



## **ESiWACE: A Center of Excellence for HPC applications to support cloud resolving earth system modelling**

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With the exa-scale era approaching, length and time scales used for climate research on one hand and numerical weather prediction on the other hand blend into each other. The Centre of Excellence in Simulation of Weather and Climate in Europe (ESiWACE) represents a European consortium comprising partners from climate, weather and HPC in their effort to address key scientific challenges that both communities have in common.

A particular challenge is to reach global models with spatial resolutions that allow simulating convective clouds and small-scale ocean eddies. These simulations would produce better predictions of trends and provide much more fidelity in the representation of high-impact regional events. However, running such models in operational mode, i.e. with sufficient throughput in ensemble mode clearly will require exa-scale computing and data handling capability.

We will discuss the ESiWACE initiative and relate it to work-in-progress on high-resolution simulations in Europe. We present recent strong scalability measurements from ESiWACE to demonstrate current computability in weather and climate simulation. A special focus in this particular talk is on the Icosahedral Nonhydrostatic (ICON) model used for a comparison of high resolution regional and global simulations with high quality observation data. We demonstrate that close-to-optimal parallel efficiency can be achieved in strong scaling global resolution experiments on Mistral/DKRZ, e.g. 94% for 5km resolution simulations using 36k cores on Mistral/DKRZ. Based on our scalability and high-resolution experiments, we deduce and extrapolate future capabilities for ICON that are expected for weather and climate research at exascale.