



Centre of Excellence in Simulation of Weather and Climate in Europe, Phase 2

## Project Objectives

The path towards exascale computing holds enormous challenges for the community of weather and climate modelling regarding portability, scalability and data management that can hardly be faced by individual institutes. ESIWACE2 will therefore link, organise and enhance Europe's excellence in weather and climate modelling to

Enable leading European weather and climate models to leverage the available performance of pre-exascale systems with regard to both compute and data capacity in 2021.

Prepare the weather and climate community to be able to make use of exascale systems when they become available.

To achieve these goals, ESIWACE2 will:

- improve throughput and scalability of leading European weather and climate models and demonstrate the technical and scientific performance of the models in unprecedented resolution on pre-exascale EuroHPC systems,
- evaluate and establish new technologies such as domain specific languages and machine learning for use in weather and climate modelling,
- enhance HPC capacity via services to the weather and climate community to optimize code performance and allow model porting,
- improve the data management tool chain from weather and climate simulations at scale,
- foster co-design between model developers, HPC manufacturers and HPC centres, and

- strengthen interactions of the community with the European HPC Eco-system.

ESIWACE2 will deliver configurations of leading models that can make efficient use of the largest supercomputers in Europe and run at unprecedented resolution for high quality weather and climate predictions. This will be a beacon for the community in Europe and around the world.

ESIWACE2 will develop HPC benchmarks, increase flexibility to use heterogeneous hardware and co-design and provide targeted education and training for one of the most challenging applications to shape the future of HPC in Europe.

## Codes of interest

**Codes:** Leading European Weather & Climate Models (coupled models of atmosphere and ocean)

- ICON (German weather service and MPIM)
- IFS (ECMWF and EC-Earth consortium)
- NEMO (European community ocean model)
- Dynamico (Next generation French model by IPSL)

Support to other models, e.g. UM from UK Met Office

## Services

ESIWACE2 plans to establish, evaluate and watch new technologies to prepare climate and weather simulation for the exascale era.

**Direct services:** Create a prototype for open services to the Earth system modelling community in Europe. The goal of the services is to create collaborations that provide guidance, engineering, and advice to support exascale preparations for weather and climate models. All groups developing and maintaining weather and climate codes - not only the ESIWACE2 partners - can apply. Proposals for such collaboration projects will be peer-reviewed and when found eligible will be granted in-kind support by one of the partners involved.



The project ESIWACE2 has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 823988

**Indirect Services:** Establish DSLs in the community, evaluate Concurrent Components to improve performance, evaluate Containers to port Earth system models to new hardware, watch emerging technologies.

## Training

Trainings are going to be organized in our WP6 “Community engagement and Training”. **WP6** links ESIWACE2 to the weather and climate community it serves on the one hand and to the European HPC ecosystem on the other hand.

**Training and Schools:** IO and HPC awareness, DSL, C++ for HPC, OASIS3-MCT, High performance Data Analytics, Docker, Summer school in HPC for weather and climate

## Interaction with industry

ESIWACE2 will improve access to computing applications and expertise that enables industry to be more productive, leading to scientific excellence and economic and social benefit.

Improved competitiveness for European companies and SMEs through access to CoE expertise and services

By giving industry the opportunity to build technology prototypes that are suited for the weather and climate community and verticals, the time-to-market for upcoming products will be positively affected – not only for this community, but also for other related verticals in data-intensive computing

Widening the access to codes and fostering transfer of know-how to user communities, including specific and targeted measures for industry and SMEs

Through:

- Enhanced sharing of code, best practices and corresponding expertise through ESIWACE2 community services

- Knowledge transfer on evolving new technologies (exascale hardware, heterogeneous computing, machine learning, containerisation) via workshops and white papers
- Sharing improved tools, such as OASIS and XIOS, by the entire community
- Fostering exchange of know-how on data management requirements between the weather and climate community and storage vendors (SEAGATE, DDN)
- Selected measures for industry provided through key performance indicators

**Addressed industrial sectors:** HPC vendors (software and hardware), storage industry

Contacts already established with BULL/ATOS, DDN, Seagate. Arm, NEC, nVIDIA, ALTAIR, CRAY

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Consortium: 19 partners

### Interested?

Get in touch

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