



# From ESiWACE2 to ESiWACE3

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*Back in 2016 EuroHPC did not yet exist, but the general plan to build an exascale system in Europe had been announced and the EU initiated Centres of Excellence (among them ESiWACE) to prepare the applications*

## ESiWACE(phase1) pillars:

**Scalability**

of codes and also of software development

**Usability**

of end-to-end workflow in HPC environment

**Exploitability**

of huge amount of complex data

*1 Simulated Year Per Day at 1 km horizontal resolution “storm resolving”*

Source: J. Biercamp, ICAS 22

## ESiWACE2: Key objectives:

**Evolution:** 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.

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

Besides working with our flagship models  
(IFS, ICON, EC-EARTH, NEMO),

**service & support activities**  
became more prominent  
in the second phase

Source: J. Biercamp, ICAS 22



**esiwace**

CENTRE OF EXCELLENCE IN SIMULATION OF WEATHER  
AND CLIMATE IN EUROPE

Research agreement No 675191

**esiwace-2**

CENTRE OF EXCELLENCE IN SIMULATION OF WEATHER  
AND CLIMATE IN EUROPE

Research agreement No 823988

**esiwace-3**

CENTRE OF EXCELLENCE IN SIMULATION OF WEATHER  
AND CLIMATE IN EUROPE



Source: J. Biercamp, ICAS 22



# ESiWACE3 partners



- ESiWACE3 involves partners with world leading scientific and technical expertise in weather and climate research, in high-performance computing and also in project management and communication.
- World leading expertise in weather forecast and climate research data handling is provided through **ECMWF, DKRZ, MPI-M, CMCC, SMHI and UH.**
- Expertise in high performance computing is brought by three supercomputing centres, **BSC, JSC and CSC.**
- Targeted software engineering for weather and climate related applications as HPC services through **NLESC, ATOS and BSC.**
- Vast experience in training, teaching, and creation of training material with **UH and SMHI.**

# ESiWACE3 objectives

- Starts from the ability to efficiently run Earth system models at  $\sim 1$  km resolution on EuroHPC supercomputers from previous phases.
- Developments are now picked up by science-driven projects.
- Community tools for coupling, data handling, and visualisation have been enabled to work at this level of resolution and throughput.

ESiWACE3 focuses to support the weather and climate modelling community to reach a higher readiness level regarding exascale supercomputing and foster knowledge transfer between the different Earth system modelling centres and teams across Europe.

# ESiWACE3 top-level aims

## **A1: Transfer and establish knowledge and technology**

for efficient and scalable simulations of weather and climate across the Earth system modelling community in Europe.

