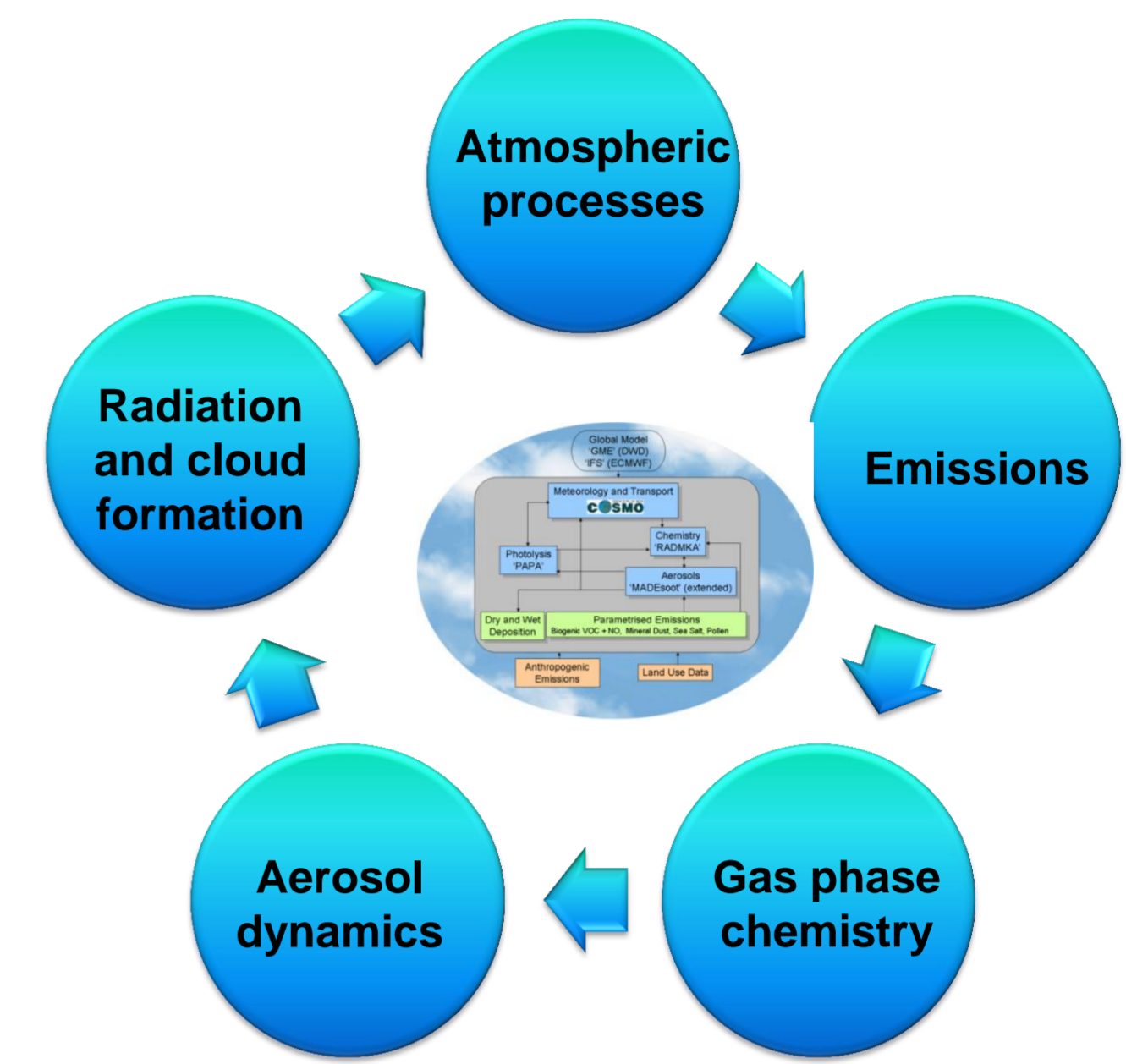


RUCACI: Reducing the uncertainties of climate projections

High-resolution climate modelling of aerosol and climate interactions on the regional scale using COSMO-ART

Autor: T. Schad, B. Vogel, A. Ferrone

In order to quantify the feedback processes between aerosols and the state of the atmosphere on the continental to regional scale the fully online integrated model system COSMO-ART with two-way interactions between different atmospheric processes was developed (Vogel et al., 2009; Knote et al., 2011; Bangert et al., 2012). The operational weather forecast model COSMO of the Deutscher Wetterdienst (Baldauf et al., 2011) was extended to treat secondary aerosols as well as directly emitted components like soot, mineral dust, sea salt and biological material and their feedback with radiation and clouds.



