Consortium for Small-Scale Modelling

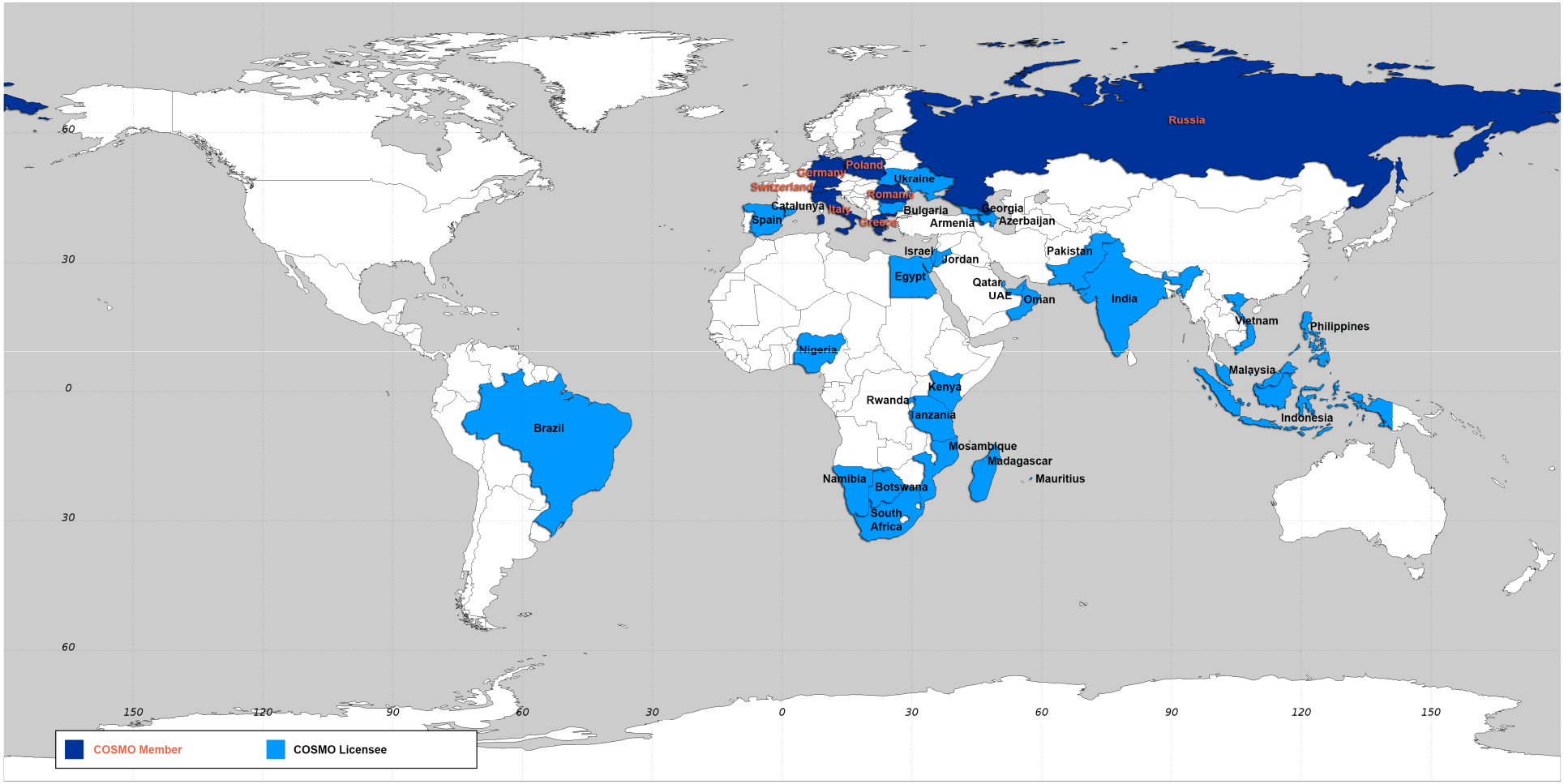
Michał Ziemiański

36th EWGLAM and 21st SRNWP meeting
29 September 2014, Offenbach

COSMO Governance: General:

- New COSMO Agreement was signed on 6 August 2014, and is in force, now
- The Israel Meteorological Service (IMS) became an applicant to COSMO consortium, this year
- There are already 7 COSMO licence takers (Botswana, Brazil (INMET), Brazil (DHN), Namibia, Oman, Servei Meteorològic de Catalunya, United Arab Emirates); possible 8 in next year

COSMO users in 2014



Michał Ziemiański (michal.ziemianski [at] imgw.pl)

COSMO Governance: Updated Science Plan

- The draft version of COSMO Science Plan 2015-2020 was prepared

  → ‘steady’ main COSMO goal: „the further development of an operational *and research* mesoscale model-system for the short to very short range and with very high convective-scale resolution, aimed especially at high-impact weather forecast and with ensemble prediction methodology at its core”

  → many valuable comments/suggestions were provided by external reviewers (thank you very much!)

