Consortium for Small-Scale Modelling

Michał Ziemiański

37th EWGLAM and 22nd SRNWP meeting
5 October 2015, Belgrade

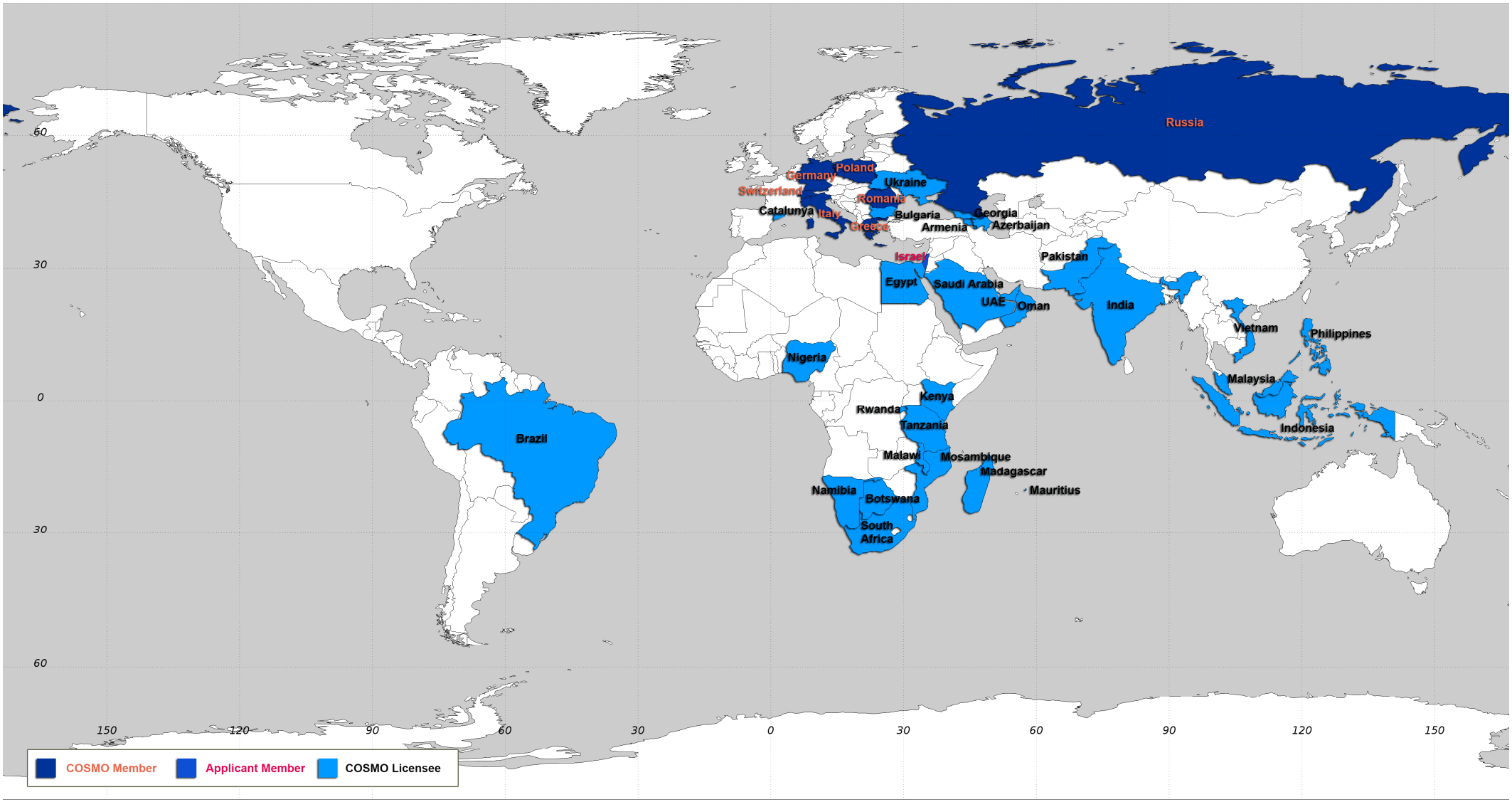
COSMO Governance: General:

- New COSMO Science Plan was approved by the STC in March 2015, and is in force, now; sincere thanks to all external reviewers!

