ESiWACE3: Excellence in Simulation of Weather and Climate in Europe

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Who we are and what we do

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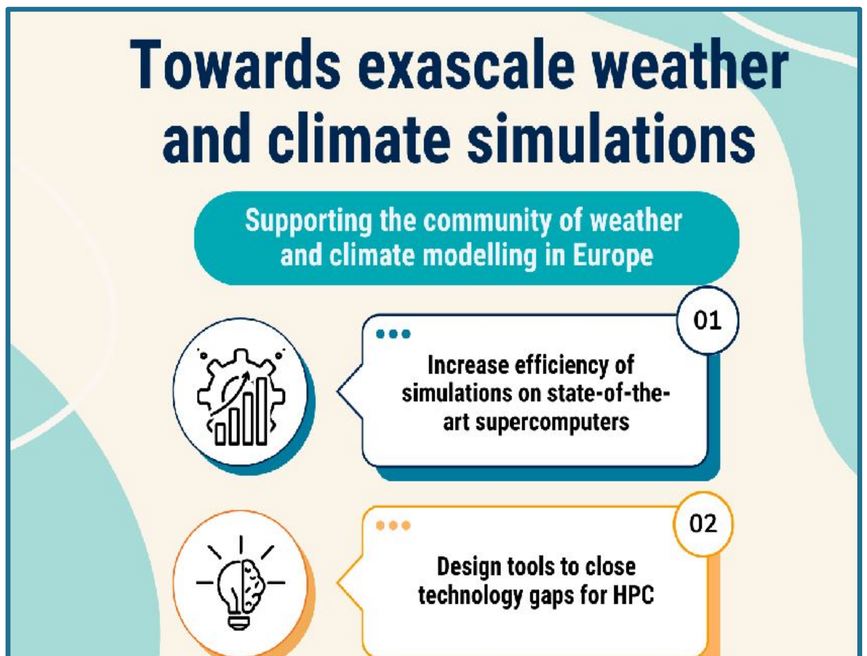
ESiWACE3, the third phase of the Centre of Excellence (CoE) in Simulations of Weather and Climate in Europe, will provide support for the **wider community of weather and climate modelling** in the use of **state-of-the-art supercomputers and new architectures**. The project will run from January 2023 until December 2026.



Our Partners

Our Objectives

The **transfer and establishment of knowledge and technology** for efficient and scalable simulations of weather and climate across the Earth system modelling community in Europe;

Closing **common technology gaps** in the knowledge and toolbox for high-resolution Earth system modelling via joint developments across the European community;

Serving as a **sustainable community hub for training, communication, and dissemination** of high-performance computing for weather and climate modelling in Europe.

Newsletter

NEWSLETTER NEWSLETTER

ESiWACE3@LinkedIn

ESiWACE@X

ESiWACE880@YouTube

WEBSITE WEBSITE

Training opportunities

ESiWACE3 offers a range of free training opportunities aimed at everyone in the European modelling community. A particular emphasis is placed on attracting **female participants** and those from the **inclusiveness target countries**.

- **Hackathons**
- **Summer schools**
- **Online training courses**

See: **www.esiwace.eu/training**

High-Performance Climate and Weather benchmark

HPCW

A Domain-Specific Benchmark targeting exascale application of climate and weather codes

Complete codes:
ICON: Ocean, Atmosphere and coupled NEMO

Dwarfs & mini-applications:
ICON Ocean advection
ICON Atmosphere GPU version
IFS dwarfs: ecRad, ecTrans, Dwarf-P-CloudSC

We offer free HPC Services

Who can apply? Weather and Climate model developers

What? Support, guidance, and advice from ESiWACE3 experts in optimising and porting Earth System modelling source codes to modern HPC systems.

Where? Remotely

When? Continuously

See: **www.esiwace.eu/services**

Specialist expertise available from ESiWACE3 partners includes:

- Developing and implementing numerical climate and weather models;
- Porting and programming for heterogeneous architectures;
- Containerisation techniques;
- Optimisation and tuning code for accelerators;
- Dealing with I/O bottlenecks and accelerating algorithms using GPUs;
- Access to an extensive portfolio of state-of-the-art tools & applications.

Success stories from our SERVICES

DALES
Dutch Atmospheric Large Eddy Simulation

TU Delft · netherlands eScience center

Service provided
Port to GPUs using OpenACC to accelerate DALES' physics modules and atmospheric dynamics with minimal code disruption, seamlessly integrating into the Fortran90 codebase.

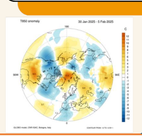
Benefits
20x — 20x speedup for a single Nvidia A100 GPU compared to a single (AMD EPYC) CPU
Substantial energy savings for longer runs
12x — On a node-by-node basis for large test cases, a 12x speedup

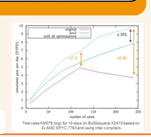
Societal & economic impact
GPU acceleration enables DALES to deliver detailed local climate projections, providing reliable information for stakeholders in agriculture, infrastructure, and other sectors.

GLOBO
Atmospheric General Circulation Model

EVIDEN · CNR ISAC

Service provided
Identify bottlenecks for performance and scaling, to improve MPI communications and to implement parallel I/O or any additional aspects to optimise the code.





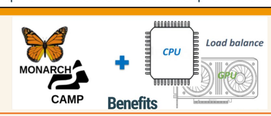
Benefits
Build system improvement, loop vectorization, and communication enhancement
2.66x — A speedup of up to 2.66x have been obtained on 240 CPU cores
Deep code optimizations of the GLOBO atmospheric model.

Societal & economic impact
Improving the numerical performance of the model will make the whole forecasting system more efficient in delivering its products to the end users, possibly enlarging its audience.

MONARCH-CAMP
Enhancing computational efficiency in NWP: Fostering CPU+GPU load-balance

Barcelona Supercomputing Center · UPC

Service provided
Deploy on Marenostrum 5 with updated compiler dependencies, enabling simultaneous CPU and GPU execution, incorporating a load-balancing algorithm for optimal resource utilization, and integrating developments in the MONARCH atmospheric model.



Benefits
1.25x — Speedup against a static load distribution for all the execution time.
70x — Speedup against the 1-core CPU run and 8x in a node-to-node comparison
3.5x — The CAMP GPU version has a 3.5x speedup against traditional approaches.

Societal & economic impact
This work enhances Earth science models by optimizing the chemistry component using GPU acceleration and load balancing, improving simulation efficiency, aiding geoscientific applications, and advancing state-of-the-art HPC for climate research.

… and much more!

EuroHPC Joint Undertaking

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