  → final release in spring 2015

COSMO Model: Version 5.1

- COSMO V5.1 is being tested for final release, now:

  → it started practical implementation of COSMO strategy to harmonise with ICON (with common physics package, first)

  → the first model release tested with newly created NWP test suite

  → contains, in between:

  - SPPT (stochastic perturbation of physics tendencies)

  - online trajectory module (as scientificly oriented code)

  - single precision model version, …

A few scientific issues:

- Data assimilation system for convective scale:

  → first results of LETKF KENDA system for 2.8 km resolution (comparable/better than nudging?)

- Convective scale ensembles:

  → how they compare with (regional) convection-parameterised ensemble (COSMO-E vs. COSMO-LEPS; any value, added?)

- Accommodation to emerging computer architectures:

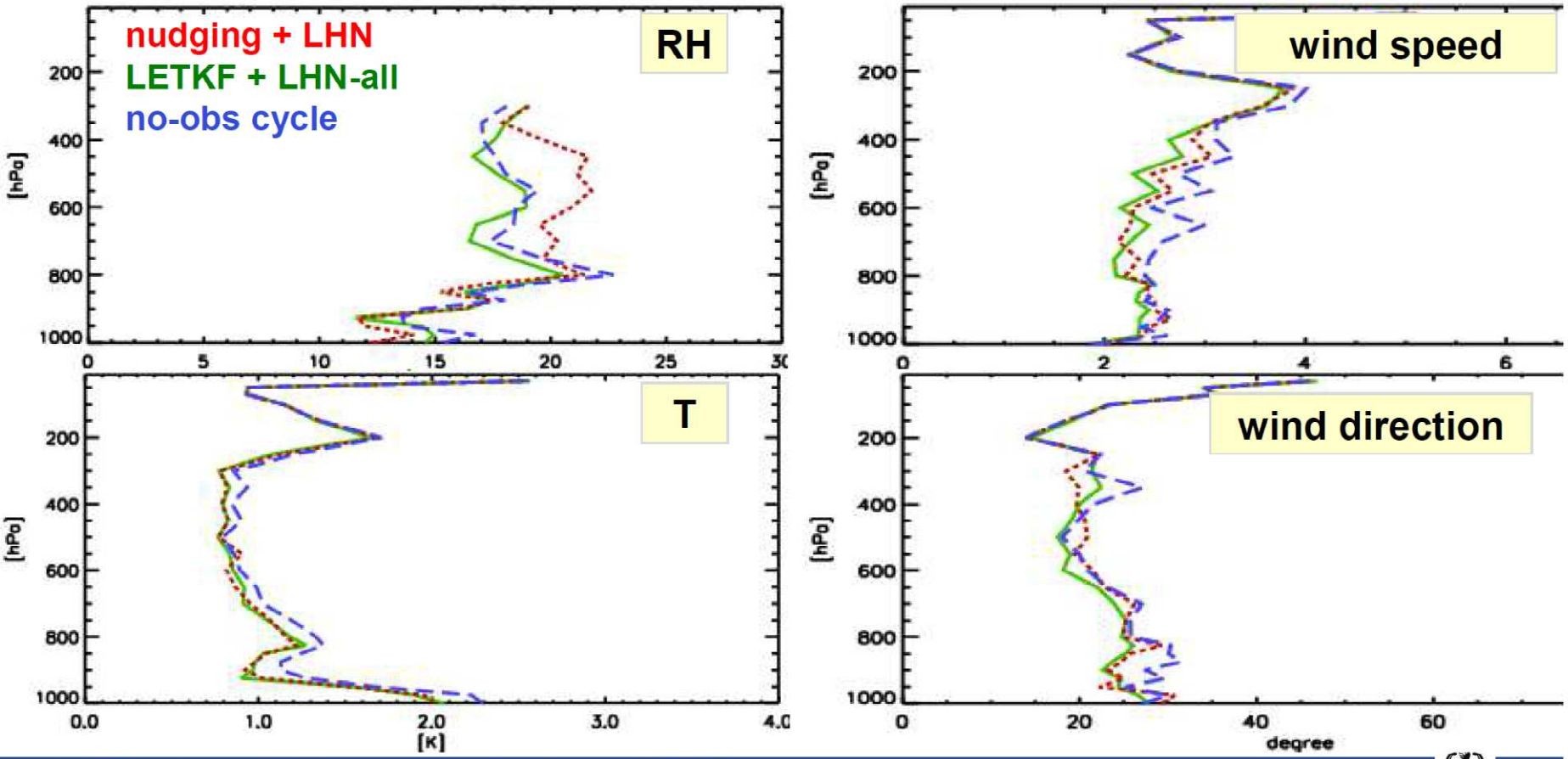
  → COSMO for GPU (practical benefits?)

