

COSMO Overview

Dmitrii Mironov

Deutscher Wetterdienst, Offenbach am Main, Germany
(dmitrii.mironov@dwd.de)

Consortium for Small-Scale Modeling

National weather services (Germany, Greece, Israel, Italy, Poland, Romania, Russia, Switzerland), **regional and military services** (Germany, ZGeoBw; Italy, CIRA, ARPAE, ARPA Piemonte, CMCC), **academic communities** (CLM, ART)

Governing bodies: Steering Committee (STC), Scientific Management Committee (SMC) incl. SPM, Technical Advisory Group (TAG)

8 Working Groups

- WG1 **Data assimilation** (Christoph Schraff)
- WG2 **Numerical aspects** (Michael Baldauf)
- WG3a **Physical aspects, Upper Air** (Matthias Raschendorfer)
- WG3b **Physical aspects, Soil and Surface** (Jean-Marie Bettems)
- WG4 **Interpretation and Applications** (Anastasia Bundel)
- WG5 **Verification and case studies** (Flora Gofa)
- WG6 **Reference Version and Implementation** (Massimo Milelli)
- WG7 **Predictability and Ensemble Methods** (Chiara Marsigli)

A number of **Priority Projects** (PP) and **Priority Tasks** (PT)

COSMO Talks

- Chiara Marsigli “Model perturbations for the COSMO ensembles” (Tu)
- Anastasia Bundel “Overview about the COSMO activity in Interpretation and Application of the forecasts” (Tu)
- Jürgen Helmert “Overview of COSMO surface activities” (Tu)
- Christoph Schraff “Recent developments in KENDA” (We)
- Michael Baldauf “Recent numerics developments in the COSMO and ICON model” (We)
- Matthias Raschendorfer “Ongoing and new physics development in COSMO” (Th)

- Axel Seifert “Machine learning to inform bulk microphysical parameterizations” (Mo, review)
- Mikhail Tsyrlunikov, Elena Astakhova, and Dmitry Gayfulin “AMPT: Additive Model error perturbations scaled by Physical Tendencies” (Th, breakout)
- Christoph Gebhardt “Precipitation forecasts of the ICON model suite for a severe flash flood event in Western Germany on 14/15th July 2021” (Fr, breakout)

COSMO to ICON

Transition to ICON has been the major occupation of most COSMO folks over recent years

COSMO has become a community of ICONodules (ICONolaters)

At the end of 2021, all COSMO members are able to run ICON in the deterministic mode and obtain good results. Particular thanks a due to the Priority Project C2I team!

Further work is ongoing (EPS, advanced verification, etc.) within the framework of COSMO WGs and (targeted) PPs and PTs

Towards the End of the COSMO-Model Story

Version 6.0, a unified version for NWP and climate modelling, is the very latest release of the COSMO model

The release of 6.0 (incl. updated documentation with DOIs) is expected in **December 2021** (realistic scenario!).

