



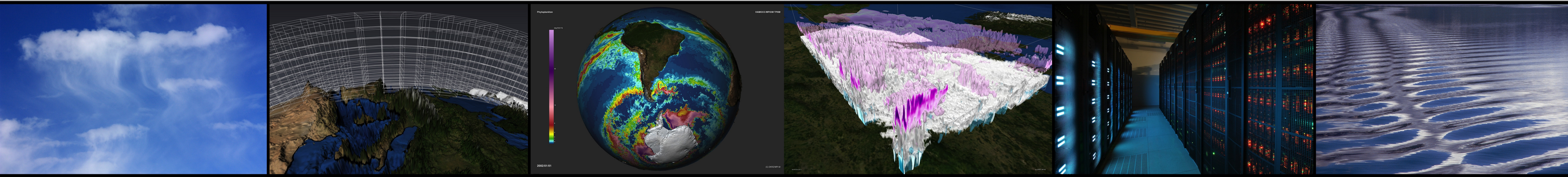
esiwace

CENTRE OF EXCELLENCE IN SIMULATION OF WEATHER AND CLIMATE IN EUROPE



DKRZ

DEUTSCHES KLIMARECHENZENTRUM



### PROJECT OBJECTIVES

**ESiWACE** (Sep 2015-Aug 2019) forms a joint scientific community around **Earth System Modelling** (ESM) from the two communities of **Weather** and **Climate** research by leveraging two established European networks:

- The European Network for Earth System Modelling
- The European Centre for Medium-Range Weather Forecasts

The main objectives of **ESiWACE** are to

- Substantially improve efficiency and productivity of numerical **Weather** and **Climate** simulation on high-performance computing (**HPC**) platforms
- Build a critical mass and create expertise to increase the community impact on hardware development towards the extreme scale as well as future international exascale initiatives

### PROJECT IMPACTS

**Weather** and **Climate** computing has always been amongst the key drivers for **HPC** development, with domain-specific scientific and technical requirements that stretch the capability and capacity of existing software and hardware to the limits.

**ESiWACE** addresses three core themes on the applications' way towards exascale computing:

- **Scalability** of models and tools at extreme scale
  - Establishing extreme-scale high-resolution demonstrators
  - Single precision tests suggest 40% runtime improvement
  - Code optimization (vectorization, communication, etc.)
- **Usability** of **HPC** systems for the ESM workflow
  - Handbooks for application and system software stacks
  - Spack-based solutions for software stack and model deployment
  - Improvements in robustness, performance and scalability of Cylc meta-scheduler
- **Exploitability** of climate data fostering new I/O paradigms
  - Business model development to address cost/benefit balance in data centres
  - Middleware development to alleviate the use of expensive and non-scalable disk resources

**ESiWACE** directly impacts the competitiveness of the European **HPC** industry by

- Opening the potential for engendering new products due to Co-Design with the science community
- Providing input regarding limits of extreme-scale test cases on state of the art hardware
- Providing opportunities for exploitation beyond the project itself
- Enhancing the skills base of staff in both industry and academia

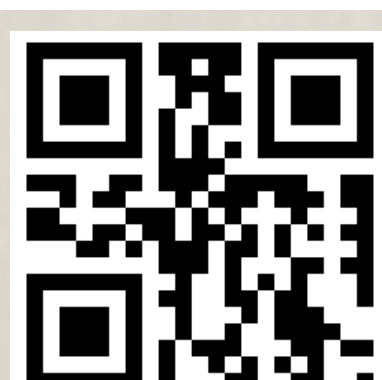
### UPCOMING ACTIVITIES

- June 18-22 2017: ISC
  - BoF "Cloud Resolving Global Earth-System Models: HPC at its Extreme"
  - Keynote: Peter Bauer, "Forecasting the future role of HPC in weather and climate prediction"
  - Poster in Track "Project Posters"
- June 26-28 2017: Platform for Advanced Scientific Computing
  - Minisymposium "Earth System Modeling: HPC bringing together weather and climate prediction"
  - Exhibition booth
- June 27-28 2017: Teratec

### ESiWACE Contacts

Web: [www.esiwace.eu](http://www.esiwace.eu)