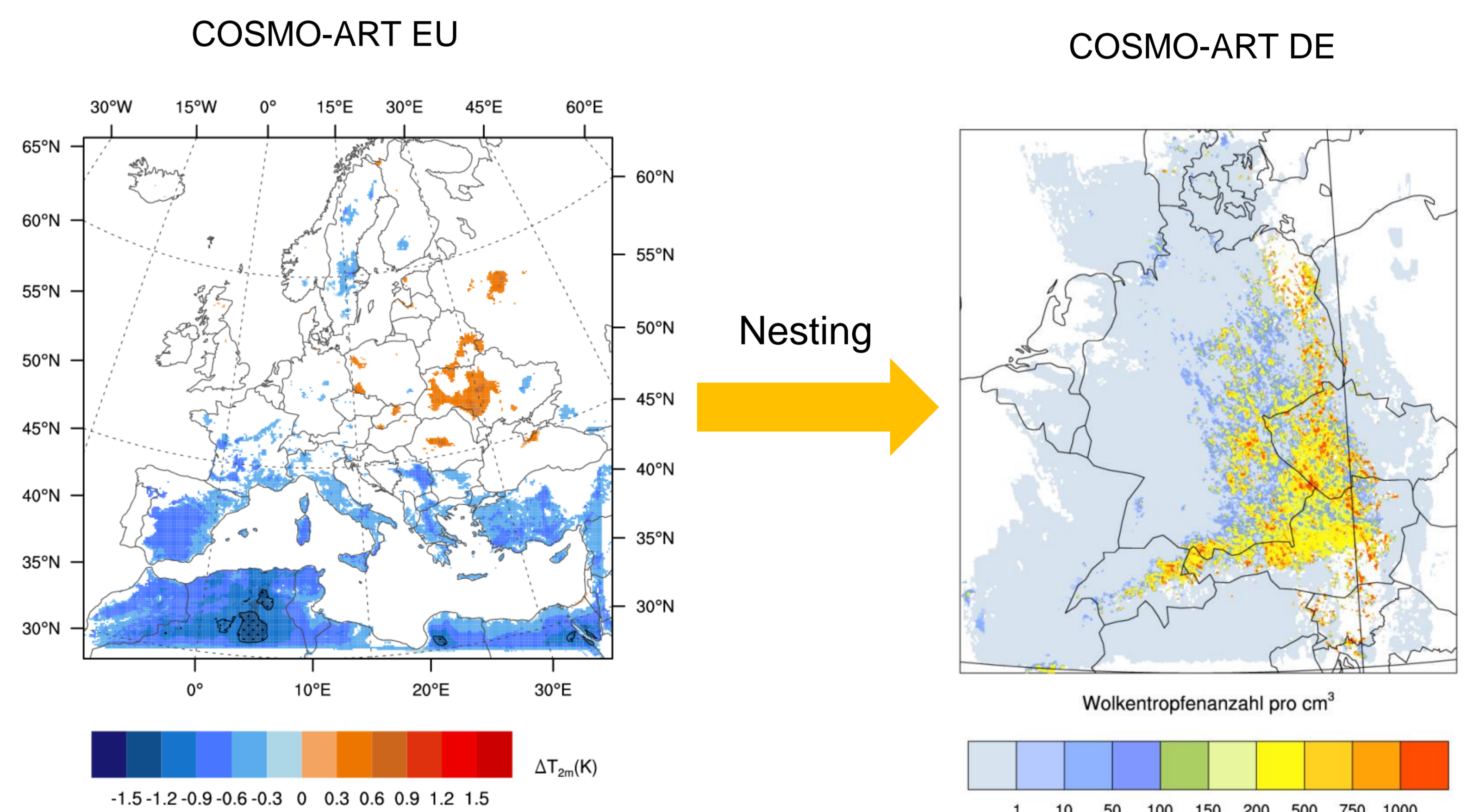
The online regional scale model system COSMO-ART

Why high-resolution climate modeling of aerosol and climate interaction?