LETKF + LHN-all vs. Nudging + LHN :
19 – 25 July 2012, deterministic fc every 6 hrs

Deutscher Wetterdienst

- obs used in LETKF / nudging: radiosonde, aircraft, wind profiler; surface pressure
- lateral BC from experimental global ICON-LETKF

upper-air verification (RMSE) of **6-h** forecasts



christoph.schraff@dwd.de

(ICON soil)	**LETKF + LHN-all** vs. **Nudging + LHN**		
	variable	RMSE	bias
upper air	geopotential	=	=
	temperature	=	=
	(relative humidity)	+	(-)
	wind speed	+	=
	wind direction	+	=
surface	2-m temperature	=	=
	2-m dew point temp.	=	=
	10-m wind	=	=
	surface pressure	-	=
	total cloud	=	=
	low cloud	(+)	(+)
	mid-level cloud	+	=
	high cloud	(-)	(-)
radar	precip 0 UTC	(-)	+/(-)
	precip 12 UTC	+	(+)

LETKF:

→overall comparable / better results

→problem with surface pressure

BUT :

results are preliminary !!

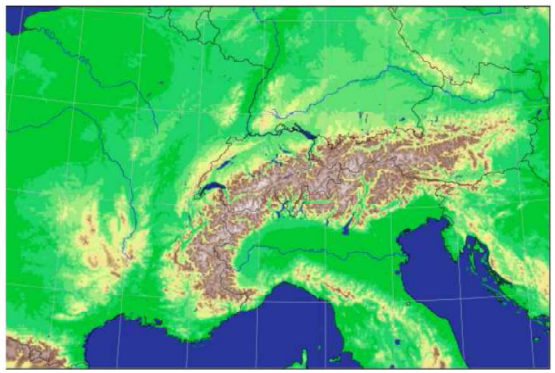
–only 6 days

–need longer periods,

–different weather situations

COSMO-E

- Ensemble forecasts with convection-permitting resolution (2.2 km mesh-size, 60 vertical levels)
- 21 members, forecasts up to +120h, Alpine area (domain 25% larger as for COSMO-2)
- regular runs once per day started end of May, stable as of mid of June
- perturbations:
  - IC: downscaled/re-cycled soil (later KENDA)
  - LBC: IFS-ENS (members 0-20)
  - model errors: Stochastic Perturbation of Physical Tendencies (SPPT)
- COMO version 5.0 (single precision)

