Verification breakout session

Review of the high impact weather over the summer. Subjective and objective verification and gaps.

Presentations and discussion

- *Christoph Gebhardt*. Precipitation forecasts of the ICON model suite for a severe flash flood event in Western Germany on 14/15th July 2021 (20 min)

- *Flora Gofa* et al. Overview of forecast methods and evaluation approaches linked to HIW (20 min)

- *Marion Mittermaier*. When the rain falls between the gauges. How good is radar really at telling you what's happening on the ground? (20 min)

- *Carl Fortelius*. Discussion on observation requirements for hectometric (sub-km-scale) model verification. (25 min)

- Wider discussion. Model inter-comparisons? What is still the biggest barrier for verification of high-impact weather events and their representation in km- and sub-km scale models? Can we address observation uncertainty? (25 min)

- Wrap up (10 min)

Summary of verification session 1

- Many examples of working towards a holistic way of verifying models. Both the ACCORD and AWARE efforts are excellent examples of working towards verification "best practice".

- Method presentations for neighbourhood verification of ensembles; verification of extreme localised precipitation.

- Efforts around agreeing methods, practices, software and data need to continue

- Exploitation of super site observations

- Exploitation of synergies with DA

- Expanding the use of crowd sourced observations and QC

- How to enhance user interactions: testbeds?

Summary of verification session 2

- For model development the reduction in systematic biases is a key component. Need observations and methods that provide a robust estimate of these biases including supersites, field campaigns.

- Getting closer to the observations/processes: use of lightning, radiation, radar reflectivity.

- Challenges of forecasting localised events e.g. precipitation on the ground, fog, low visibility, AQ and then verifying them. The weaknesses in the observations.

- How do we deal with sub-km-scale models? Do we need them? How do we show value? Domains with more complex terrain likely to show more value but this presents other challenges for observations. Need methods and observations which can keep the fine scale, but also explore the theoretical as well as larger scale, e.g. spectra. Can learn from the LES community.

- Model inter-comparisons: role of field campaigns. Planned: WesCon and Paris 2024. How can we exploit this? Which models? What variables? Common area is beneficial. Could an intercomparison without a common area be designed? Could test cases be used?

Summary of verification session 3

- How do we solve the observation uncertainty conundrum? Merging and data fusion is still the best solution, but more needed for estimating uncertainties to deal with detection issues and impact of evaporation in the sub-cloud layer. Christoph Gebhardt showed some interesting results which suggested that DA/LHN of the radar data at the shorter lead times was influential at reducing the size of the rain volumes. This is at odds with the general conclusion that assimilation of radar data is beneficial for ICON. QC is therefore a key factor to both assimilation and verification.

- Identify subgroup(s) interested in developing SRNWP-wide activities around observation uncertainty (probabilistic observations) and designing intercomparisons, with links to the SRNWP-EPS activity? Could an extensive list of interesting cases be a way to do this? (e.g. LACE interesting case database)

Finally... last but NOT least!

- We want to thank Bent Hansen Sass for his contribution to EWGLAM verification sessions and want to wish him well for the future.