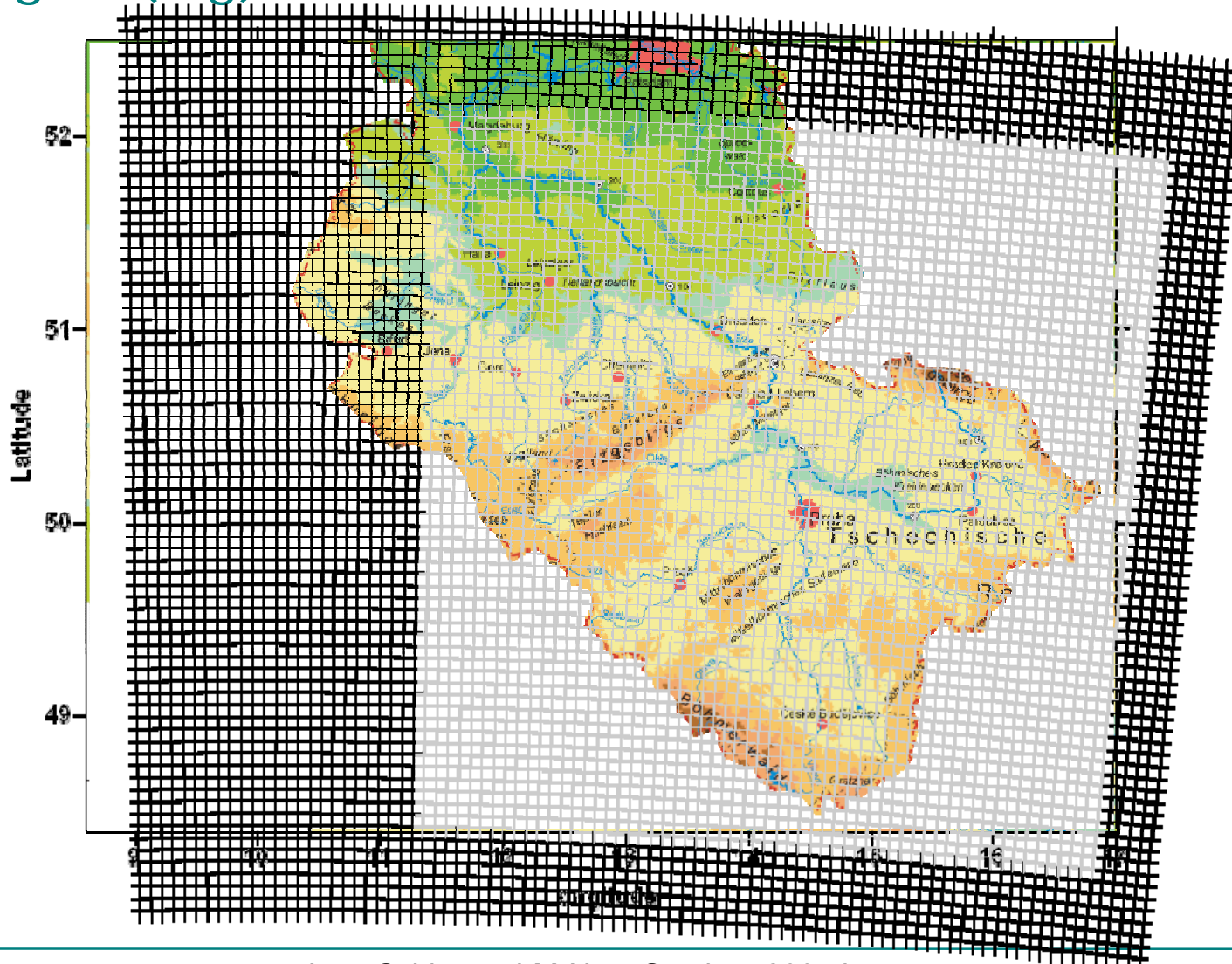


model grid (small)