E-Mail: [esiwace@dkrz.de](mailto:esiwace@dkrz.de)



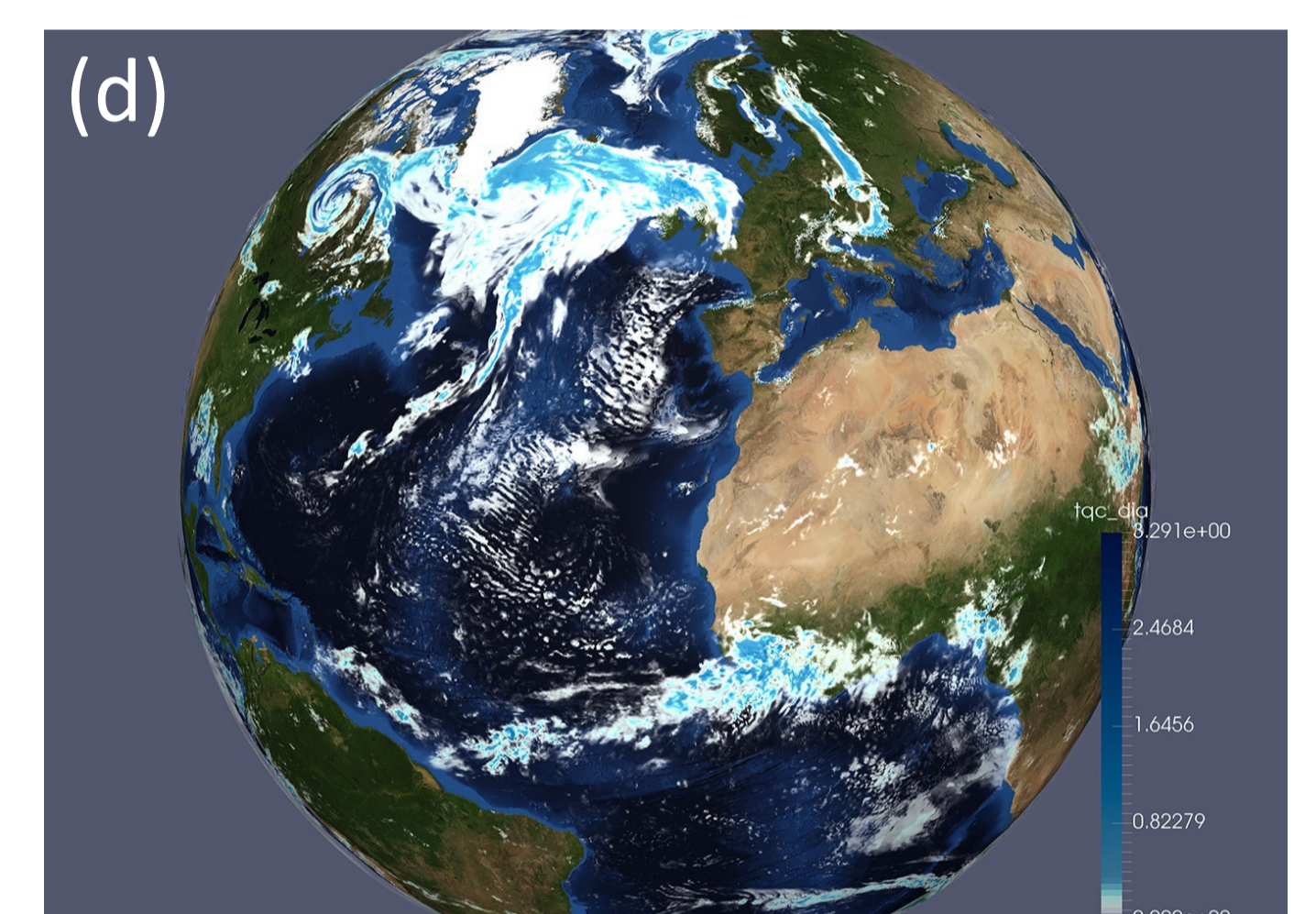
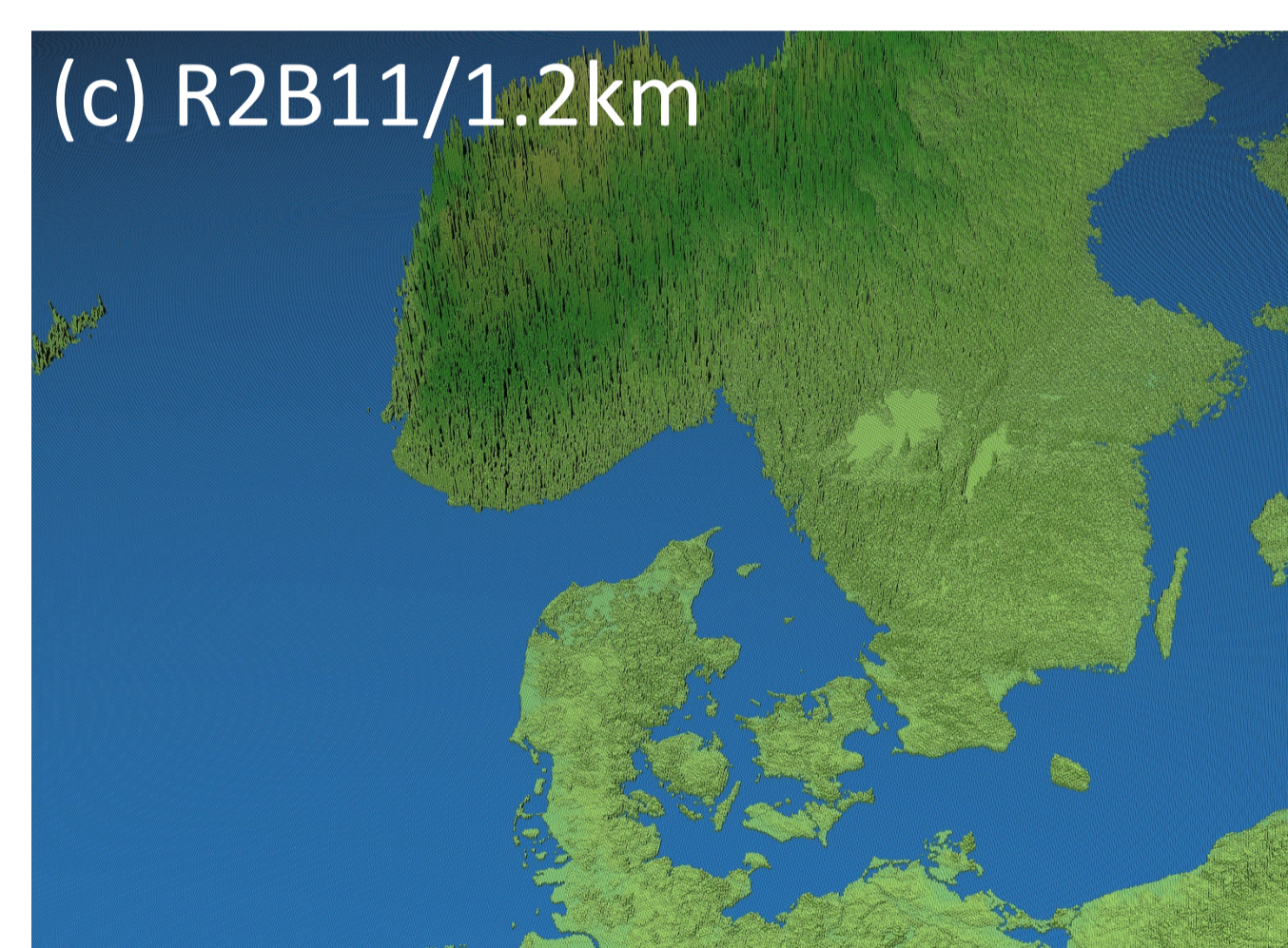
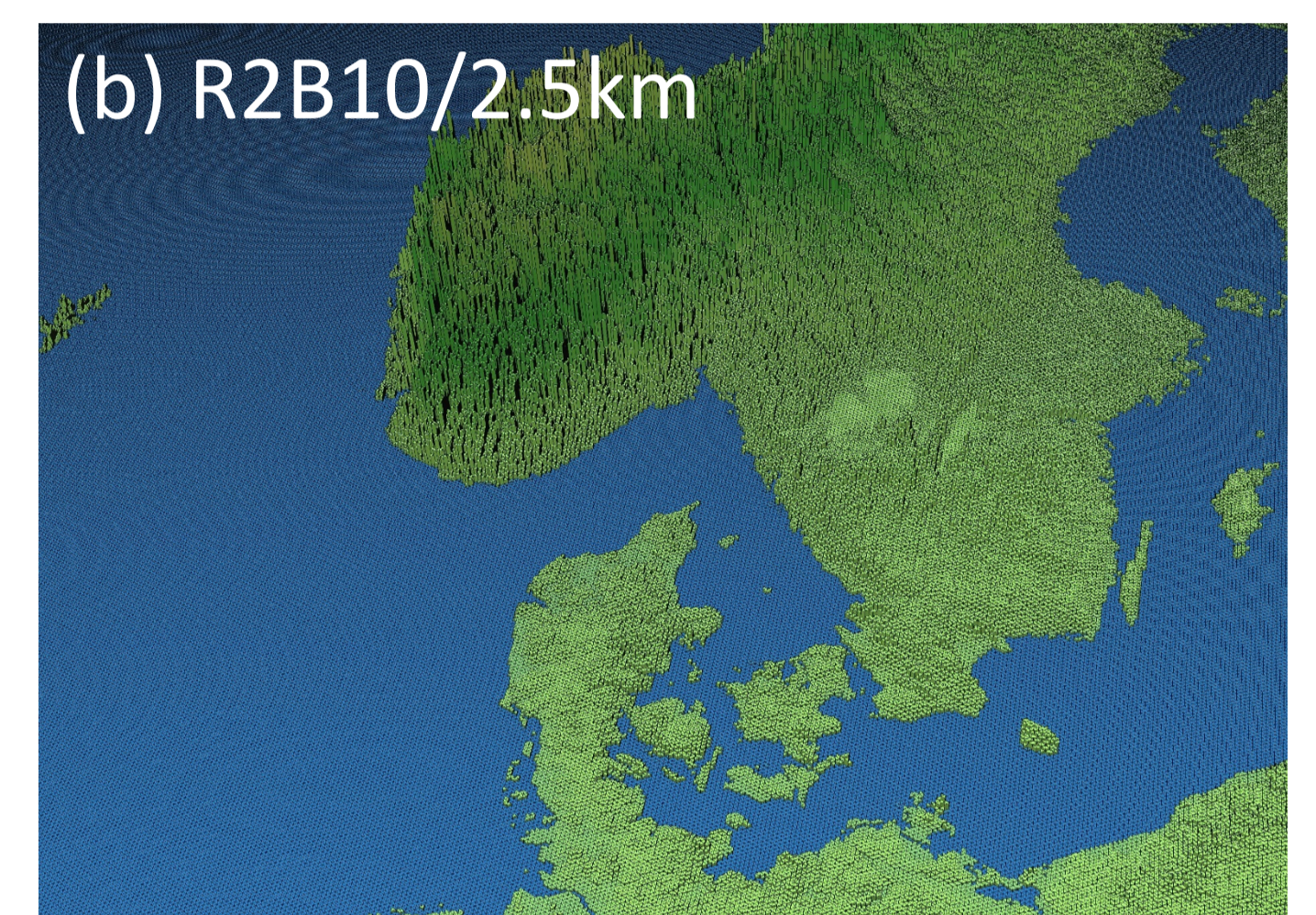
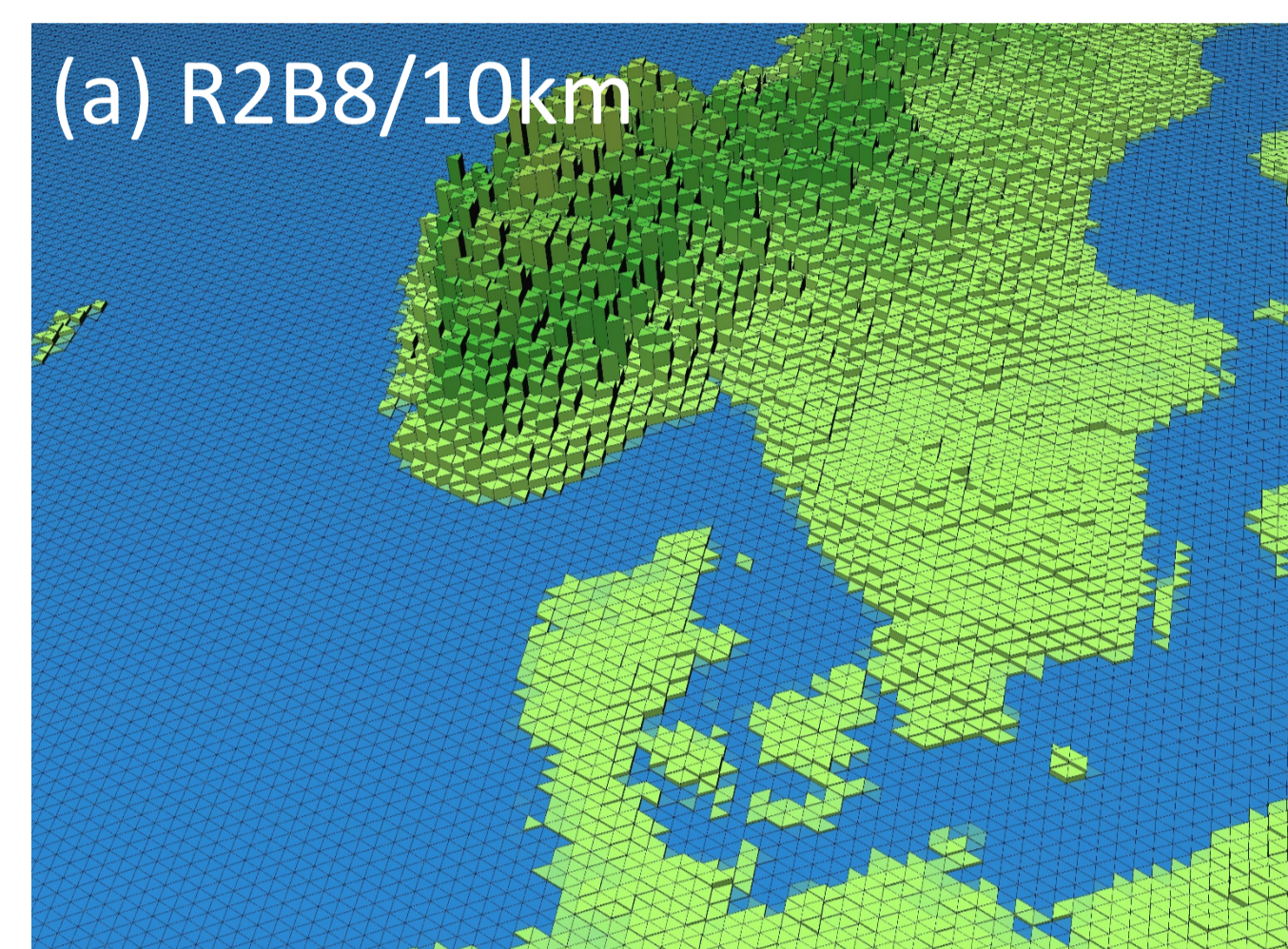