- The Israel Meteorological Service (IMS) successfully begun the second year of its applicantion period to the COSMO consortium

- There is one more COSMO licence taker (Namibia) with possible Turkmenistan next year (see the map)

COSMO users in 2015



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COSMO Governance: Elections

- In September 2015 COSMO Steering Committee elected:

  → Detlev Majewski as the Steering Committee Chair for 2016

  → Michał Ziemiański as the Scientific Project Manager for 2016

  → Antonio Vocino as the Source Code Administrator for VERSUS

COSMO Governance:
Current priority projects and priority tasks

- COSMO priority projects and tasks (PP/PTs) implement the overall strategy of harmonization with ICON and the newly adopted Science Plan
- This year, we have a substantial number of new PP/PTs
- The current PP/PTs are as follows:

  → new PP KENDA-O for further development of LETKF assimilation methods and use of diverse observations

  → continuation of PP CELO, now for COSMO model with compressible EULAG dynamical core (ECMWF)

  → new PP CDIC on testing ICON dynamical core for regional model framework

COSMO Governance:
Current priority projects and priority tasks

- continuation:

  → new PP T2(RC)2 for further improvement od cloud-radiation coupling and use of new aerosol information (Tegen climatology, prognostic MACC fields)

  → continuation of PT ConSAT on new turbulence and SAT schemes

  → continuation of PP CALMO on objective model tuning, now directed into convective-scale applications

  → new PT TSA for improvement of stand-alone surface model TERRA

COSMO Governance:
Current priority projects and priority tasks

- continuation:

  → new PP INSPECT on spatial verification methods, especially for EPS applications, and a contribution to MesoVICT

  → continuation of PP POMPA for GPU capable model version and its porting to main model trunk

  → new PP SPRED for development of convective scale ensembles and especially for improving near-surface spread and for post-processing/interpretation

A few scientific issues:

- Objective tuning of model physics:

  → results of PP CALMO for 7 km resolution (comparable/better than expert tuning?)

- Convective scale ensembles:

  → external evaluation of COSMO-DE-EPS, COSMO-E (systematic issues, skill?)

PP CALMO: objective tuning

- The method is based on Bellprat O. et al., 2012: „Objective calibration of regional climate models”, *Journal of Geophysical Research*, **117**, D23, adapted to NWP purposes

- Results for COSMO-7 calibration of turbulence length, minimum limits for the turbulence coefficients and the heat resistance length of laminar layer for T_2m_max, T_2m_min and precipitation are published as COSMO Technical Report No. 25 by P. Khain, I. Carmona, A. Voudouri, E. Avgoustoglou, J.-M. Bettems, F. Grazzini

PP CALMO: objective tuning

- The recipe:

  → find an analytical approximation for the dependence of model results (T, precip.; for an area, time period) on the tuned parameters: quadratic Metamodel; expensive!

