

DESTINATION EARTH

THE CLIMATE CHANGE ADAPTATION DIGITAL TWIN

Sebastian Milinski

on behalf of the Climate DT and ECMWF teams



Funded by
the European Union

Destination Earth

implemented by

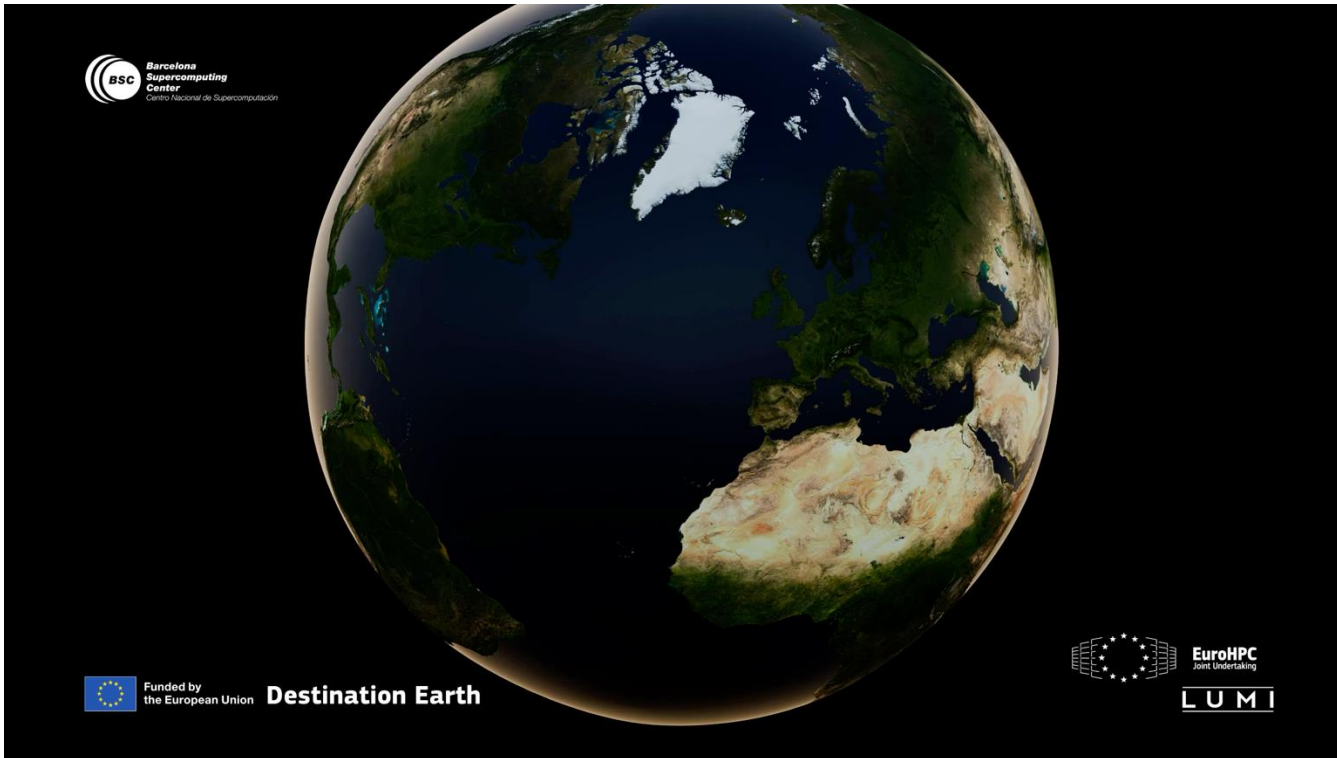




CLIMATE DT PRODUCING TAILORED CLIMATE INFORMATION

multi-decadal km-scale climate projections

Where should we build the next wind farms knowing storm occurrences could shift depending on different scenarios?

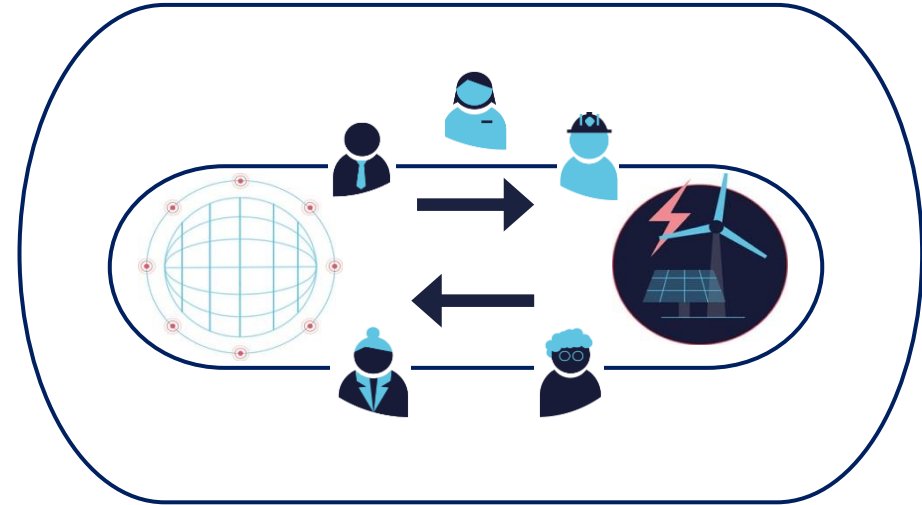




THE CLIMATE CHANGE ADAPTATION DIGITAL TWIN

Operational framework for km-scale multi-decadal climate projections

- ✓ Regular production, frequent updates
- ✓ Enhanced flexibility of simulations and output
- ✓ Enhanced spatial and temporal resolutions
- ✓ Integration of sectoral models in the DTs workflow