Beyond that point in time

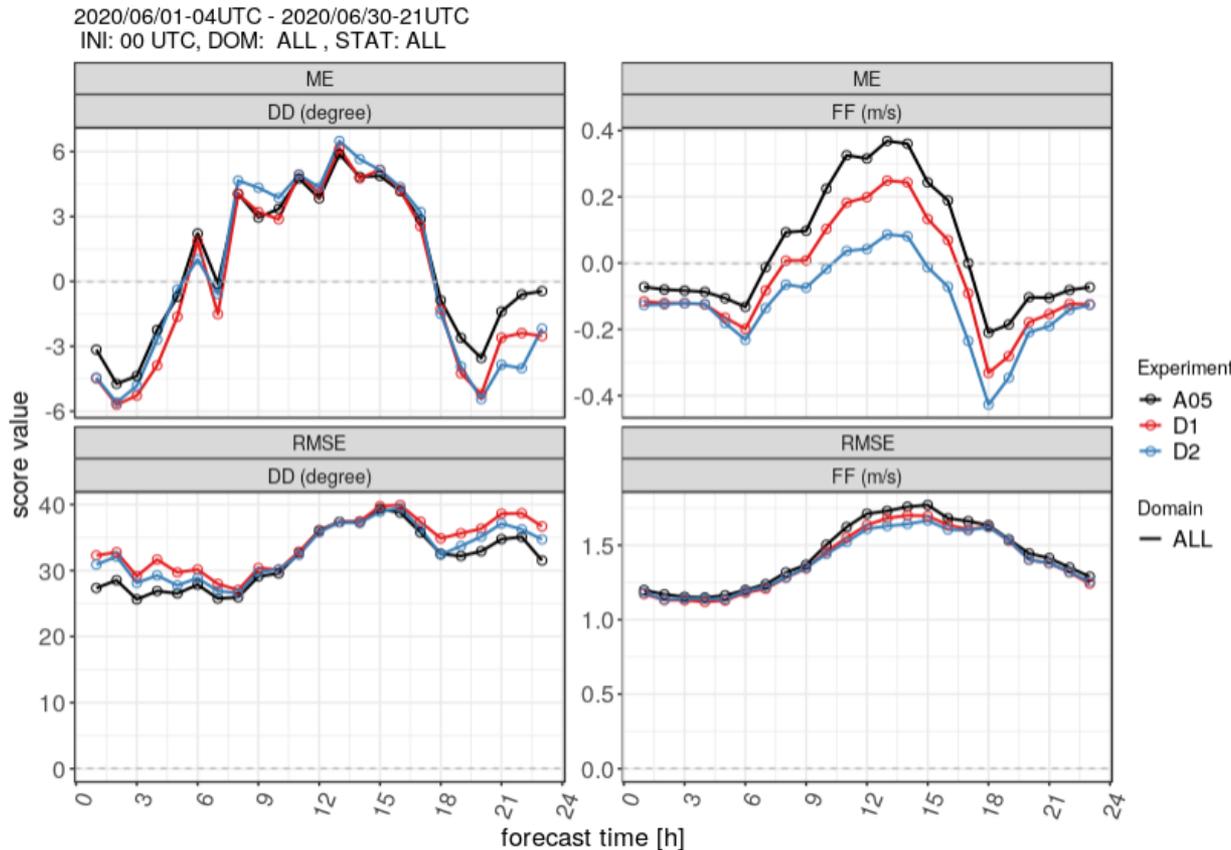
- the COSMO code is frozen,
- only maintenance is provided (incl. bug fixes)

More than 20 years in operation... a success story.

Great thanks to all contributors!

High-Resolution Challenge

Results by **Günther Zängl** (DWD). January 2019 and June 2020 ICON-LAM runs, Alpine region, horizontal mesh size of ca. 2 km, 1 km, and 500m.