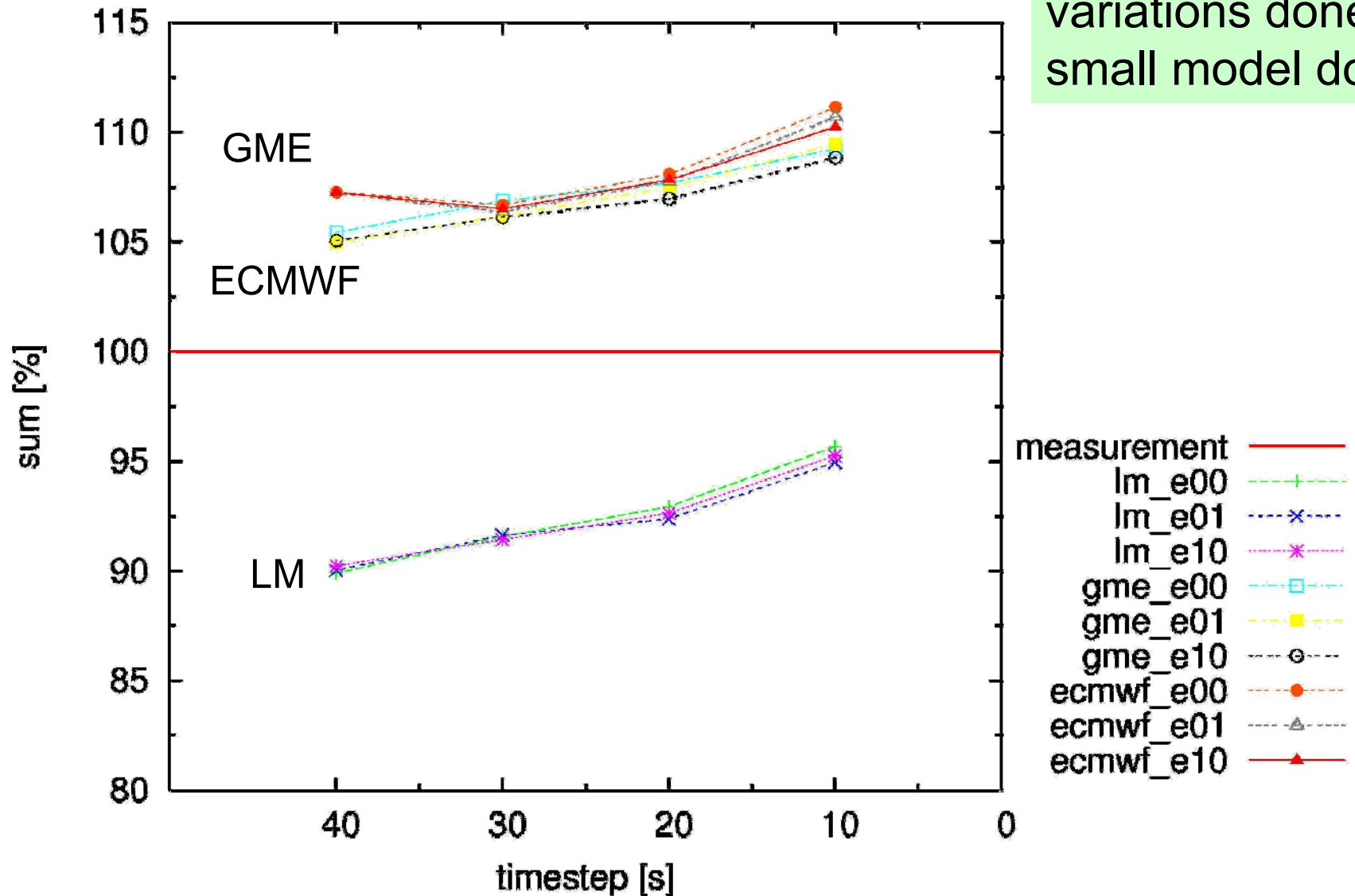
model grid (big)