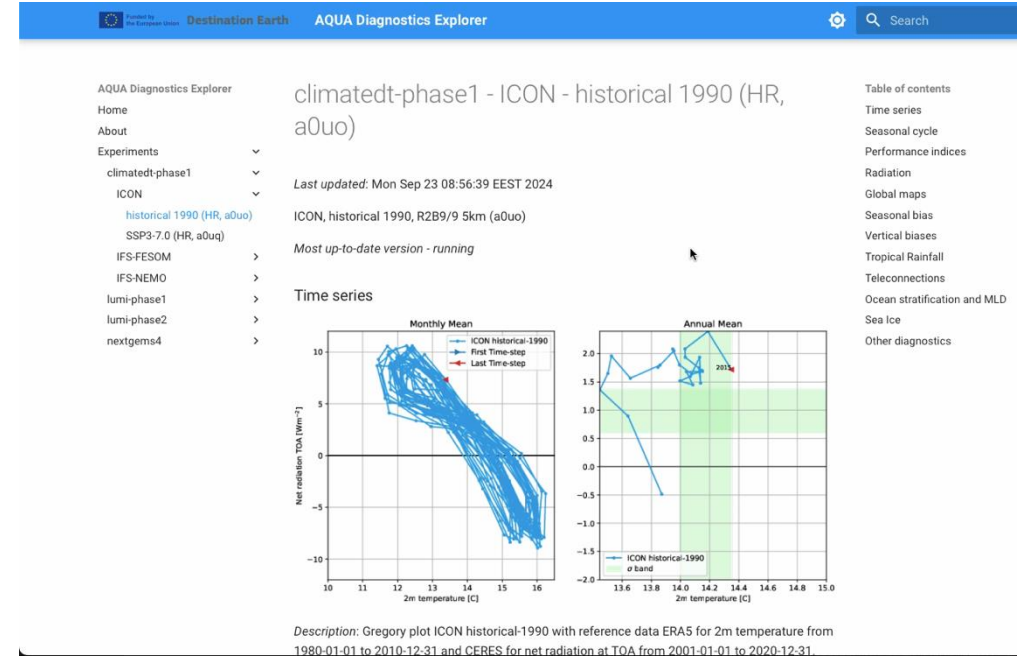
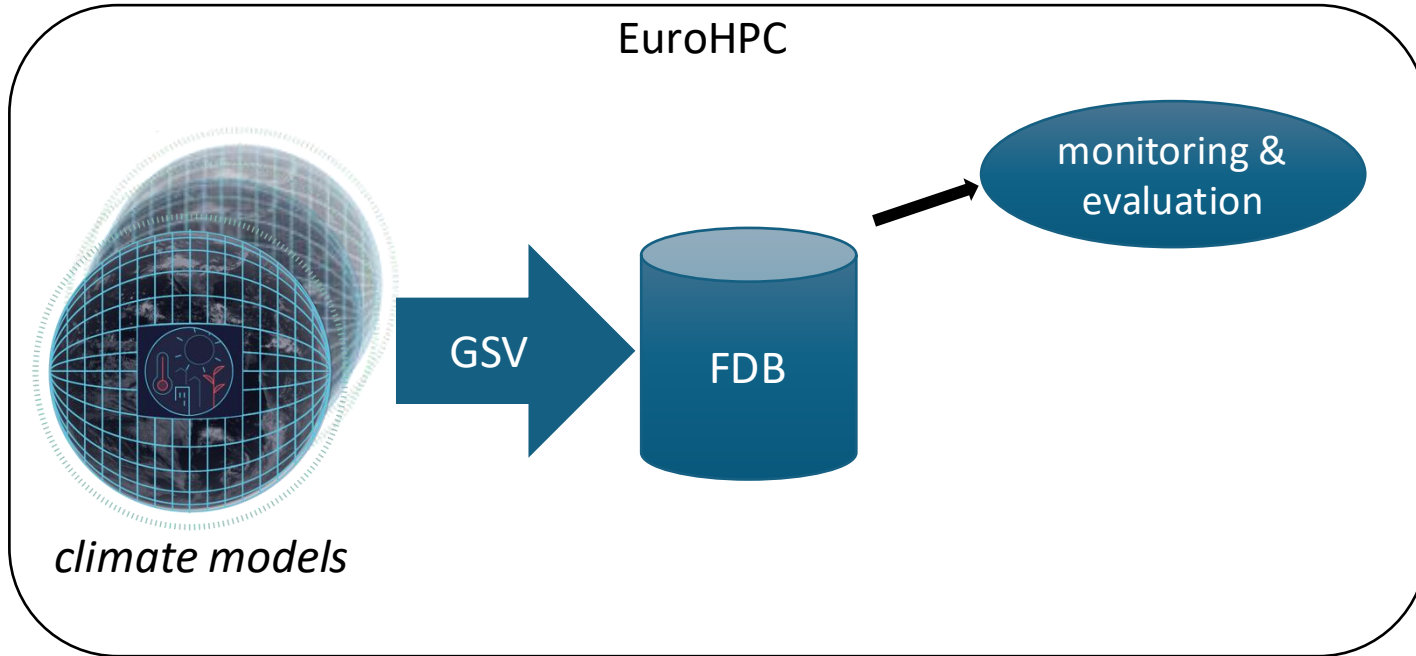


13-member European partnership led by CSC

ALFRED-WEGENER-INSTITUT HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG **Barcelona Supercomputing Center** Centro Nacional de Supercomputación
Deutscher Wetterdienst Wetter und Klima aus einer Hand **DKRZ** DEUTSCHES KLIMARECHENZENTRUM **JÜLICH** Forschungszentrum
ILMATIETEEN LAITOS METEOROLOGISKA INSTITUTET FINNISH METEOROLOGICAL INSTITUTE **UNIVERSITY OF HELSINKI** **MAX-PLANCK-INSTITUT FÜR METEOROLOGIE**
Politecnico di Torino **ISAC** **Schweizerische Eidgenossenschaft** Confédération suisse Confederazione Svizzera Confederaziun svizra
UFZ HELMHOLTZ Centre for Environmental Research

