COSMO overview

Christoph Gebhardt (COSMO, DWD)

COSMO "Consortium for small-scale modeling"

- 7 national meteorological services with active cooperation
- Roshydromet temporarily suspended
- 6 regional and military services
- Close cooperation with
  - CLM (regional climate modelling)
  - KIT (COSMO/ICON-ART)
  - ICON community

- Steering Committee (Chair: Yoav Levi, IMS $\overset{01/2023}{\rightarrow}$ Panagiotis Skrimizeas, HNMS)
- Scientific management committee, Scientific project manager, working groups
- Priority projects, priority tasks, WG tasks, user support

- Current main activity in COSMO: transition to ICON model framework (operational & research applications, ICON community, user licenses & support)

Transition to ICON in COSMO

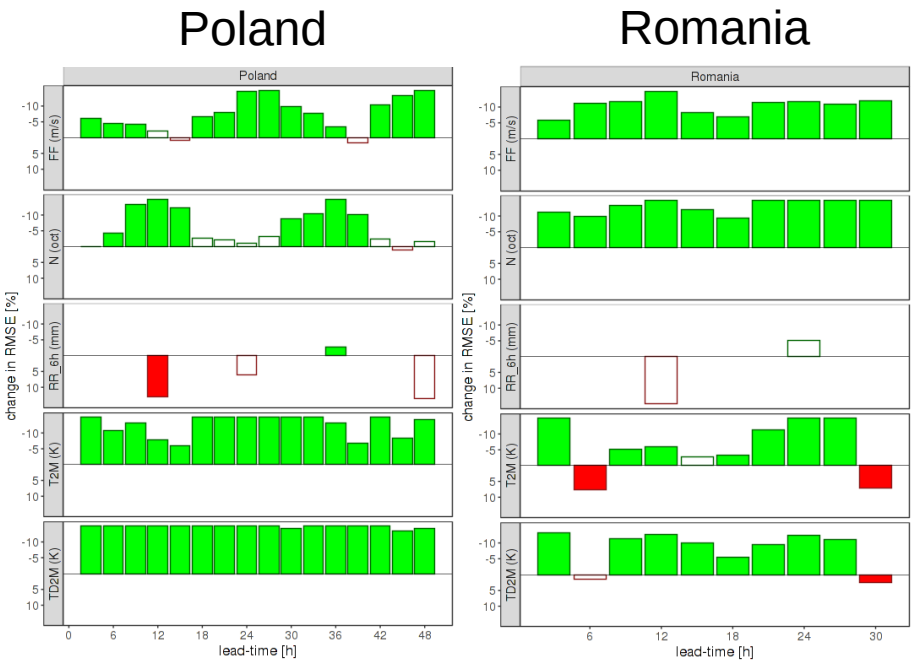
- Transition to ICON model at meteorological services of COSMO members for deterministic runs
- Transition of EPS forecasts, ICON-LEPS to replace COSMO-LEPS
- Scientific development with/for the ICON model in cooperation with the larger ICON community
- Transition to the source code administration of ICON
- Transition of user support / user licences

Transition to ICON forecasts at COSMO met. services

- Priority Project C2I “Transition of COSMO to ICON-LAM” *(Daniel Rieger)*
  - Duration: 2018-2022
  - Implementation and evaluation of a deterministic run at participating services has been completed
  - Each COSMO member is free to chose when to migrate to ICON-LAM

RMSE
Summer 2021

ICON-LAM better
than COSMO



Transition to ICON forecasts at COSMO met. services

COSMO Member	Configuration	Operationalization
Germany	ICON-D2	11/2019 (pre-operational) 02/2021 (operational)
Greece	ICON-GR2.5	06/2019 (pre-operational, not time-critical) 2023 (operational, planned)
Israel	ICON-IL2.5	06/2020
Italy	ICON-IT	07/2020; Full switch: Q4/2023 *(Ensemble requires GPU-capable version)*
	ICON-2I	06/2022 (pre-operational)
Poland	ICON-PL	09/2022
Romania	ICON-RO-2.8km	01/2020
Switzerland	ICON-1E ICON-2E	Q1/2024 *(Requires GPU-capable version)*

(D. Rieger, DWD)