## **A2: Close common technology gaps**

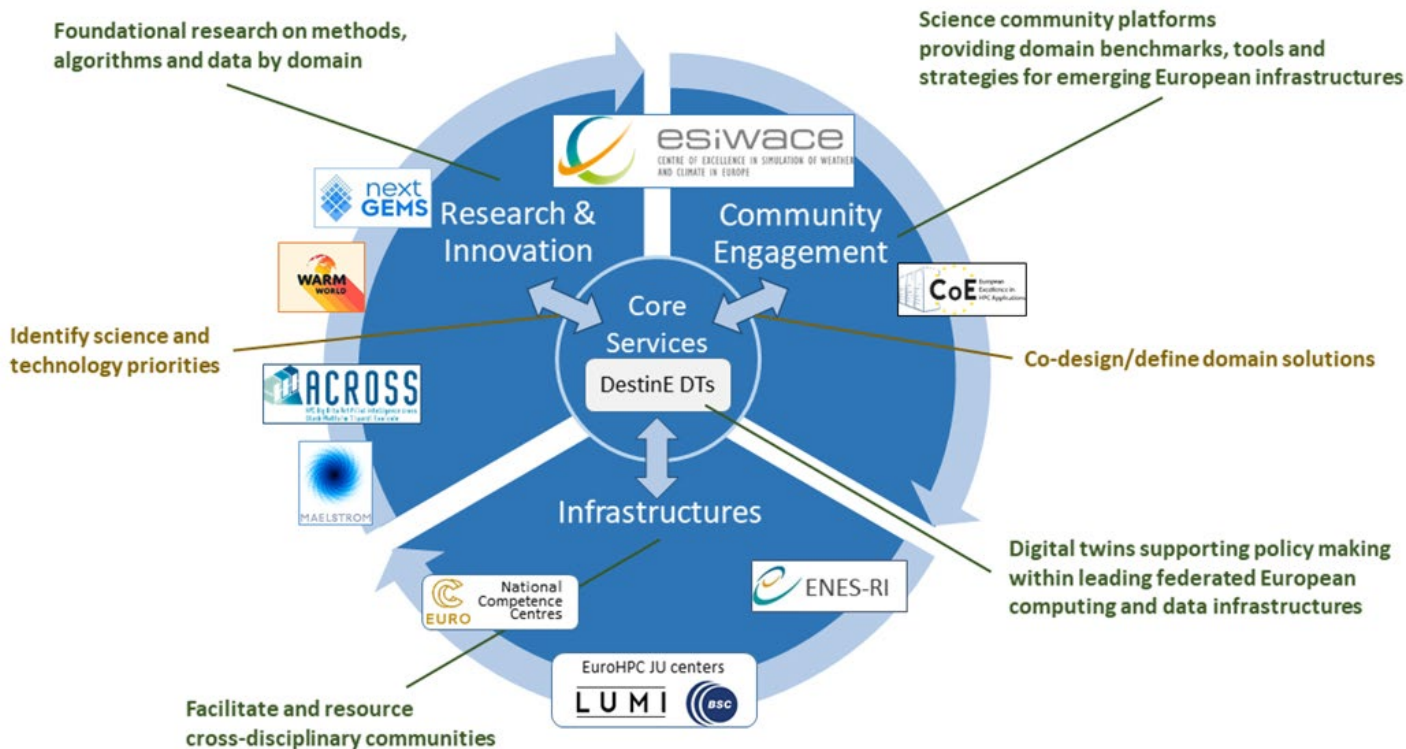
in the knowledge and toolbox for high-resolution Earth system modelling via joint developments across the European community.

## **A3: Serve as a sustainable community hub**

for training, communication, and dissemination for high-performance computing for weather and climate modelling in Europe.



# Continuous innovation cycle envisaged by the ESiWACE3





# Main goals

**To achieve the aims, ESiWACE will focus on a number of top-level objectives to support the community of weather and climate modelling in Europe:**

- O1: Increase efficiency of weather and climate simulations on state-of-the-art supercomputers.**
- O2: Design tools to close technology gaps for high performance computing.**
- O3: Develop tools to tackle the data challenge of high-resolution weather and climate modelling.**
- O4: Support the wider community of weather and climate modelling in the use of state-of-the-art supercomputers via targeted services.**
- O5: Support the wider community of weather and climate modelling in the use of state-of-the-art supercomputers via training and capacity building.**
- O6: Build a well-connected and inclusive community for high-resolution Earth system modelling across Earth system science and HPC and establish connections and knowledge transfer between existing European initiatives.**

# ESiWACE3

## PILLAR 1

### Technical developments and research activities

O1 **Increase efficiency**  
of weather and climate simulations on state-of-the-art computers

O2 **Design tools to close technology gaps**  
for high performance computing

O3 **Develop tools to tackle the data challenge**  
of high-resolution weather and climate modelling