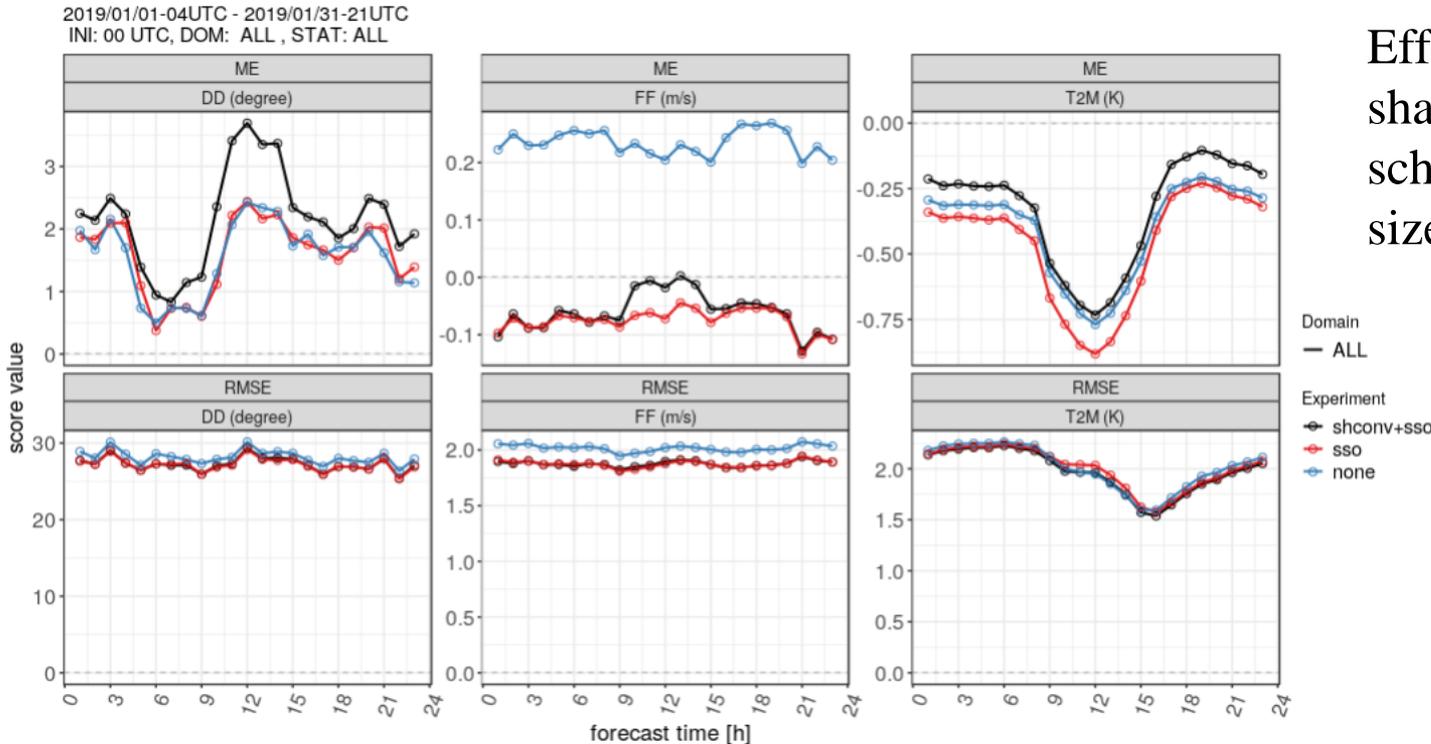


**Too strong daytime
boundary-layer
mixing at higher
resolution.**

Wind speed and wind direction, June 200.

High-Resolution Challenge (cont'd)

Results by Günther Zängl (DWD).



Effect of SSO and shallow-convection schemes, 500 m mesh size, January 2019.

shconv+SSO
SSO
none

Unexpectedly large impact of SSO scheme on low-level wind field even with 500 m mesh size, minor positive impact of shallow convection on temperatures due to additional mixing.

High-Resolution Challenge (cont'd)

With the increasing spatial resolution we enter the “convection-permitting” range of scales

- Still no general consensus about the treatment of shallow convection
- Sophisticated interplay of radiation, turbulence, microphysics (expensive solutions exist, but how to make things cheap?)
- The interaction of SGS and resolved scales is not well understood
- Frankly speaking, we do not really understand what our models actually do, and (!) test results obtained so far are disappointing for both LAM and global applications

**We know that something is happening here
But we don't know what it is (Bob Dylan)**

**Doing “convection-permitting” is awkward,
and we should find a sound way to go**

Careful Planning is Vital

It would not be an exaggeration to say that
“All simple problems are already solved,
the problems left are all complex”

- Draft project plans (this is not a waste of time), stress motivation and goals, set priorities
- Consider both short-term and medium-term prospects (long-term planning is more difficult but try to guess)
- Formulate clearly what you expect to have at the end of the day

**Those, who don't know where they are heading to,
will be very surprised when they get to the wrong place
(Mark Twain)**

See **COSMO Working Group Development Guidelines**
(<https://www.cosmo-model.org/content/consortium/reports/>)

New COSMO SPM

From 1 January 2022, Christoph Gebhardt (DWD) will serve as the COSMO SPM. The appointment is for four years (with a possible extension for one further year).



Good luck, Christoph!

Possibly Useful Idea

Inter-Consortium Cooperation

Many points of common interest...

A Proposal

“Towards more physically sound modelling of stably-stratified PBLs in NWP and climate studies”

- Better representations of essential physical processes at work in the PBL - surface layer – soil system
- LES and DNS results by Mironov and Sullivan, further ideas

Thank You!