- Potentially high influence of aerosols on radiation and clouds
- Currently major uncertainty in our understanding of climate systems
- Only roughly described in coarse resolution global climate models
- COSMO-ART already showed in several case studies to close the gap between global simulations and large-eddy-simulations
- COSMO-ART is able to quantify impact of aerosols on radiation and clouds
- Identify key principles of interactions between aerosols and climate

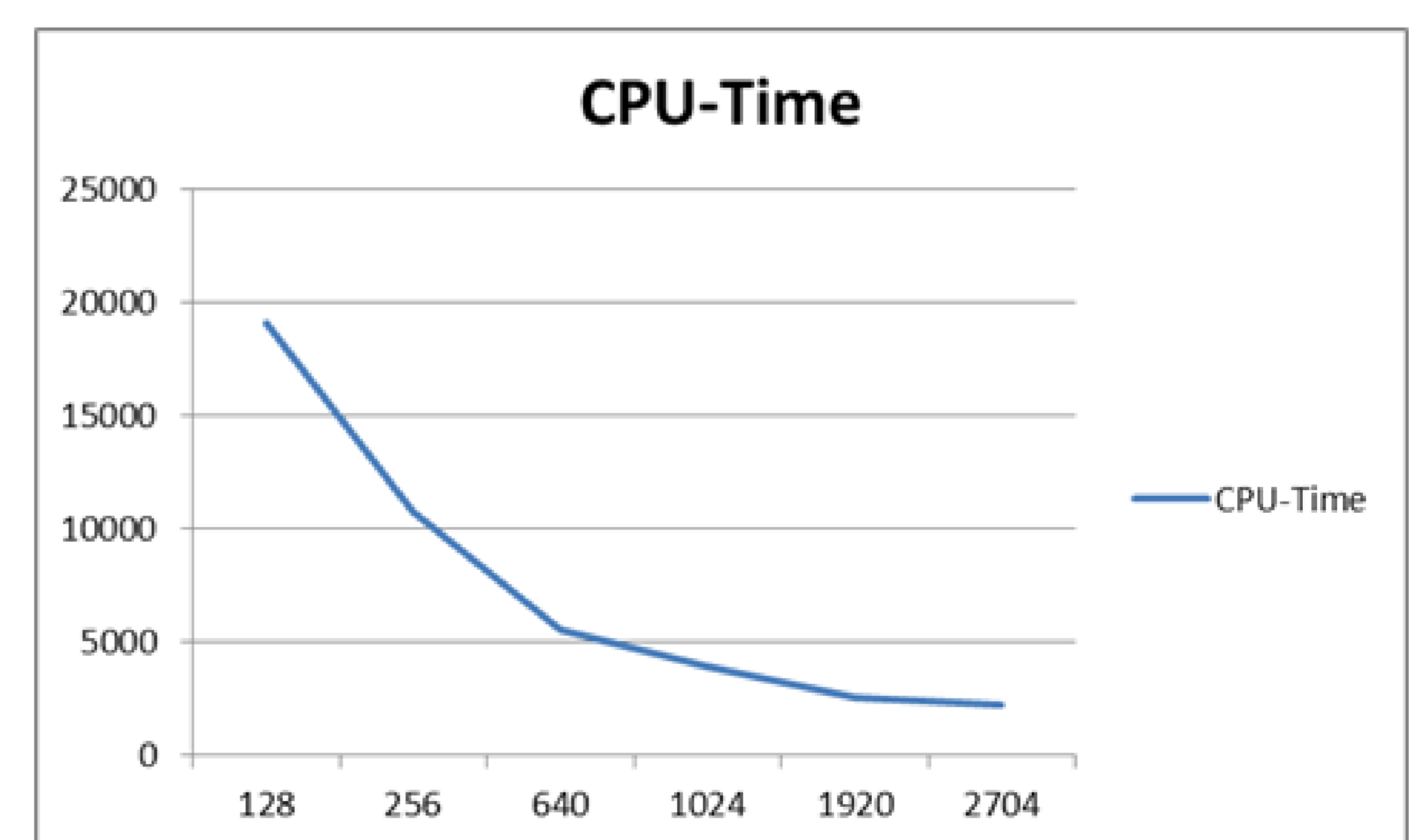
Planned simulations in two domains

Name	Resolution + Time step	N° of Gridpoints	Timescale	Boundary Conditions	CPU Time (hours)	Storage Capacity (TB)
COSMO-EU	0.125° (~14km), 150s	332 x 328 x 40	1990-2005	ERA-Interim	500 000	50 (4 online)
COSMO-ART-EU	0.125° (~14km), 150s	332 x 328 x 40	1995-2005	ERA-Interim + ECHAM5-HAM-MOZ	5 000 000	250 (15 online)
COSMO-DE	0.025° (~2.8km), 25s	421 x 461 x 50	1990-2005	COSMO_EU	2 500 000	100 (6 online)
COSMO-ART-DE	0.025° (~2.8km), 25s	421 x 461 x 50	1995-2005	COSMO-ART_EU	22 000 000	600 (35 online)



First Steps

- Successful model implementation
- Technical Testing → model chain
- Scaling test for COSMO-ART EU domain
- Storage amount for input of one day simulation: 14GB
- Storage amount for output of one day simulation: 19GB



Scaling Results for COSMO-ART EU domain