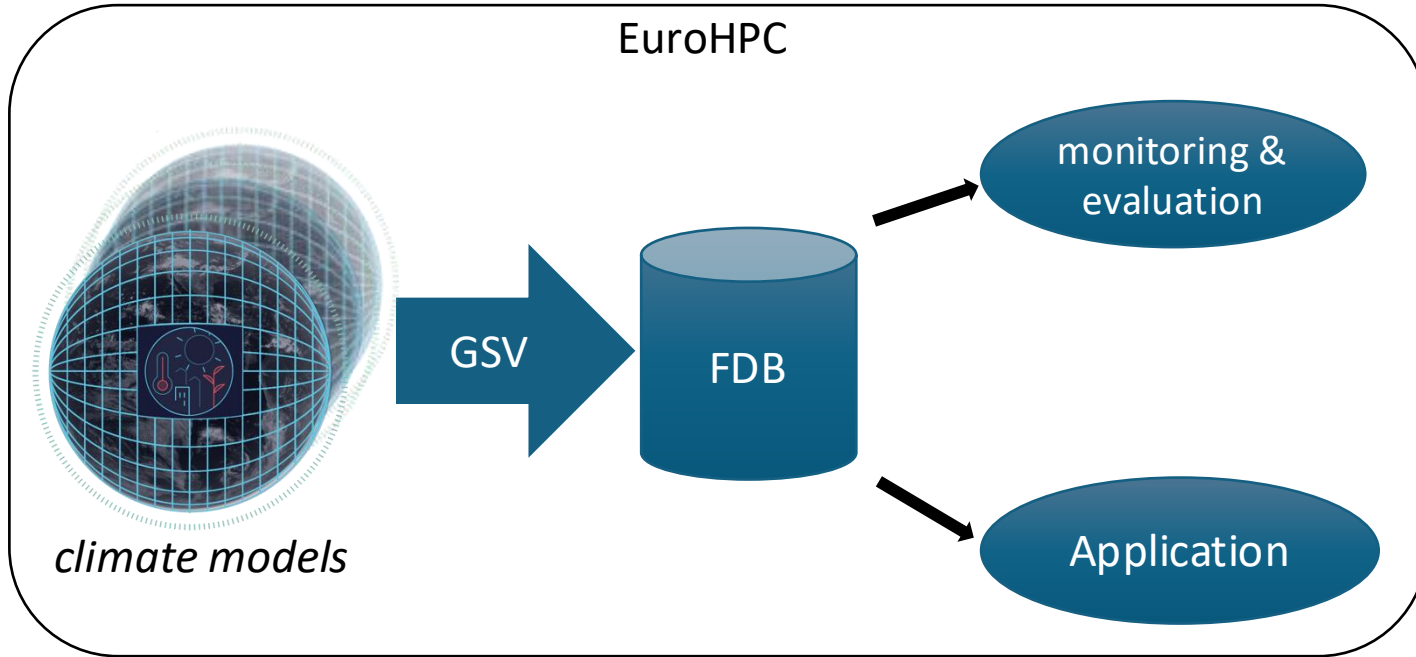


CLIMATE DT: OPERATIONAL FRAMEWORK FOR MULTI-DECADAL CLIMATE PROJECTIONS





CLIMATE DT: OPERATIONAL FRAMEWORK FOR MULTI-DECADAL CLIMATE PROJECTIONS

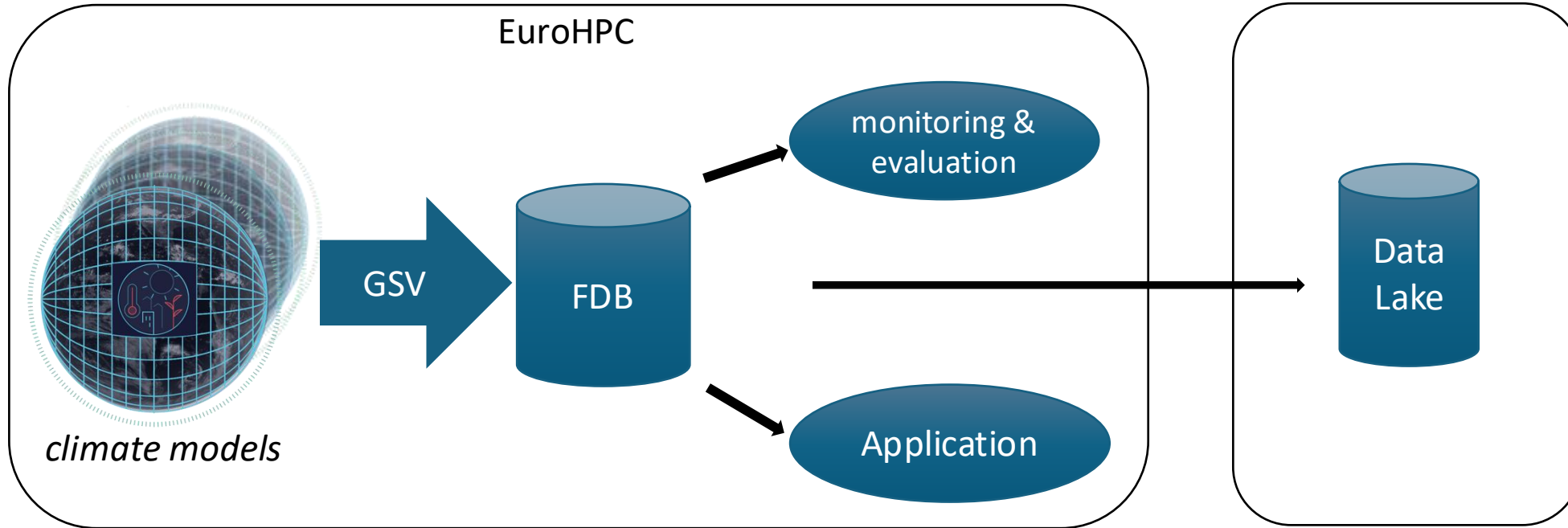


Use cases embedded in Climate DT



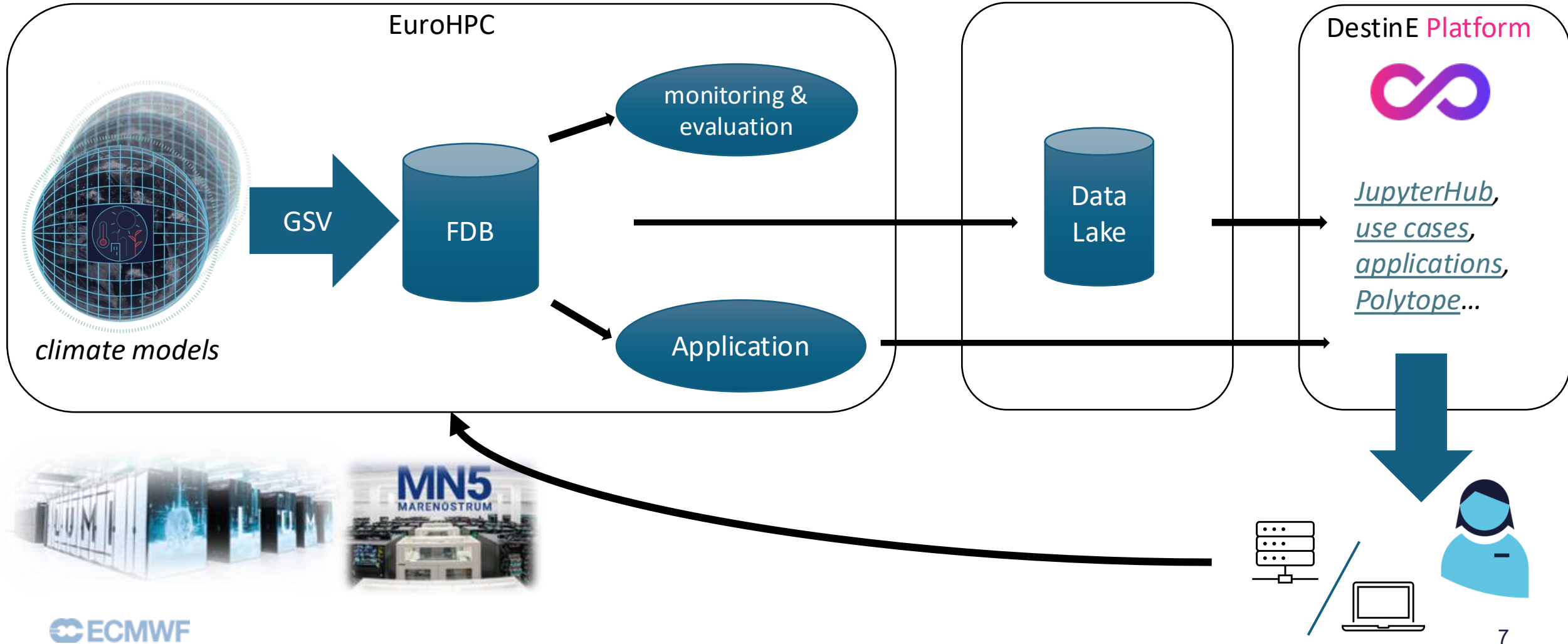