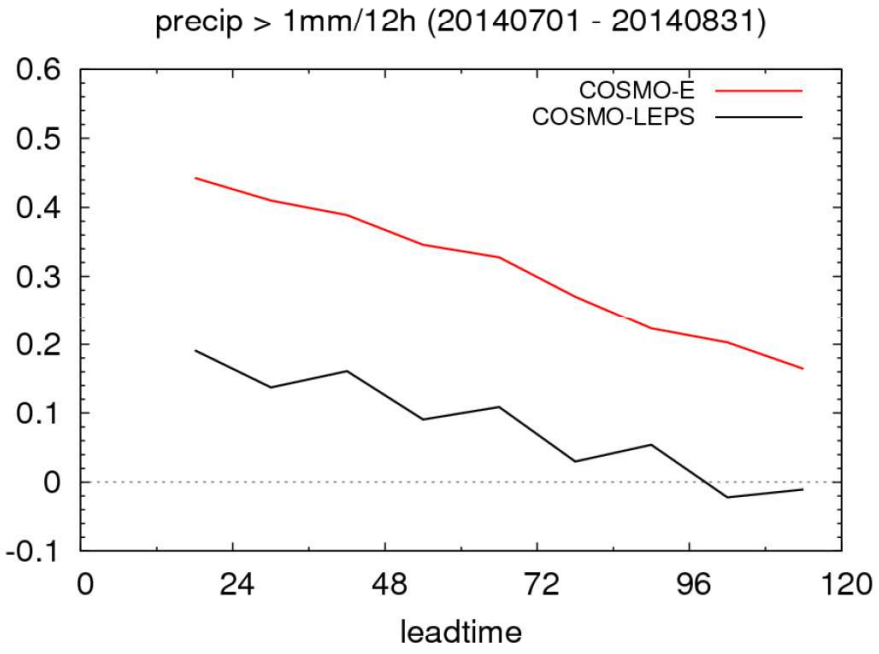


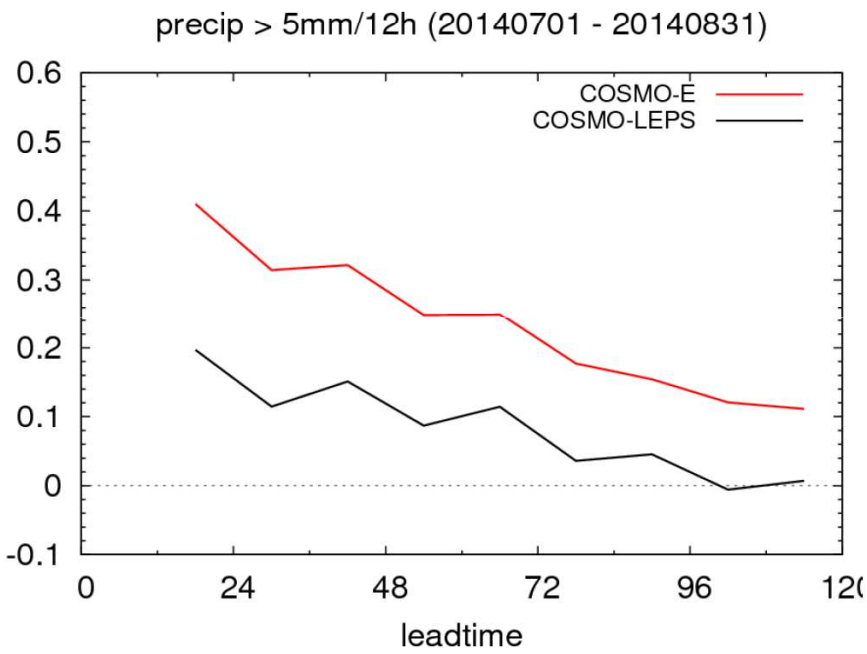
by: Marco Arpagaus, André Walser, Daliah Maurer

Brier Skill Score (BSS)