## PILLAR 2

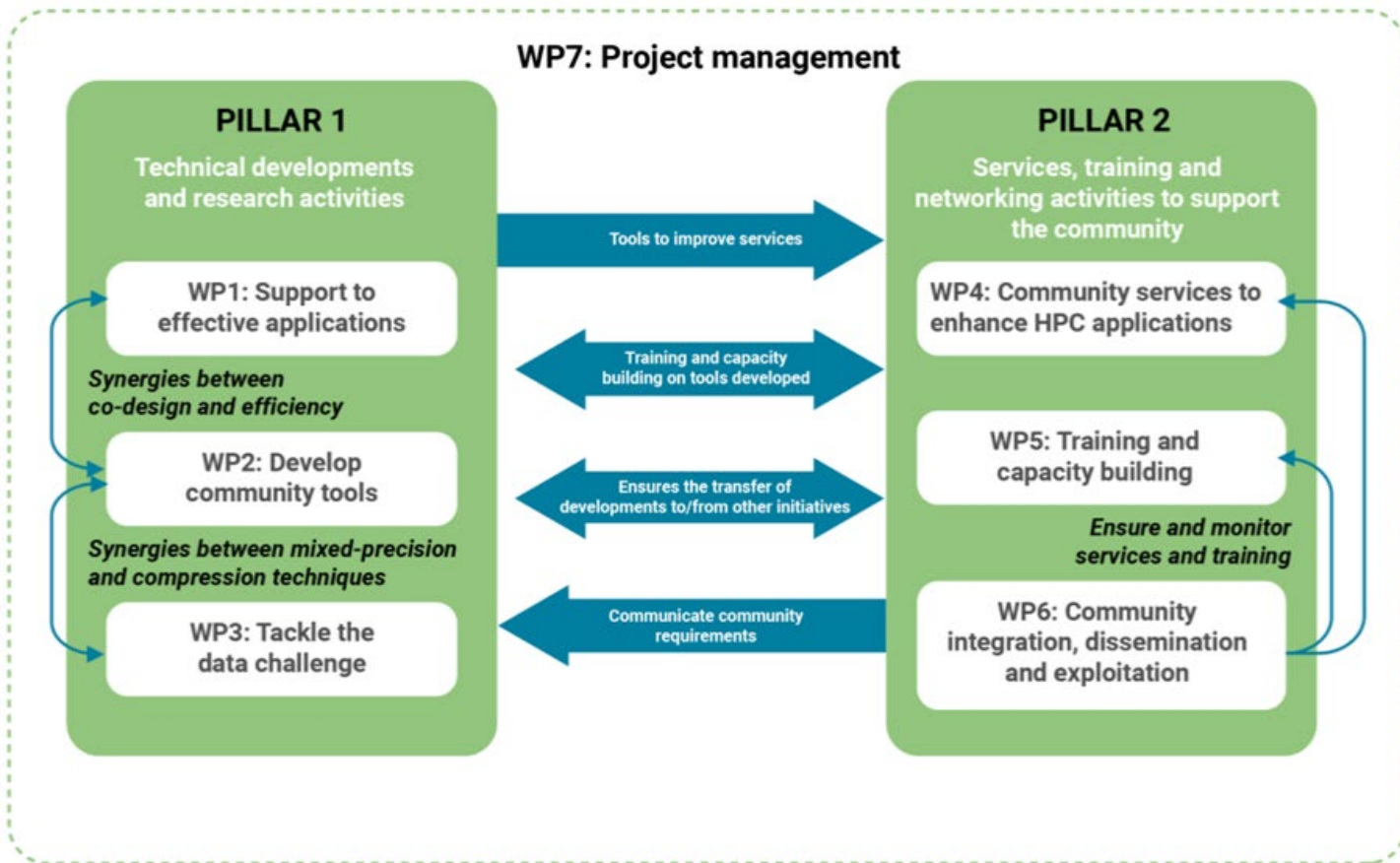
### Services, training and networking activities to support the community

O4 **Support the wider community of weather and climate modelling in the use of state-of-the-art supercomputers via targeted services**