CLIMATE DT: OPERATIONAL FRAMEWORK FOR MULTI-DECADAL CLIMATE PROJECTIONS



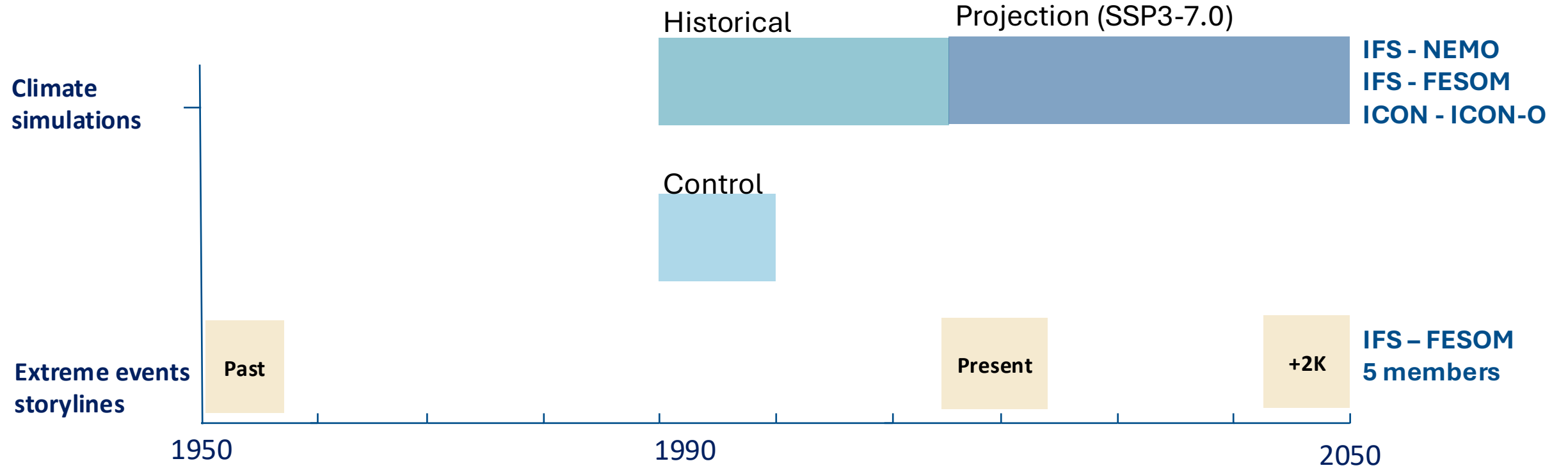


CLIMATE DT: OPERATIONAL FRAMEWORK FOR MULTI-DECADAL CLIMATE PROJECTIONS





CLIMATE DT: PHASE 2 SIMULATIONS



210 years at 5 km atmosphere, 5km / 1/12° ocean
 135 years at 10 km atmosphere, 5 km ocean