Transition to ICON in COSMO

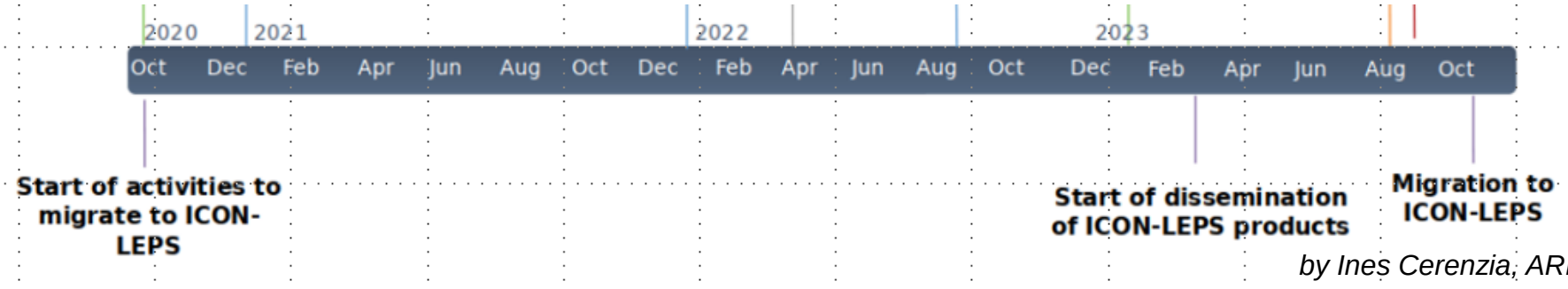
- Transition to ICON model at meteorological services of COSMO members for deterministic runs

- Transition of EPS forecasts, ICON-LEPS to replace COSMO-LEPS

Transition of EPS forecasts

- Transition for convection-permitting EPS forecasts
  - Most COSMO members with operational EPS on the convection-permitting scale have plans to migrate to ICON-LAM-EPS in 2022/23
  - MeteoSwiss and COMET (Italy) to migrate once the ICON is ready for GPU
  - DWD has migrated in 2021 (ICON-D2-EPS)

- ICON-LEPS
  - currently COSMO-LEPS (7km) is used at NMHS and other places, e.g. EFAS
  - Target for ICON-LEPS: <= 3km grid, possibly larger domain
  - account for users' requirements for the definition of the new set-up
  - evaluate possible options in view of available resources