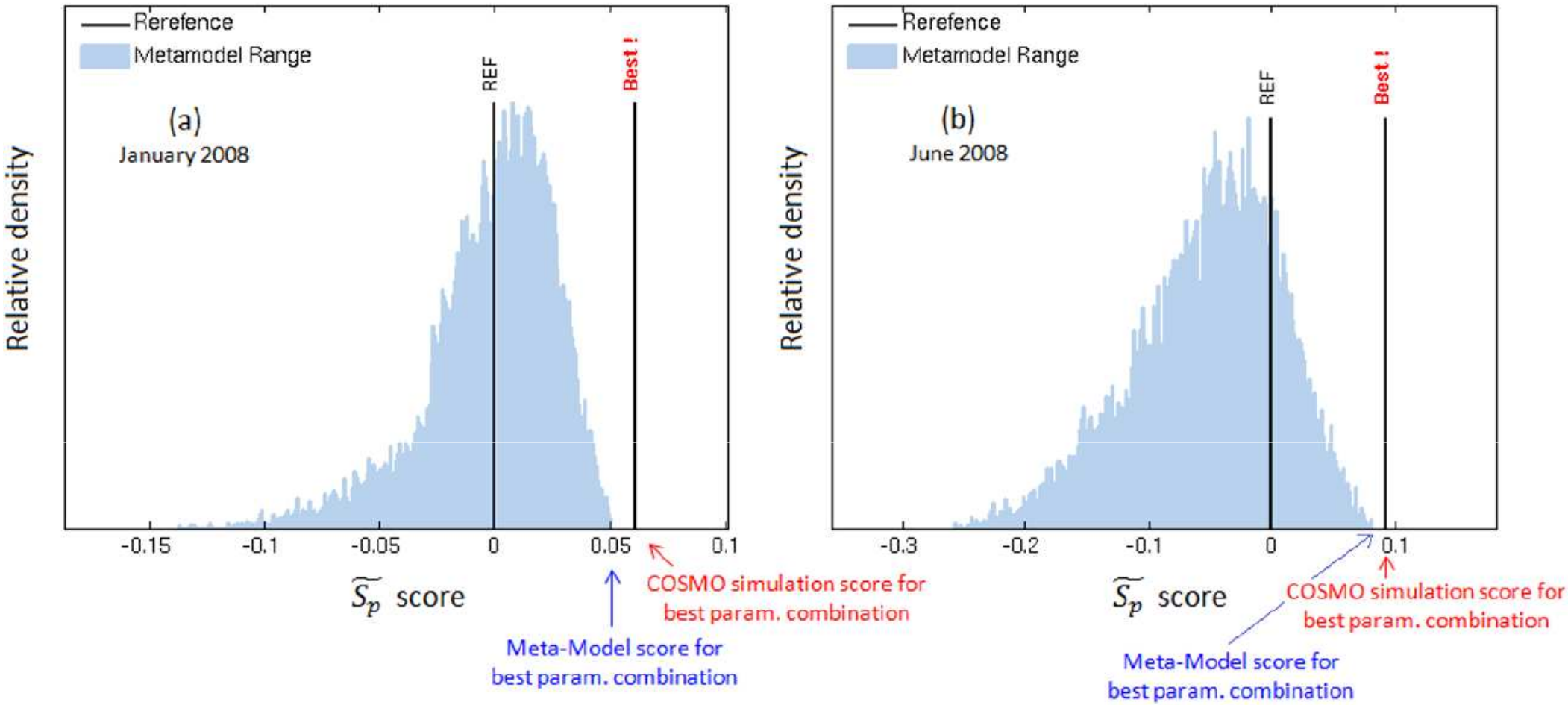
  → define suitable performance score quantifying the model error (common for T, precip.)

  → find minimum of the performance score using the Metamodel and observations, densely probing the space of possible values of tuned parameters

  → results:

PP CALMO

Improvement for relative score (against the expert tuning):



PP CALMO

- Practical improvement (seen in mean errors): temperature for winter and precipitation for summer, otherwise the results are neutral (optimistic!)