skill wrt climatology (2001-2010) based on 300 stations

COSMO-E
COSMO-LEPS



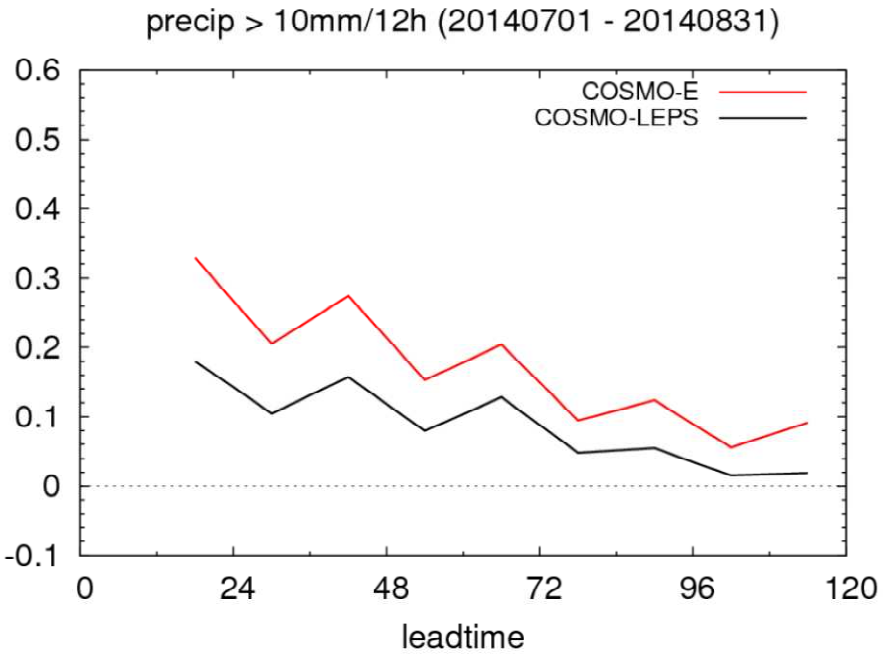


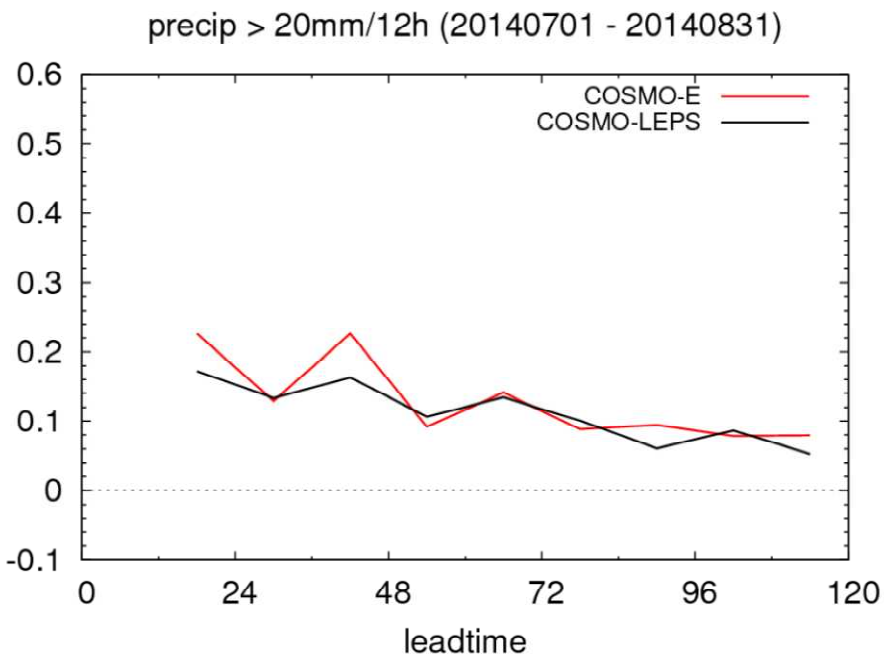
- COSMO-E shows significant skill until end of forecast range
- clearly better than COSMO-LEPS, even though 9 grid-points averages used for both

Brier Skill Score (BSS)

skill wrt climatology (2001-2010) based on 300 stations

COSMO-E
COSMO-LEPS

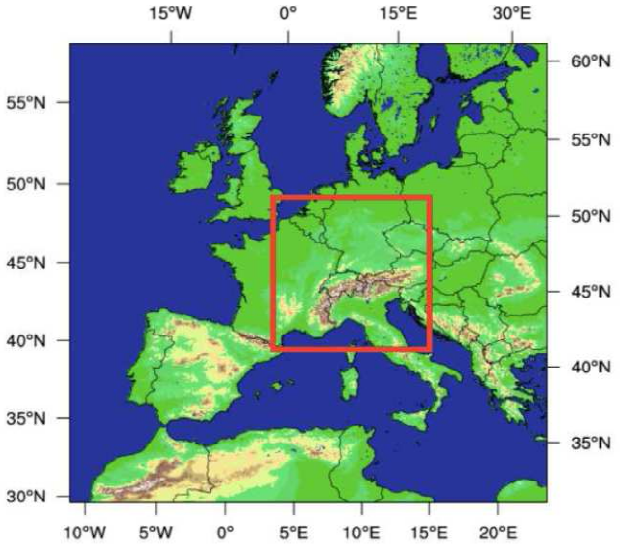




- COSMO-E shows significant skill until end of forecast range
- For large precipitation COSMO-E only slightly better than COSMO-LEPS

Climate Simulations on GPU

- Cray XC30 @ CSCS
  each node has one GPU and one CPU
- COSMO 4.18 + modifs
- European Domain @ 2.2 km
  Size 1536 x 1536 x 60
- 144 nodes (only GPU used)
  40% of DWD's XC30
- Time-to-solution is roughly 0.2 SYPD
  ~2 months for 10 years
- Allocation for ~50 years
  1.1 million nodehours



by David Leutwyler

Cloud-Resolving Simulation of Winter Storm Kyrill

David Leutwyler, Oliver Fuhrer, Christoph Schär, Andrea Arteaga, Isabelle Bey, Mauro Bianco, Ben Cumming, Tobias Gysi, Xavier Lapillonne, Daniel Lüthi, Carlos Osuna, Anne Roches, Thomas Schulthess

COSMO already plans to use its GPU model version within PP CALMO for extensive calculations necessary for objective tuning for 2.2 and 1 km resolutions

Further COSMO presentations during the meeting:

→ Michael Baldauf on current dynamical core activities
→ Matthias Raschendorfer on physics developments
→ Gdaly Rivin on COSMO tools for Sochi Olympics
→ Christoph Schraff on KENDA results
→ Chiara Marsigli on LAM-EPS developments
→ Juergen Helmert on land-surface activities
→ Massimo Milelli on COSMO code issues

Thank you!