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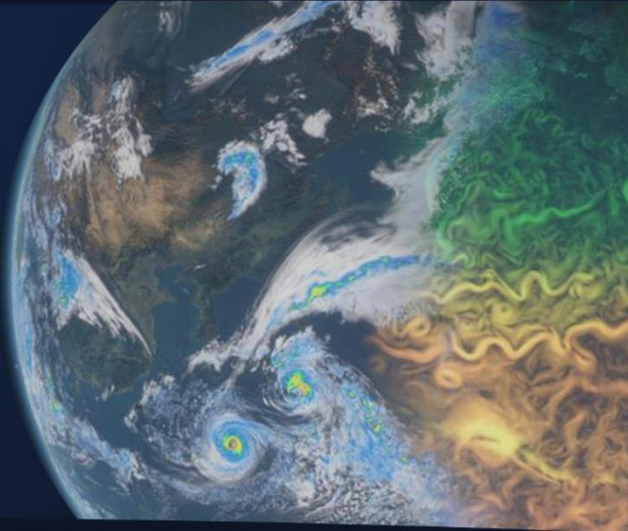
Destination Earth Home Services Onboarding Updates About Resources

CLIMATE DT

The Destination Earth Climate Change Adaptation Digital Twin provides high-resolution, globally consistent climate information to support climate adaptation.

A new set of simulations is now available, building on upgraded climate models, and impact-sector applications.

This page guides you step by step through all relevant information, including how to access and use the Digital Twin simulations.