precipitation sum 10.–14.08.2002

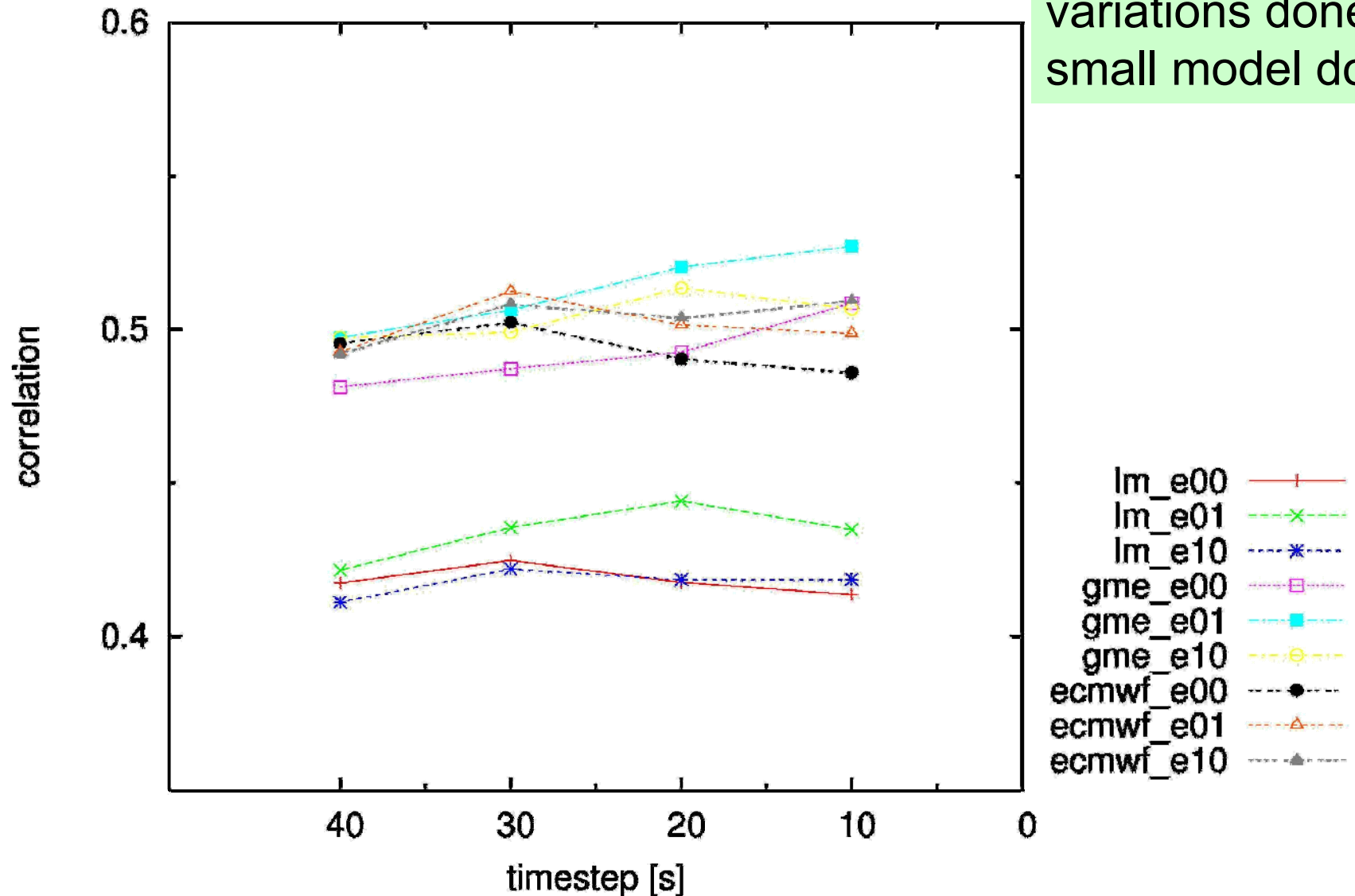
variations done on
small model domain





pearson correlation