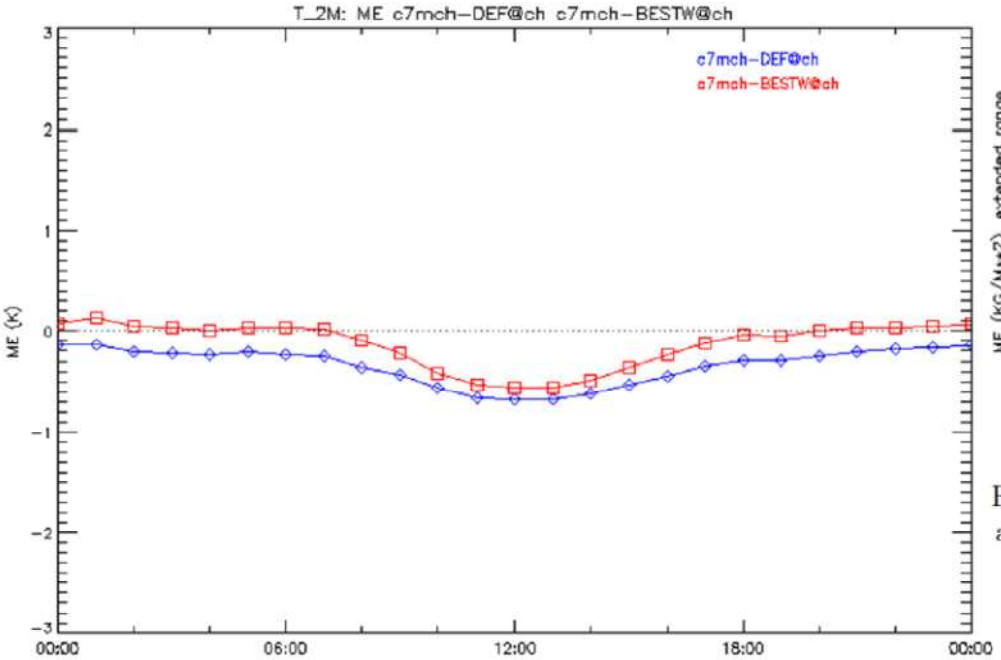


Figure 43: 2m-temperature diurnal cycle mean error for the REF (blue) and the Best (red) simulations, for the period 2-20/1/2008. The Best simulation is clearly better than REF simulation.

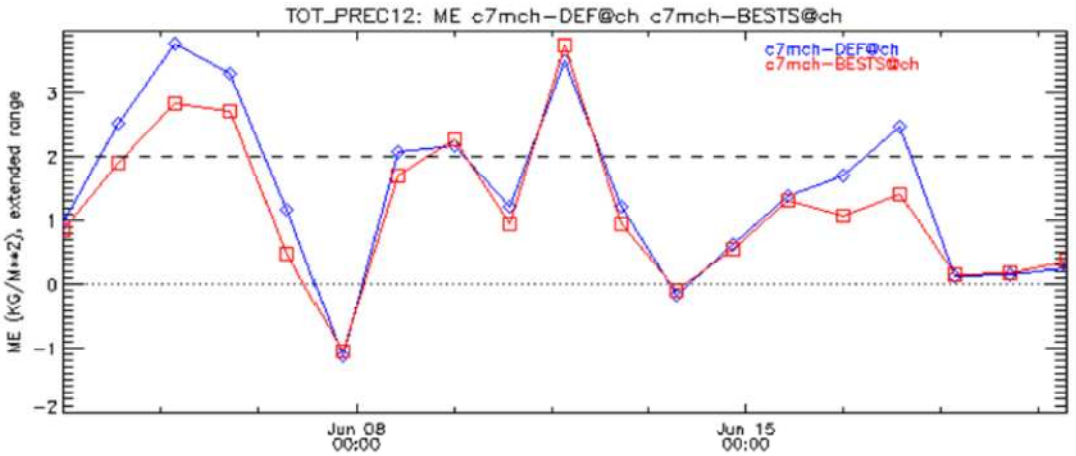


Figure 46: Mean error time series of the 12h accumulated precipitation for the REF (blue) and the Best (red) simulations, for the period 2-20/6/2008. The Best simulation is clearly better than REF simulation.

COSMO external review:

- COSMO convective-scale models were recently externally evaluated in European Severe Storm Laboratory (ESSL) Research and Training Centre:

  → ESSL Testbed 2014 experiment (2 to 27 June), for COSMO-DE and COSMO-DE-EPS

  → ESSL Testbed 2015 experiment (25 May to 26 June 2015), for COSMO-DE and COSMO-DE-EPS, as well as COSMO-E and COSMO-1

COSMO external review: main findings:

→ the model simulates the evolution of mesoscale convective systems (MCS) well, once these systems are present within the COSMO domain

→ often, convective initiation was late in all of the convection permitting COSMO models (especially over flat terrain, in absence of weather systems that produce local lift, and in warm air-masses), no specific differences beetwen models

→ convective coverage, away from the mountains, was also often underestimated, but better represented by EPS tools

→ participants noticed on several occasions that particular features of the deterministic run were forecast well 24 or even 48 hours in advance (e.g. some tornadic supercells)

COSMO external review: main findings:

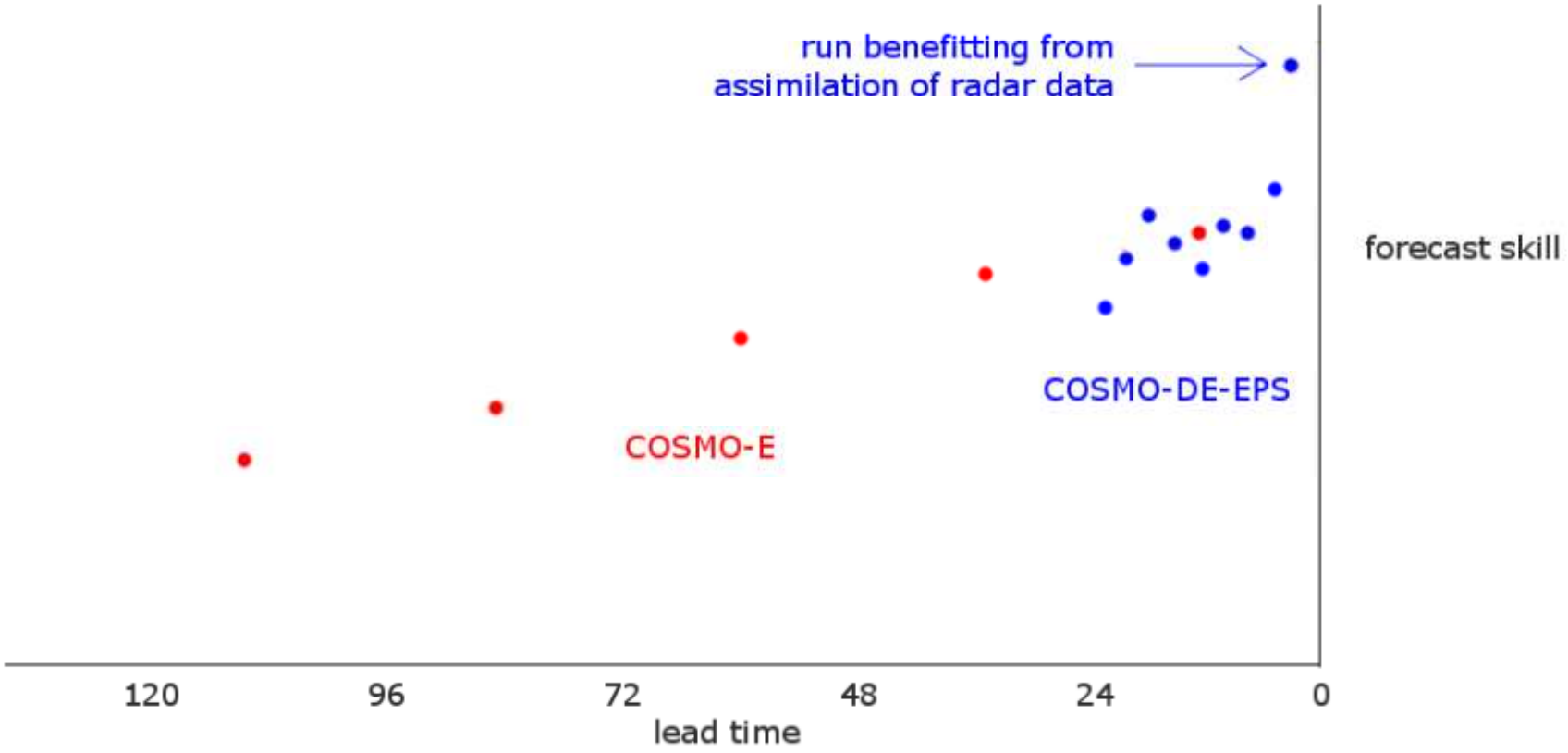
→ lead time of useful forecast: participants and testbed staff were sometimes positively surprised by the accuracy of COSMO-1 forecasts and COSMO-E forecasts at forecast ranges 24 - 48 hours ahead

→ the impression was that for convective events, the forecast quality increases strongly when lead times become so short (i.e. 15 UTC forecast for 18 UTC) that assimilated radar data “tells” the model where convection has initiated

→ however, the difference between a run on the same day in the morning, or the afternoon the day before is not as large

COSMO external review: main findings:

Qualitative illustration:



COSMO external review: conclusions:

→ the tests demonstrated significant skill of the models, also for forecast periods 24 to 48 hours, and even beyond

→ the evaluators recommend running convective scale models for time horizons beyond 24 hours