New data released on May 18th

platform.destine.eu/climate-dt

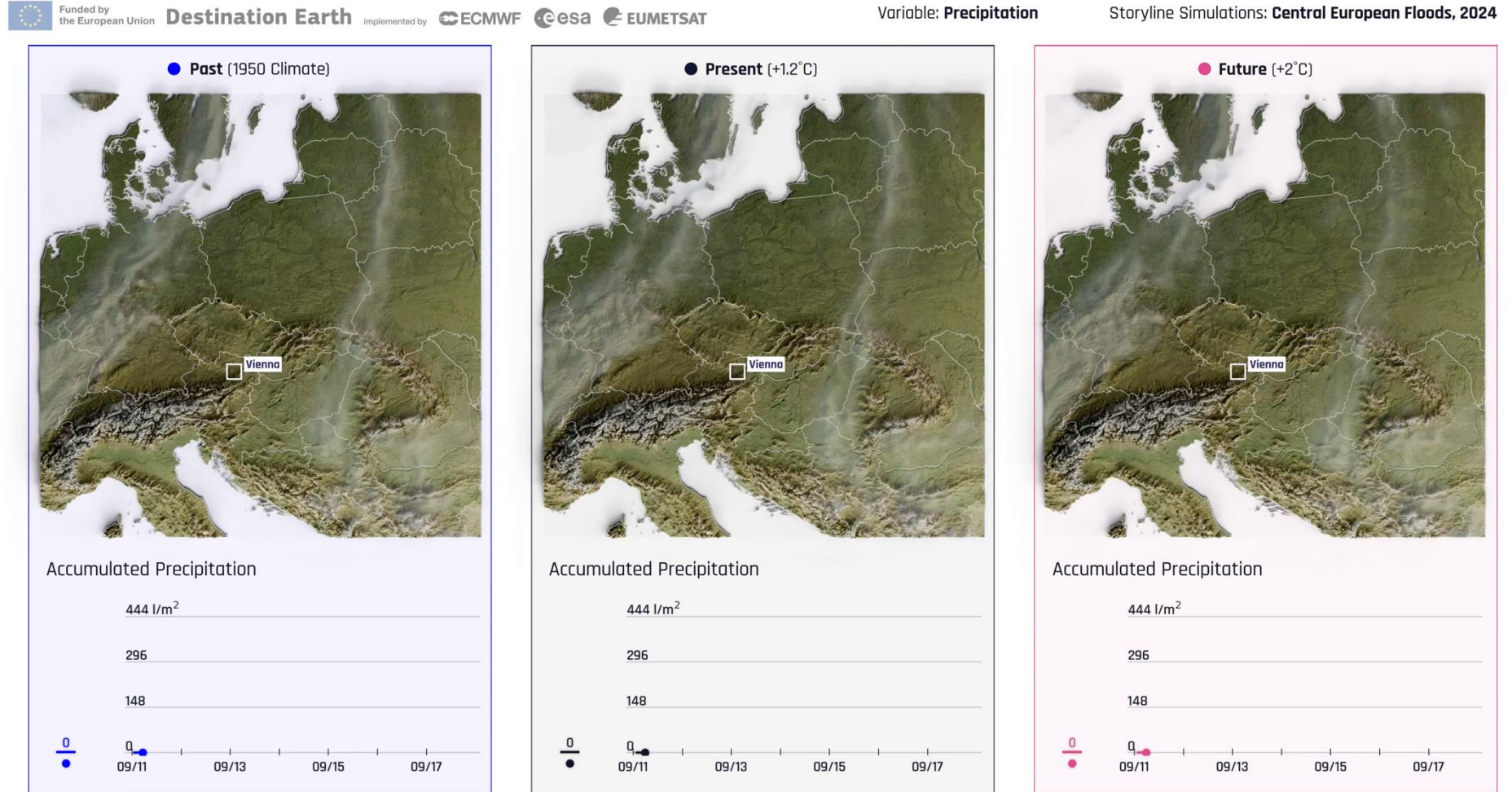




CLIMATE DT STORYLINES: REPLAYING RECENT EXTREME EVENTS

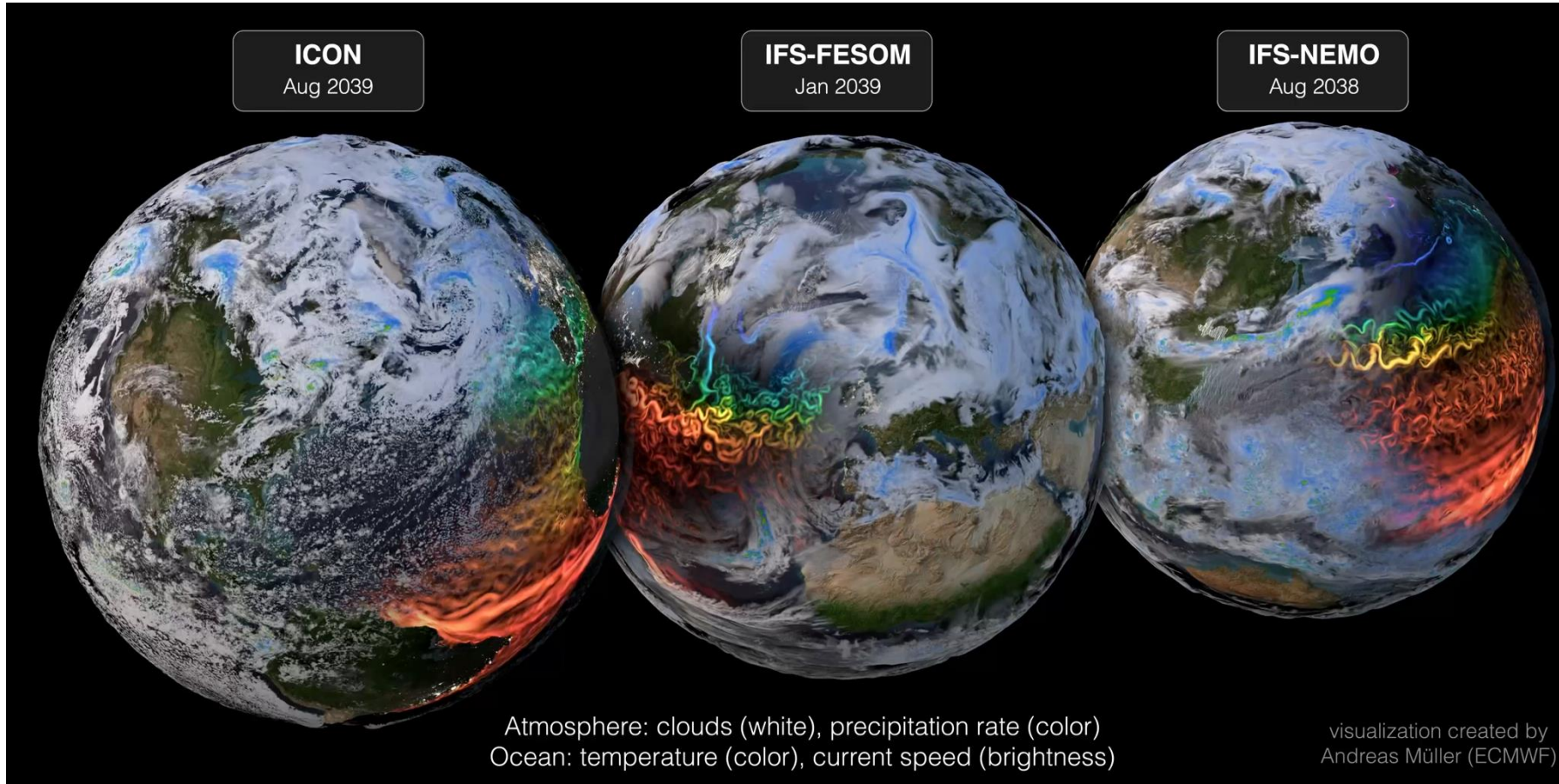
Central Europe floods September 2024

- How would it have unfolded in past (1950) and +2K climates?





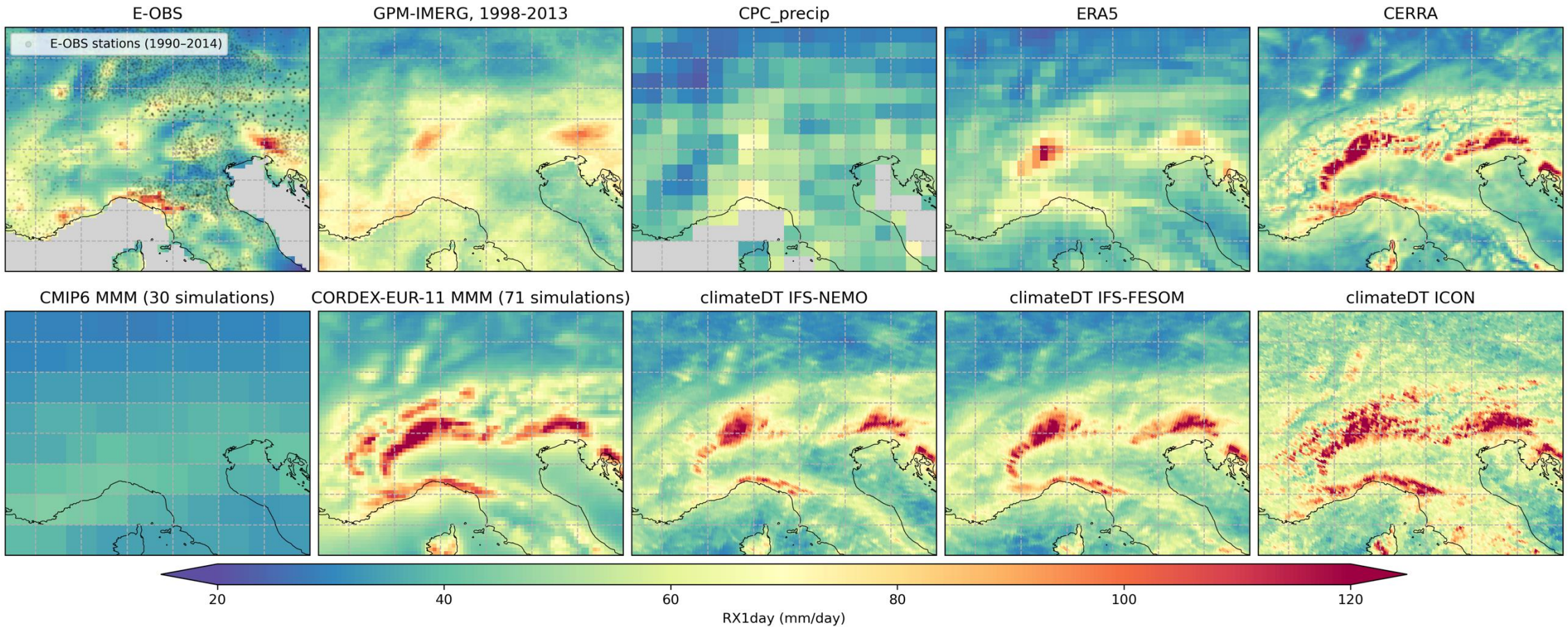
GLOBAL INFORMATION WITH LOCAL GRANULARITY