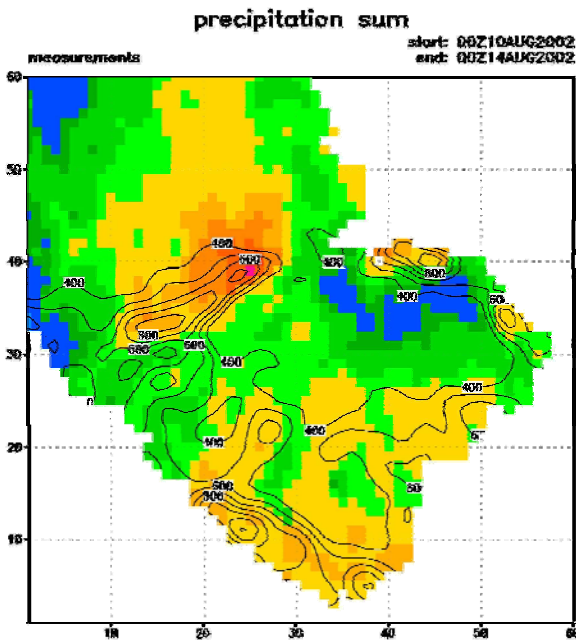
variations done on
small model domain



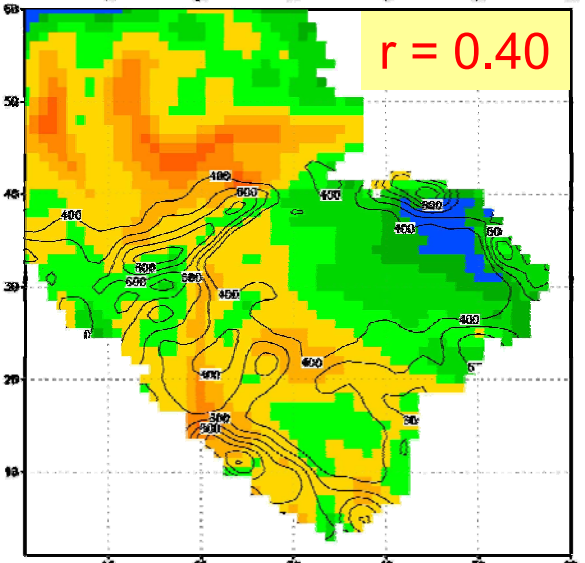