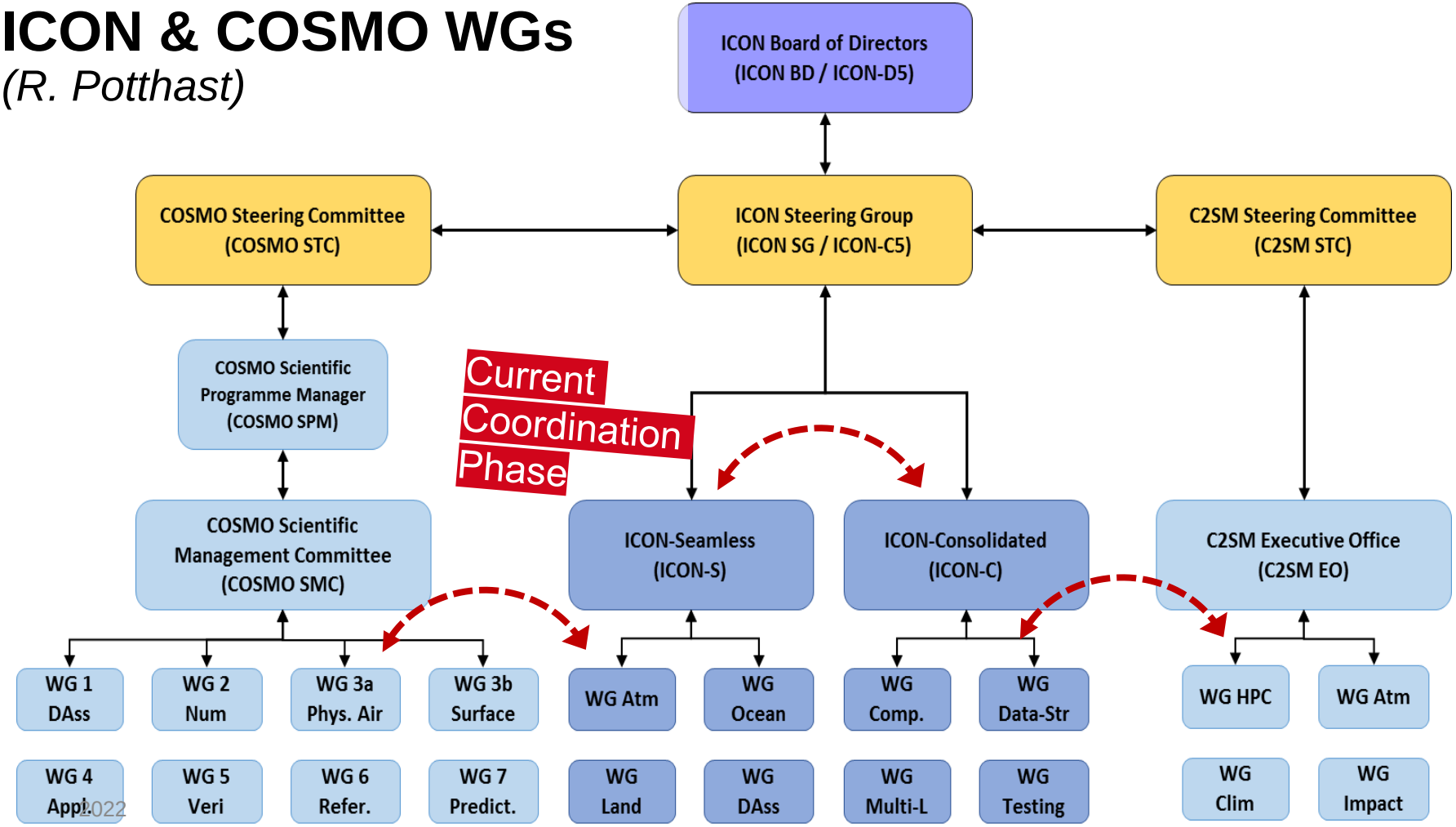
by Ines Cerenzia, ARPAE

Transition to ICON in COSMO

- Transition to ICON model at meteorological services of COSMO members for deterministic runs
- Transition of EPS forecasts, ICON-LEPS to replace COSMO-LEPS
- Scientific development with/for the ICON model in cooperation with the larger ICON community

ICON & COSMO WGs

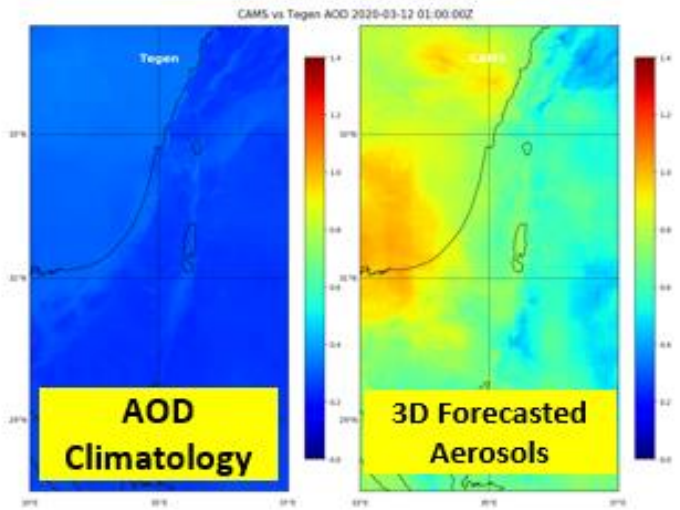
(R. Potthast)



PP CAIIR-2
"Clouds and Aerosols Improvements in ICON Radiation Scheme" *(Harel Muskatel, IMS)*

- Duration: 03/2020-09/2023; 6.33 FTE

- different methods for cloud optics (ice/liquid)
- Implementation of different aerosol data sets (climatology and prognostic), CAMS
- tests with aerosol datasets for cloudy/clear sky conditions
- implementation of Spectral Bin Microphysics