LOCAL GRANULARITY – extreme rainfall

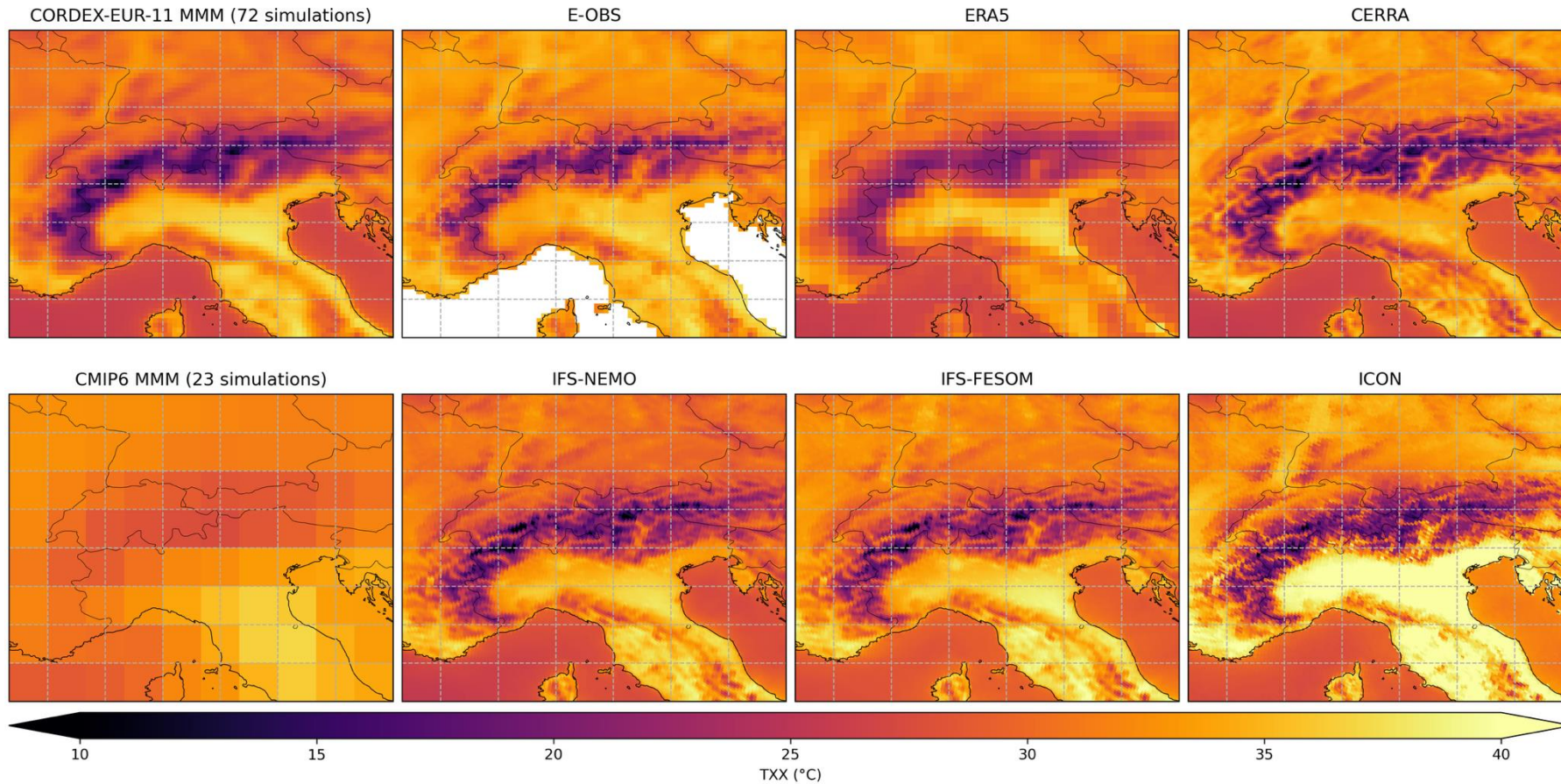
Mean of annual maximum 1-day precipitation (RX1day) from 1990 to 2005