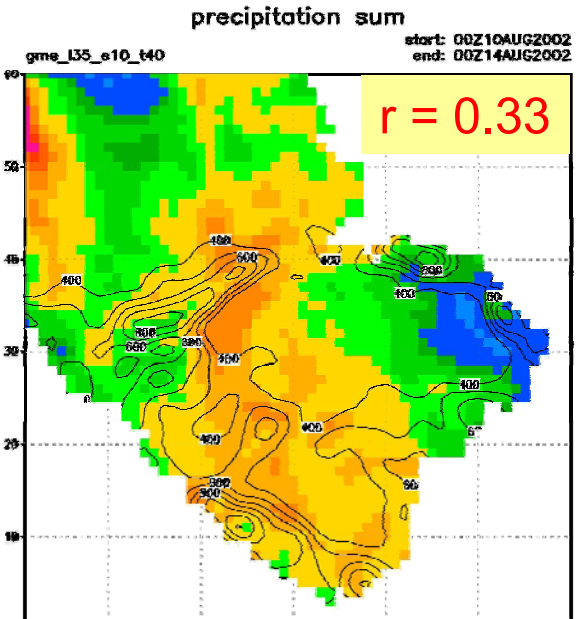
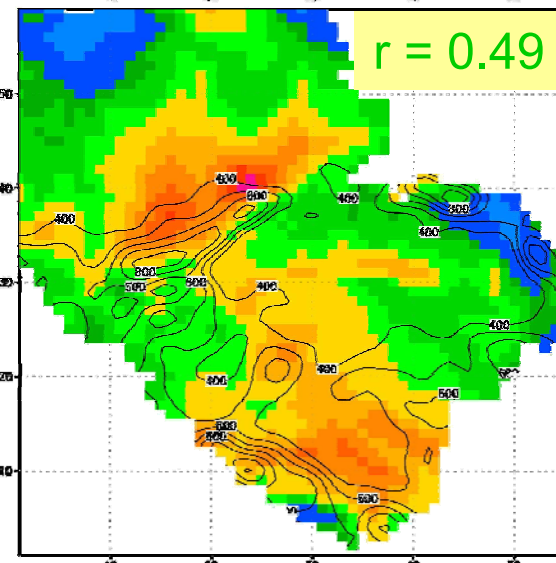
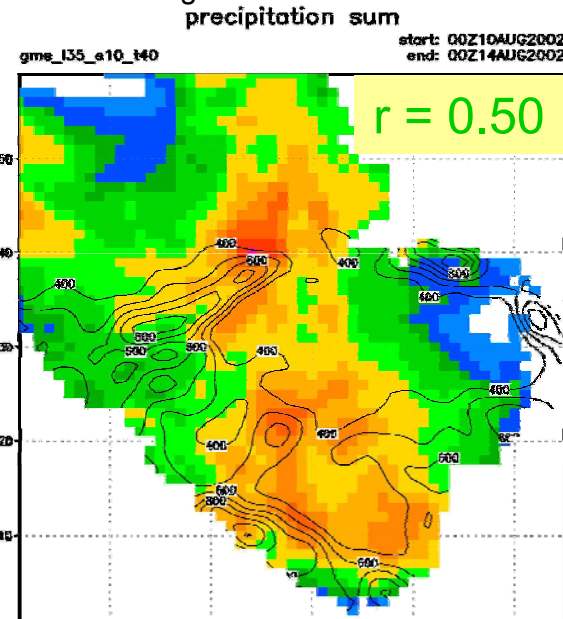