→ the tests demonstrated the importance of assimilation of the radar information, especially for convection initiation

→ they identify also the areas for model improvement, especially for representation of convection initiation

Please, note further COSMO presentations during the meeting:

→ Chiara Marsigli on ensembles in COSMO

→ Matthias Raschendorfer on physics developments

→ Michael Baldauf on current dynamical core and numerics

→ Philippe Steiner on porting NWP to GPU

→ Flora Gofa on verification

→ Christoph Schraff on recent KENDA results

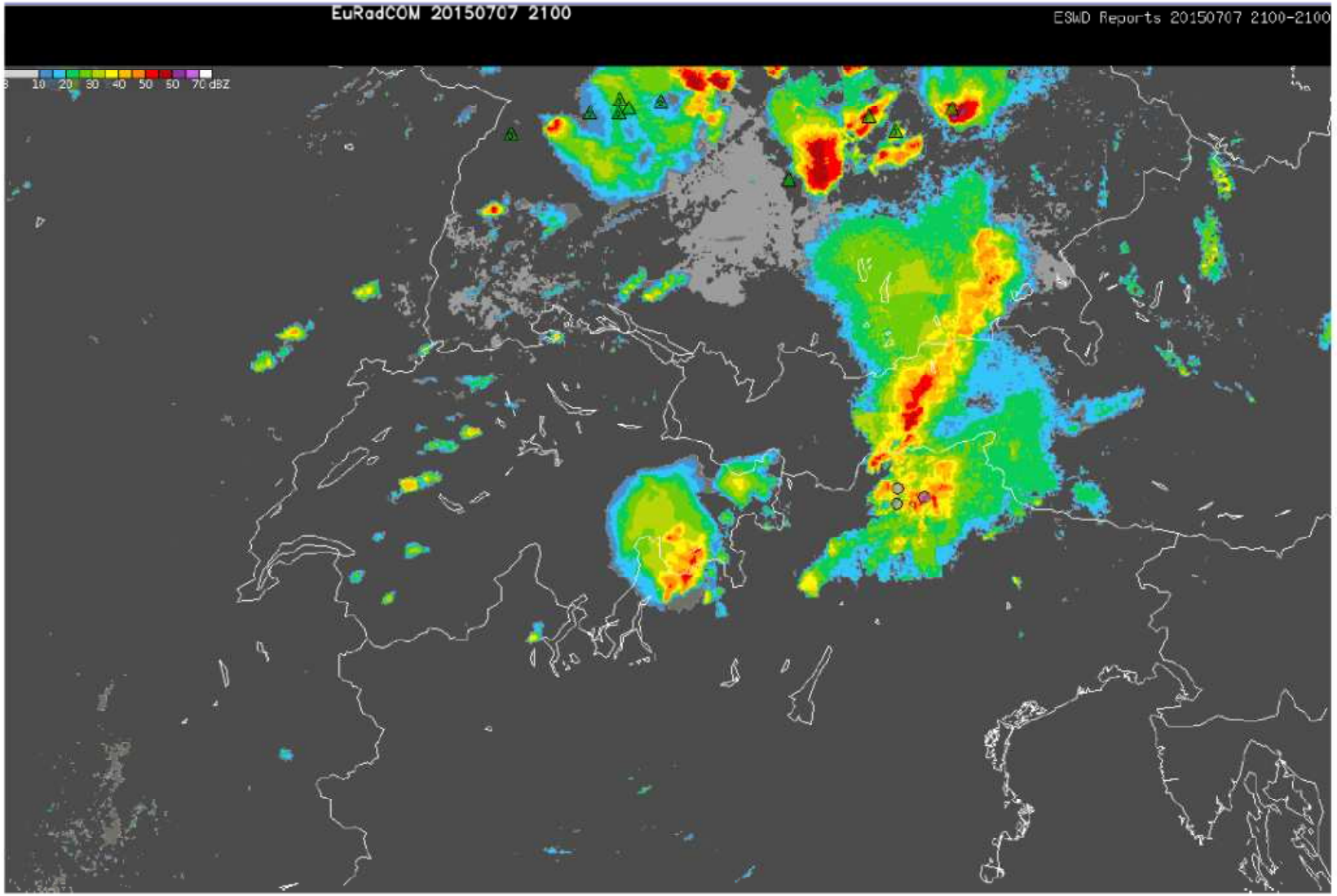
→ Christoph Schraff on soil and surface activities