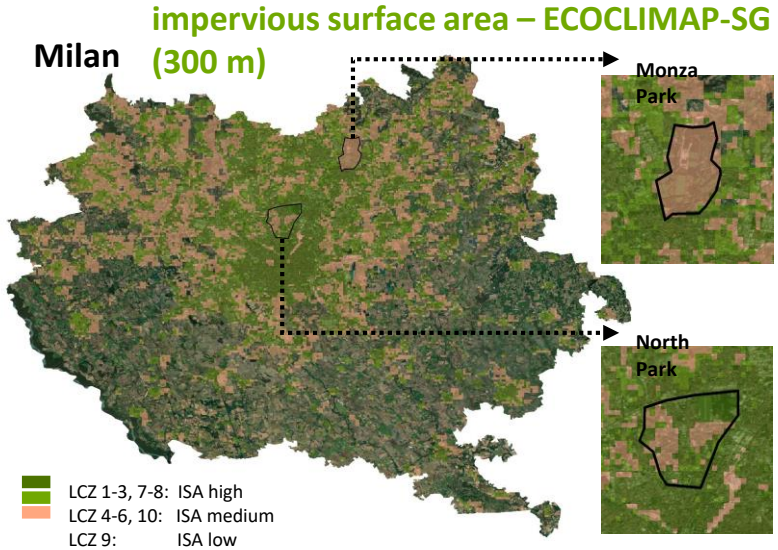


by Harel Muskatel, IMS

PP CITTÀ
"City Induced Temperature change Through Advanced modelling" *(Jan-Peter Schulz, DWD)*

- Duration: 07/2021-08/2024; 11.1 FTE

- transfer of the urban canopy parametrization TERRA_URB and its achievements from COSMO to ICON
- urban external parameters for TERRA_URB
- further development of the package (vegetated urban areas, boundary layer clouds over urban areas)
- tests for several cities in COSMO countries



Carmela Apreda, CMCC

Potential future tasks in cooperation with ICON community

- Related to ICON-Seamless and ICON-Land activities

- offline soil and surface module
  - integration in the ICON framework
  - easily maintainable and up to date with most recent developments

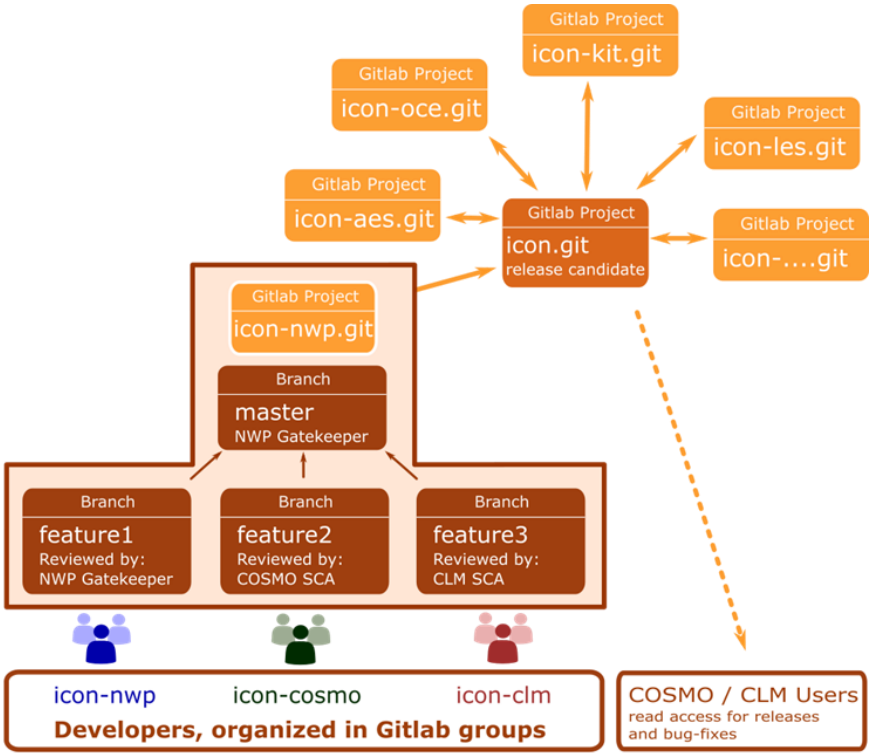
- SNOWPOLINO for ICON *(Sascha Bellaire & Jean-Marie Bettems, MeteoSwiss)*
  - multi-layer snow model
  - implemented in COSMO
  - implementation in ICON in cooperation with ICON-Seamless & CLM

More on developments in COSMO in dedicated presentations this week

- Overview on last slide of this presentation

Transition to ICON in COSMO

- Transition to ICON model at meteorological services of COSMO members for deterministic runs
- Transition of EPS forecasts, ICON-LEPS to replace COSMO-LEPS
- Scientific development with/for the ICON model in cooperation with the larger ICON community
- Transition to the source code administration of ICON



ICON consolidated (ICON-C)