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GME analysis data



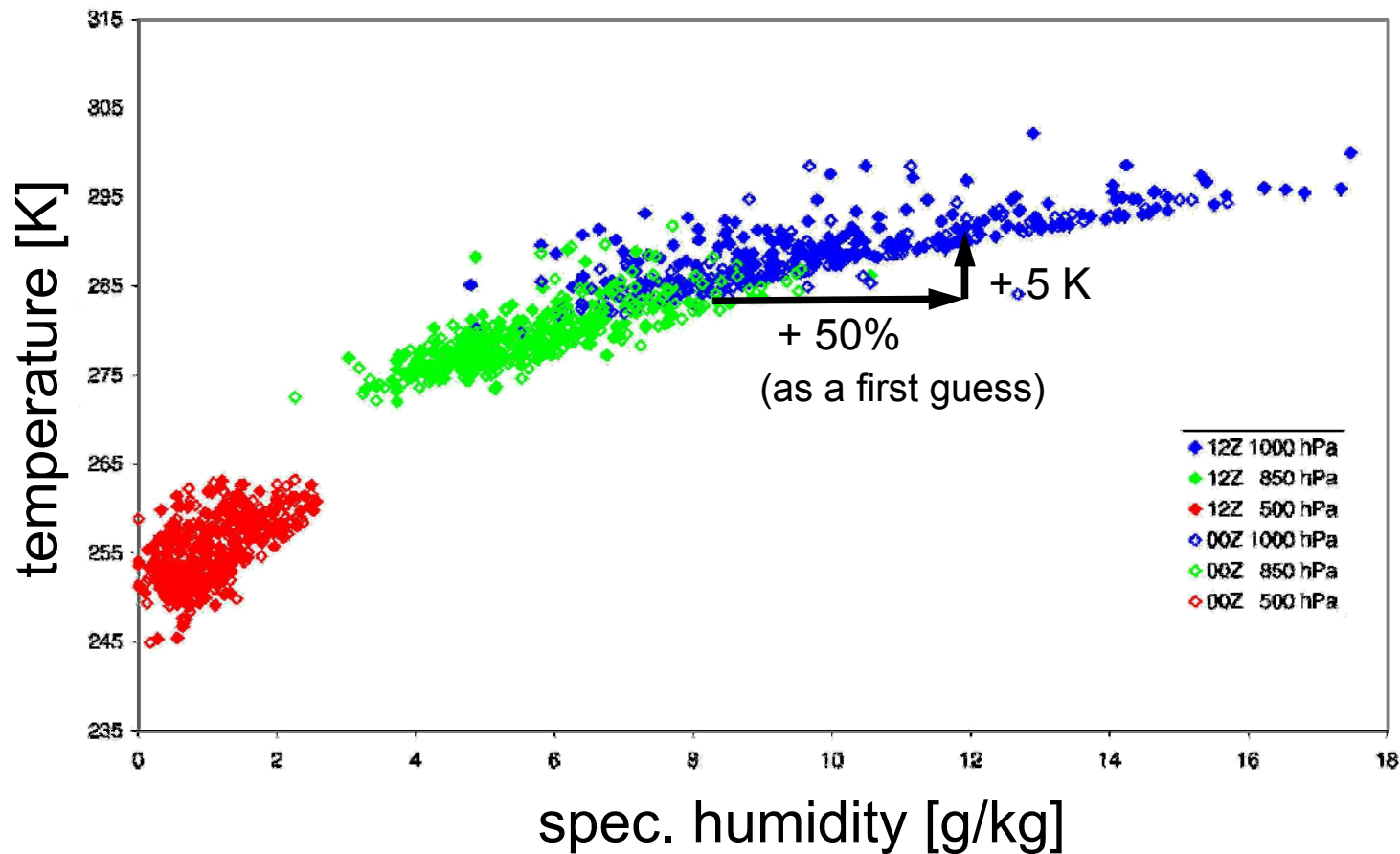
ECMWF analysis data

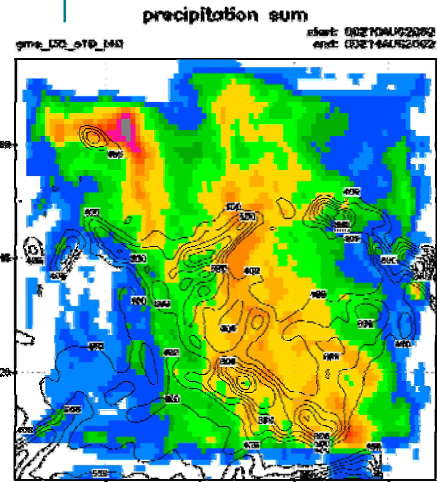




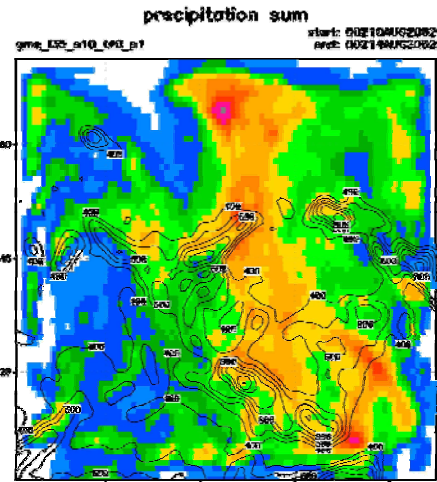
Modification of humidity and temperature