→ Inna Rozinkina and Gdaly Rivin on low visibility prediction

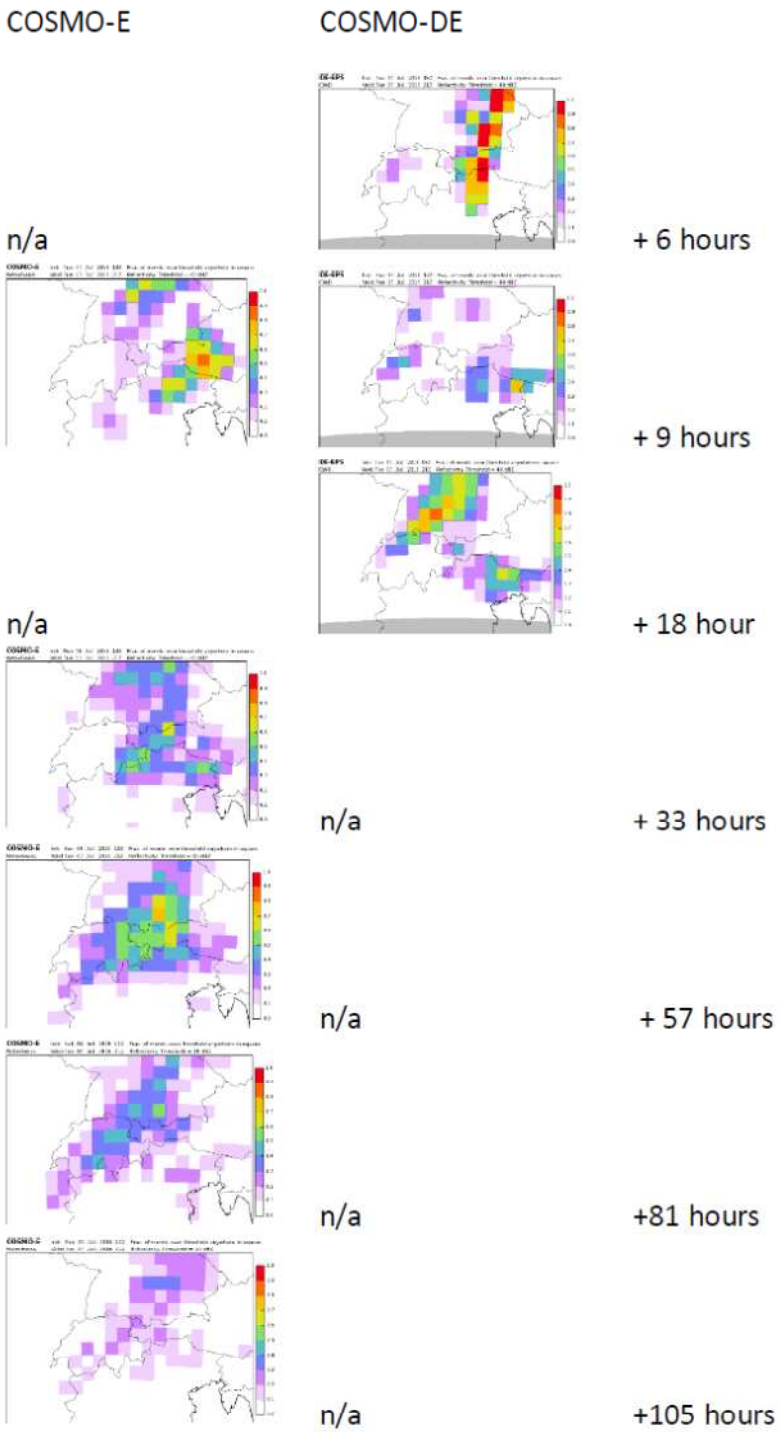
and review talks by Andrea Montani and Pierre Eckert

Thank you!

- Illustration: 7 July, 21:00



- 7 July, 21:00



Probability of exceedance of 40 dBZ in COSMO-E and COSMO-DE-EPS