

# PHY-EPS hectometric Workshop

DWD, 5-7 February 2024

## Summary activity and final discussion

### Round-table of key-points

(\* = name unknown)

Humphrey

- we've all had different experiences with models at these scales
- grey zone problem still key
- what is your application – all our applications are different

Chiara

- what observations we need
- problem of upscaling not well understood
- develop model for 100 m but still use at 10km

Davide

- still room for numerical experiments for microscale -> mesoscale

Didier

- need to work on turbulence
- need of evaluation with fine scale observations
- difficulties to evaluate model at different resolutions
- need of evaluation with fine-scale observations

Juerg Schmidli

- LES is a very valuable tool for parameterization development
- great observations are becoming available

Sophia

- I would be interested in future plans for 3D radiation / 3D turbulence / small-scale circulation (especially in complex terrain, e.g. in connection with TEAMx)

Kirsty

- physics schemes that we need for O(100m) models, especially turbulence and shallow convection
- appropriate diagnostics for ensembles
- appropriate observations for evaluating O(100m) models

Lewis

- not much evidence that going to sub-km is giving a lot of benefits
- long way to go developing grey zone and shallow convection
- not much work on statistical downscaling, going to sub-km with less computational cost

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- don't forget uncertainty in optimizing parameters
- ensemble
- benefits of improving orography

Alberto

- similar problems in the community
- look at organization
- is surface more important

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- shocked that 500m don't get so much benefit
- look more at the horizontal scales of processes, moisture and thermal transports scales
- problem we have look at scales

Wim

- many processes key at same time
- look at simple scales
- don't look at 2m temperature

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- Smagorinsky and 1d closure should be combined to get benefit of both
- generalized boundary layer approximation for turbulent layer is needed
- filtering of orography is an issue, adaptation of SSO parameters
- interpretation of results – upscaling procedures

Natalie

- valuable observations for verification – good observation campaigns
- lots of progress from 2 years ago

Stephan

- learned a lot as LES modeler
- not all models are using horizontal subgrid diffusion, there is some inconsistency
- need for LES modelling of 3d fields in cities

Brigitta

- search for phenomena on O(100m), what would we benefit
- appreciation for horizontal shear paper
- observations – adapt model validation strategies

Aristofanis

- how can we ensure that ensemble perturbations are constrained from natural variability
- as we go to O(100m), couple perturbations from different schemes in the models

- what type of metrics for hi-res ensembles

Birgit

- scale awareness – is nice but are we still far from it working well?
- modeling and obs. – different field campaigns – obs and modelling groups are too far apart

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- we have hi res measurements
- choices for parameterizations can make a big difference
- specific applications – modelling of forest fires

Ivan

- what are the right reasons/ right results? Assumptions still need to be examined

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- good progress, but pragmatic solutions, lack comprehensive theory for grey zone convection
- not convinced that the O(100m) modelling is cost benefit effective for operations
- still important to improve 1 or 2 km operations models

Andrei

- everyone needs new physics but we don't have it, progress is slow
- might not be worthwhile to work on grey zone
- people are tackling problems based on personal preference, setting priorities would be useful

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- surprised with how difficult it is to show improvement between 500m and 2km
- I think there are places where obs and modelling are working very well close together

Juan

- a bit disappointed there wasn't more EPS talks
- wanted to decide if we should improve resolution, we decided after this to wait

Andrzej

- can't see reason to go to O(100m) scale modelling for operations, not convinced
- keep focus on forecasting, focus for better forecasts

Anders

- improvements to clouds but need more focus on improvements to microphysics
- liked discussion about parameter uncertainty, what parameters to include
- do idealized simulations represent reality

Guenther

- benefits and issues are similar at DWD to others
- for ICON development, invest more into expanded parameter data, parameterization development

Zahra

- cautious - the physics seems behind in  $O(100m)$  modelling
- newcomer in EPS, ensemble has a lot of potential

Daniela

- dig deeper into certain parameterizations in terms of higher resolution
- implementation
- check for more suitable measurements in the Alps

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- instrument synergy – velocity variance
- have parameters that adapt to the flow
- think in terms of split between grid scale and subgridscale

Yann

- don't share the same models, share same problems, continue meetings
- shown in presentations that performance depends on parameter you look at

Eric

- 2 km and 1km have been tuned already but 500m and below has not – might need to change comparison methods
- agree with Ivan, hypotheses are still not valid at  $O(100m)$ , use of SSO

Russell

- observation campaigns are encouraging
- surface seems to have big impacts, should investigate more

### **Final discussion and conclusions**

The final discussion elaborated the key-points proposed by the participants. A remarkable comment was that there is a high ethical standard in this community: we want to have the things right for the right reason! Some general conclusions are here summarised, divided into three topics:

#### **1. Scientific development:**

- missing comprehensive framework for turbulence and convection
- scale aware schemes
- use LES, use idealized simulations
- understand the perturbation upscale
- include uncertainty in optimizing parameters
- metrics, change the verification methods
- use special observations and campaigns
- evaluation of the processes

#### **2. Organisation of the community:**

- a lot of progress in the last 2 years
- we need to set priorities

- more development is needed
- O(100m) ensemble lags behind

### 3. Usage of very high-resolution models:

- consider that the forecast is used by forecasters
- consider the needs of the users
- the models are used at lower resolution than the nominal

The organisers and the participants propose that this community meets regularly, to follow and foster the developments in the hectometric scale modeling. Some collaborations are already in place, others are reinforced or started thanks to this workshop. A good framework for collaboration is offered by the observational campaigns.

See you in about 1 year!