NCEP Reanalysis, Vb-patterns

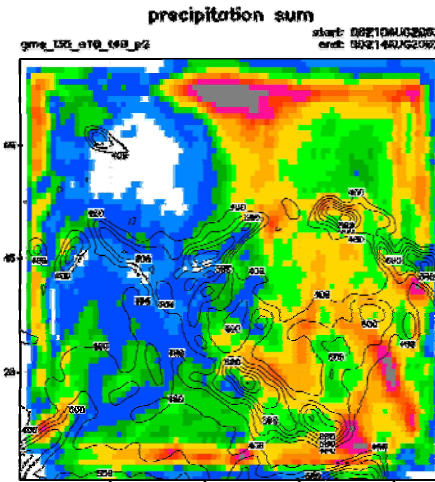




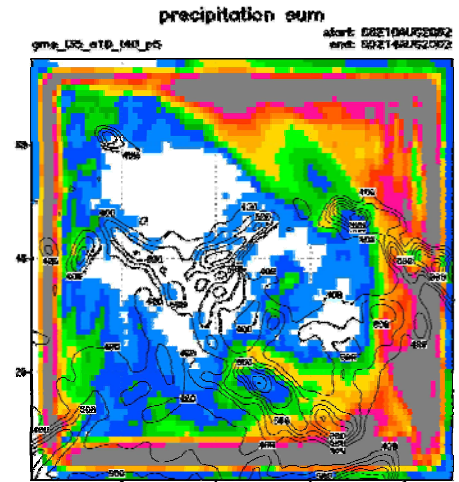
reference run



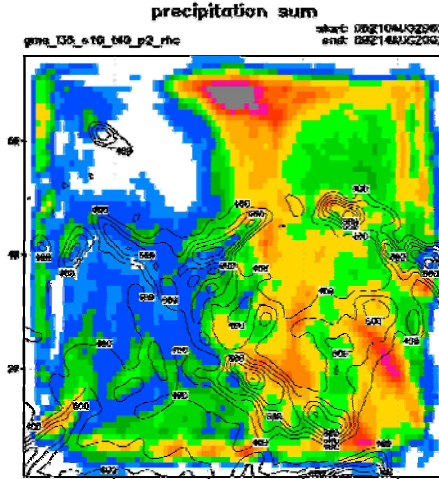
QV + 10%, T + 1 K



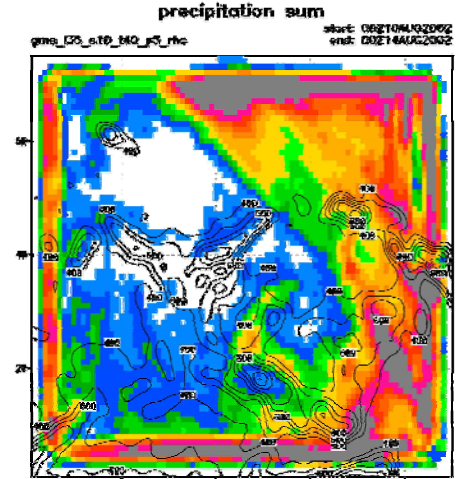
QV + 20%, T + 2 K



QV + 50%, T + 5 K



QV + 20%, T + ΔT_1



QV + 50%, T + ΔT_2

as a second guess:
relative humidity remains constant

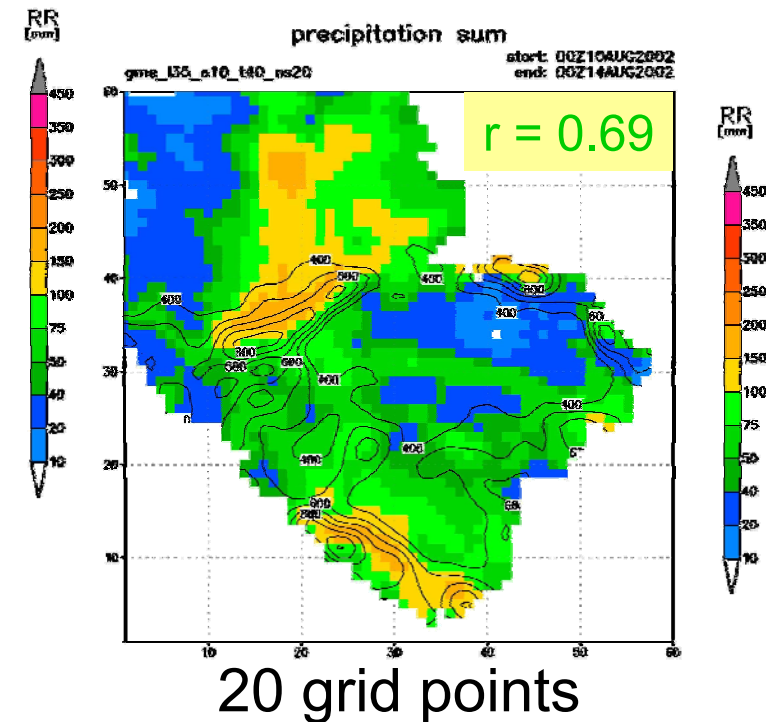
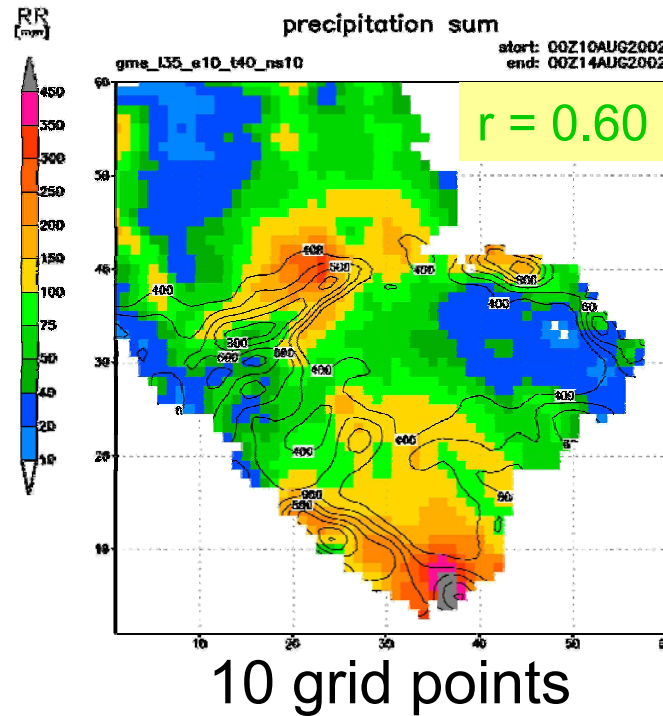
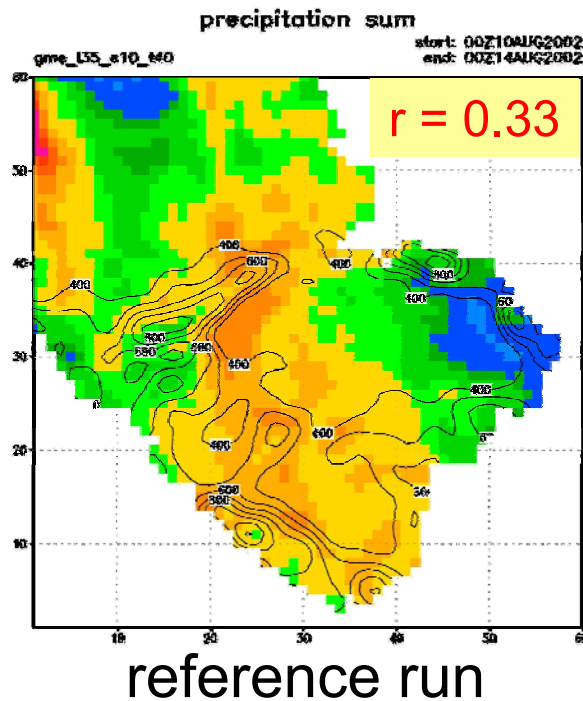


Spatial shift of weather conditions

- ❖ Run INT2LM with a shifted model domain (10 and 20 grid points to north, east, south and west, resp.)
- ❖ Change longitude and latitude in grib files back to original coordinates
- ❖ Substitution of the constant fields (orography, soiltype, ...) and the fields in the soil layers



Shifting to the south (10 grid points = 70 km)





Summary and outlook

- ❖ Extended model domain worsen the precipitation modelling, so selection of a suitable model domain is advisable
- ❖ Increasing of humidity leads to explicit boundary effects. Further investigations have to be made. Maybe the event 2002 is already saturated... (switch to other events)
- ❖ By shifting the weather conditions we get precipitation fields (amongst other!) which are far better than reference run
- ❖ Reduce grid spacing to 2.8 km (and later to 1 km)



Thank you for listening



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