- Infrastructure project to make the ICON code more modular, i.e. encapsulate the different components with clear/defined interfaces
- more scalable development workflow
- final ICON-C code base should allow for all needed climate and NWP operational applications
- Prepare functional version by the end of 2023, 5-year planning in total

Transition to ICON in COSMO

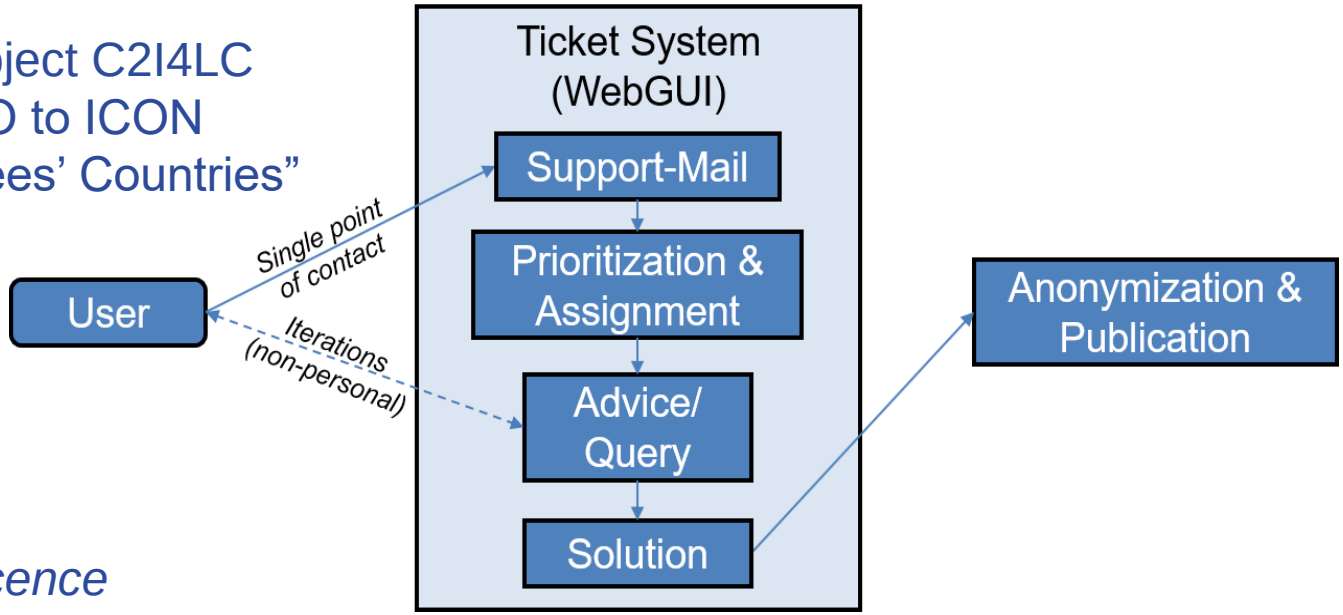
- Transition to ICON model at meteorological services of COSMO members for deterministic runs
- Transition of EPS forecasts, ICON-LEPS to replace COSMO-LEPS
- Scientific development with/for the ICON model in cooperation with the larger ICON community
- Transition to the source code administration of ICON
- Transition of user support / user licences

User licences & support

- COSMO licence agreement with fees*:
  - up to now: COSMO model software and support licence for NMHS “official duty”
  - Under preparation: ICON support & COSMO software licence

- support activities for migrating COSMO users to ICON will be a major effort of COSMO in the coming year

- Dedicated priority project C2I4LC “Establishing COSMO to ICON migration for Licensees’ Countries”



** no fees for research licence*

Presentations this week

- Michael Baldauf: *The BRIDGE project Basic Research for ICON with Discontinuous Galerkin Extension* Monday 4:20pm
- Andrzej Mazur: *Operational forecasts of the air dispersion of hazardous pollutants based on results of COSMO model* Tuesday 8:50am
- Chiara Marsigli: *From COSMO ensembles to ICON ensembles* Tuesday 11:20am
- Flora Gofa *Overview of consortium verification activities* Tuesday 1:30pm
- 2 presentations in the *"Parallel session on surface aspects"* Wednesday 09:30 am
- Matthias Raschendorfer: *Ongoing and new physics development in COSMO* Wednesday 12:00pm
- Jürgen Helmert: *Overview of COSMO surface activities* Thursday 08:40am
- Christoph Schraff: *Update on KENDA and a particle filter* Thursday 12:20pm