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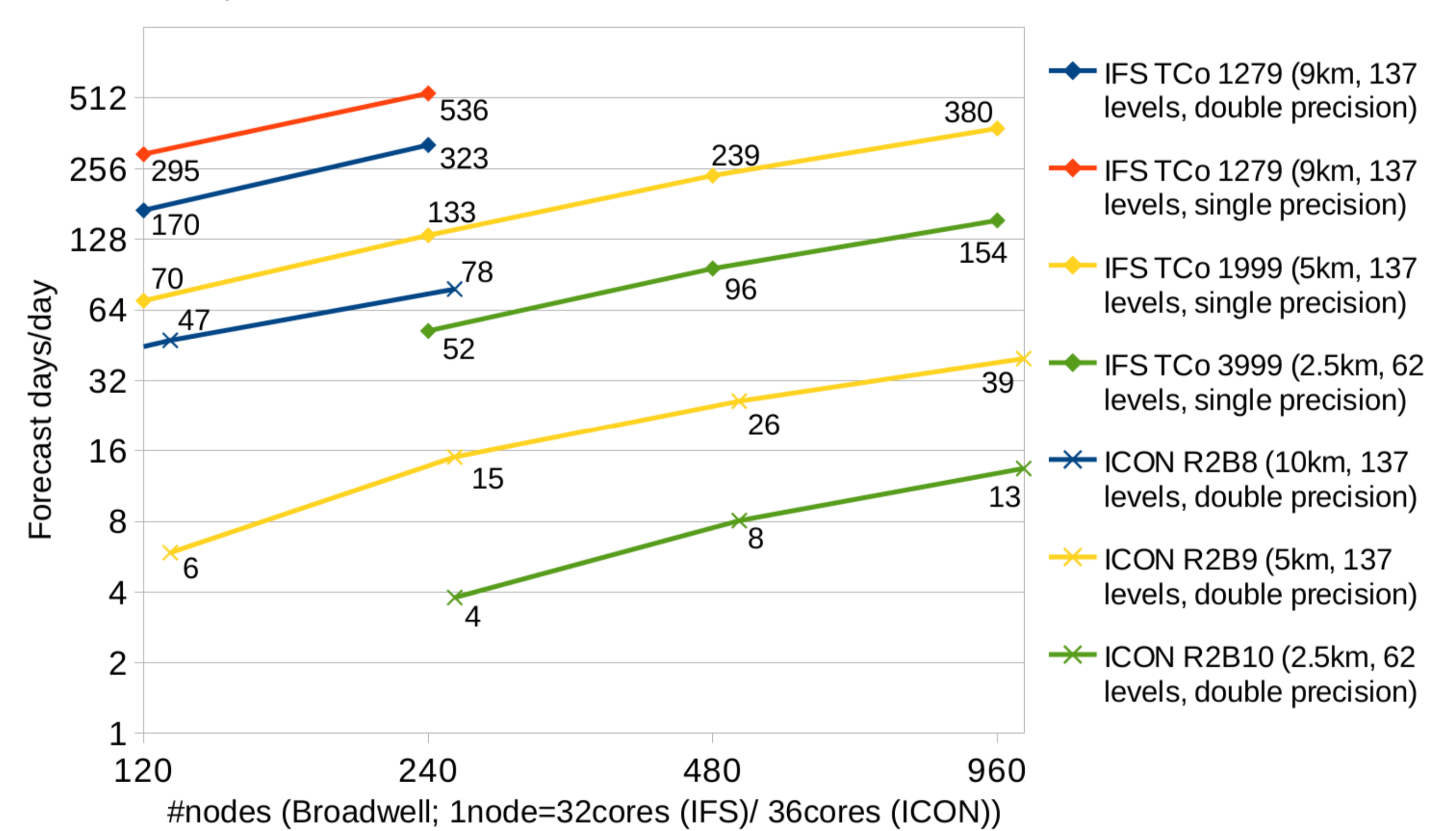
### THE CENTRAL DELIVERABLE:

#### GLOBAL HIGH-RESOLUTION DEMONSTRATORS

**ESiWACE** will deliver **global high-resolution demonstrators** of atmosphere-only, ocean-only and coupled ocean-atmosphere simulations; a key target is to reach spatial resolutions (ca. 1 km) that allow simulating convective clouds and small-scale ocean eddies. This will provide much more fidelity in the representation of high-impact regional events. The demonstrators will allow for computability estimates for these configurations at exascale. They are based on widely used European models (IFS, ICON, NEMO, EC-EARTH).



(a)-(c) Extraction from global ICON grids. (d) Initial cloud distribution of global R2B10/2.5km simulation



Scalability of the models IFS and ICON for global high-resolution atmosphere-only predictions (no I/O)

### THE CONSORTIUM

Coordinator: DKRZ DEUTSCHES KLIMARECHENZENTRUM

WEATHER

CLIMATE

HPC