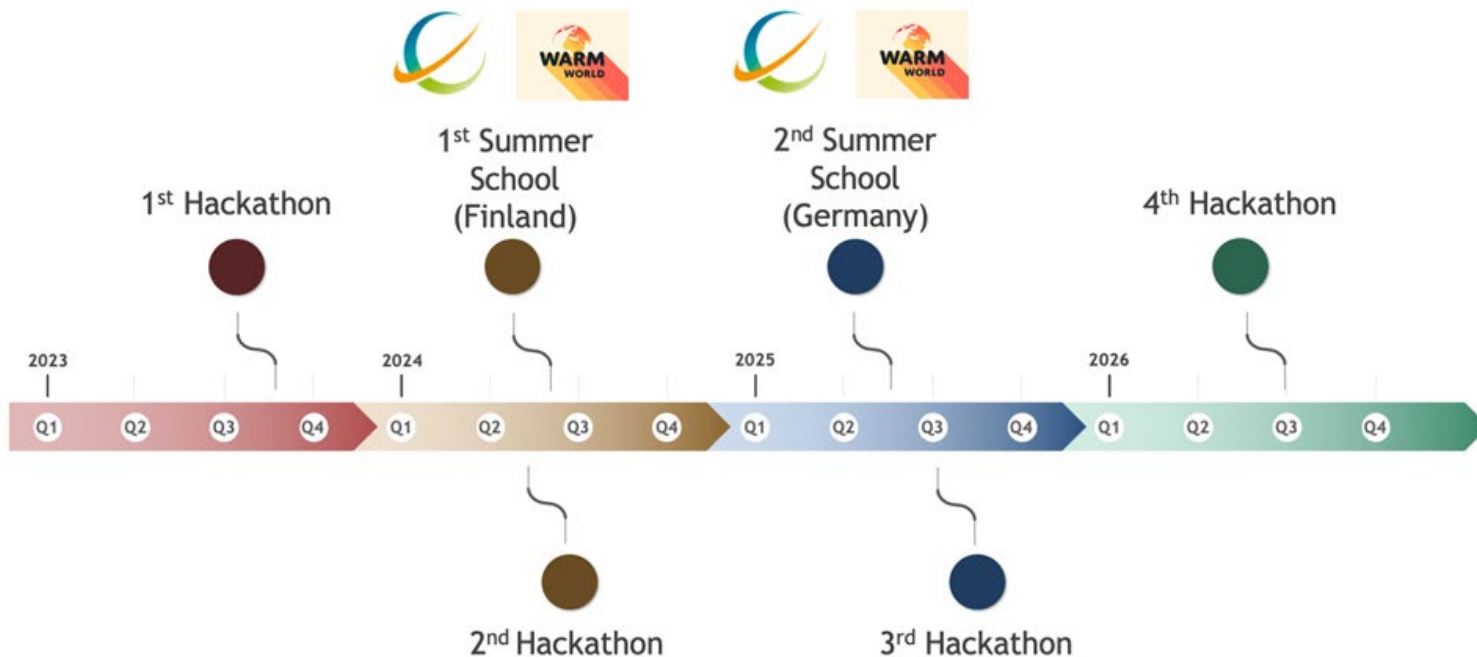
O5 **Support the wider community of weather and climate modelling in the use of state-of-the-art supercomputers via training and capacity building**

O6 **Build a well-connected and inclusive community**  
for high-resolution Earth system modelling across Earth system science and HPC, and establish connections and knowledge transfer between existing European initiatives

# Work Plan



# ESiWACE3 training events



# Communication

## Main goals

- Organisation of activities to build a well-connected and vibrant community of Earth system modelling across Earth system sciences and HPC;
- Creation of a project strategy that maximises engagement taking gender equity and regional diversity into account;
- Organisation of and participation in activities to connect with the HPC scientific community, technology providers, and users, as well as sharing knowledge with other relevant European projects and initiatives.
- Maximisation of the long-term impact and sustainability of the project and its results.

## Actions

- Planning, implementing, monitoring, and adjusting an effective strategy for communication, dissemination, and exploitation activities to maximise the visibility of the project and of the training and capacity building actions organised within the project, directed to support the use of HPC by the wider weather and climate modelling community.
- Developing innovative formats to disseminate the project results to multiple target audiences.

# Scale and significance of project contributions

Impact Area	Project results (short-term) / <i>indicators</i>	Project outcomes (medium-term) / <i>indicators</i>	Project impacts (long-term)
SCIENTIFIC	Several summer schools and hackathons organised in collaboration with other projects > 6 events	Young scientists discover the Earth Sciences community and develop a career in the field <i>Young scientists participating in ESiWACE3 events are starting a master or PhD related to Earth Sciences</i>	More and better prepared scientists working on Earth system modelling
	Scientific results prepared for publication and dissemination <i>At least 20 peer-reviewed scientific publications</i>	Uptake of scientific outcomes of ESiWACE3 <i>Peer-reviewed publications reference ESiWACE3 publications</i>	Improved European community models and tools
	Services delivered to the community > 20 services	Improved and more efficient codes <i>Technical evaluation with improvement metrics at the end of the services</i>	Faster and more efficient code runs with a reduced carbon footprint
	An HPCW version released to the public > 200 downloads	HPCW provides a meaningful benchmark when evaluating new architectures for systems <i>Usage of HPCW in scientific projects or HPC procurements</i>	Future HPC site deployments are more performant when running Earth system model applications
	HPC centres running EC-Earth4 through container solution > 5 centres	Increased numbers of EC-Earth4 users/institutions <i>Users access results</i>	Improved knowledge and understanding of the climate and Earth System by using a climate model

## Interested in getting in touch?



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



Twitter: <https://twitter.com/esiwace>



YouTube: <https://www.youtube.com/@esiwace880>



ESiWACE is on Zenodo, the Open Access repository for scientific results  
<https://zenodo.org/communities/esiwace>



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