LOCAL GRANULARITY – extreme heat

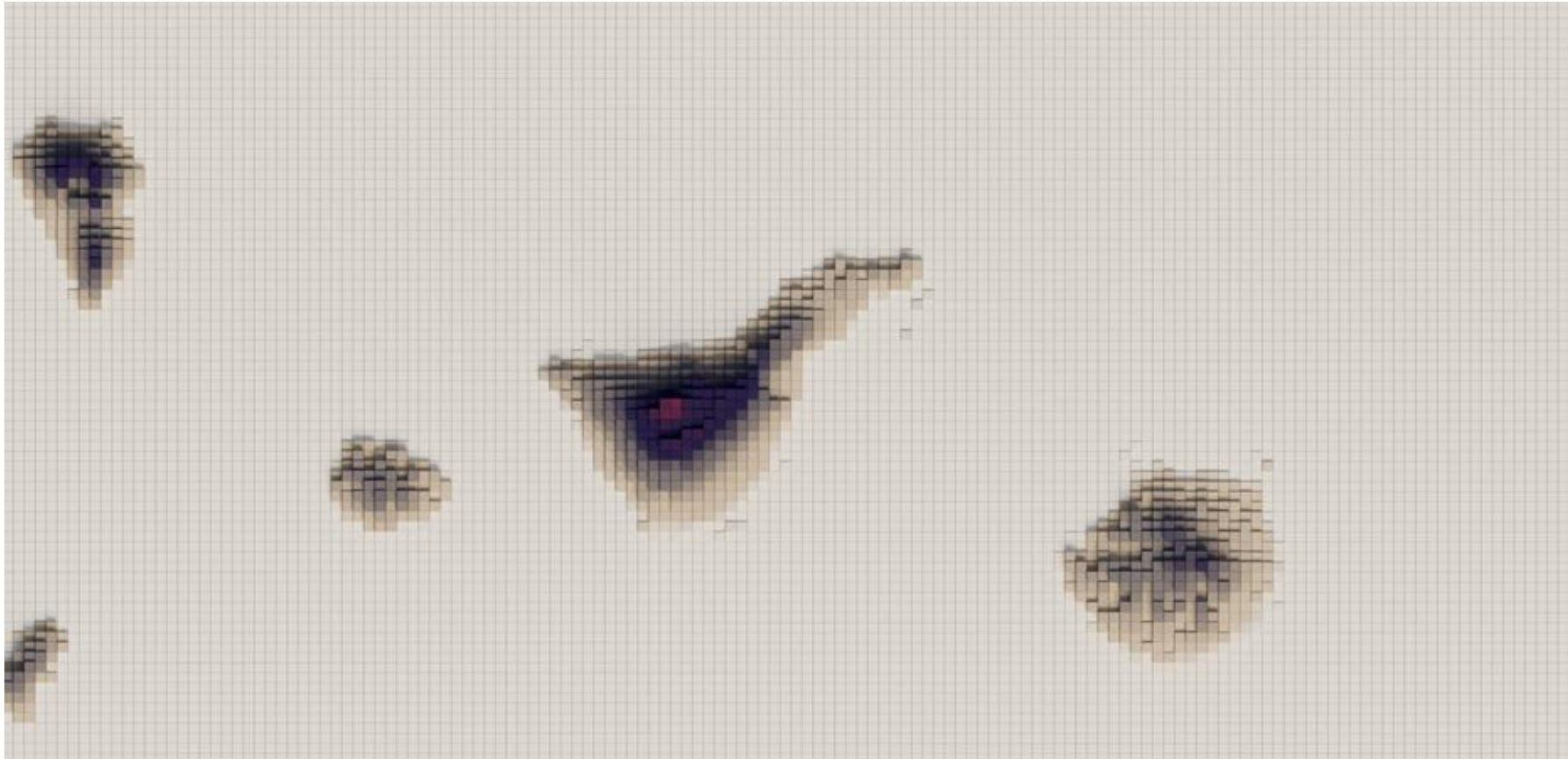
Mean of annual maximum temperature from 1990 to 2005





LOCAL GRANULARITY

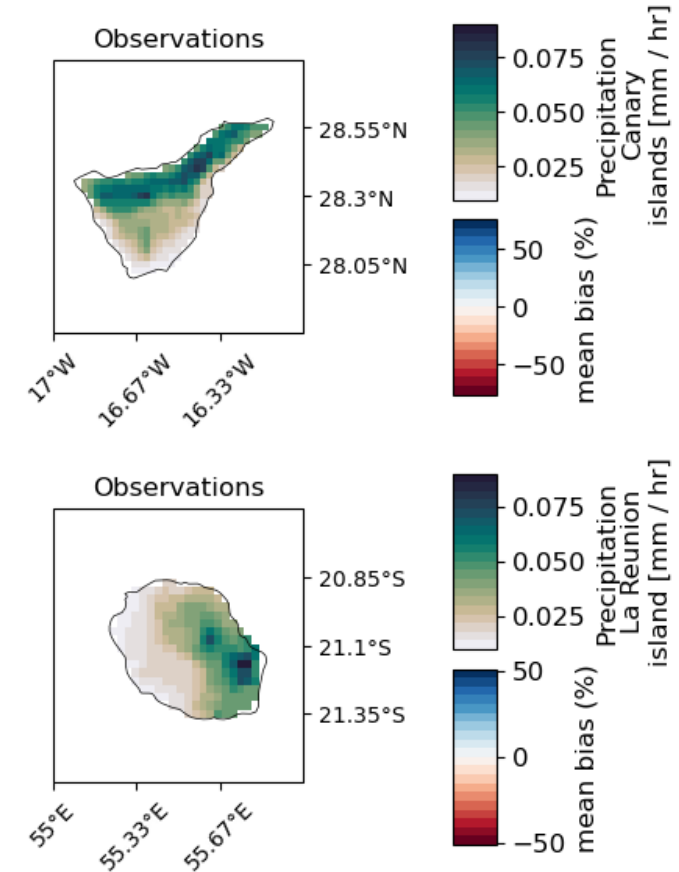
5 km





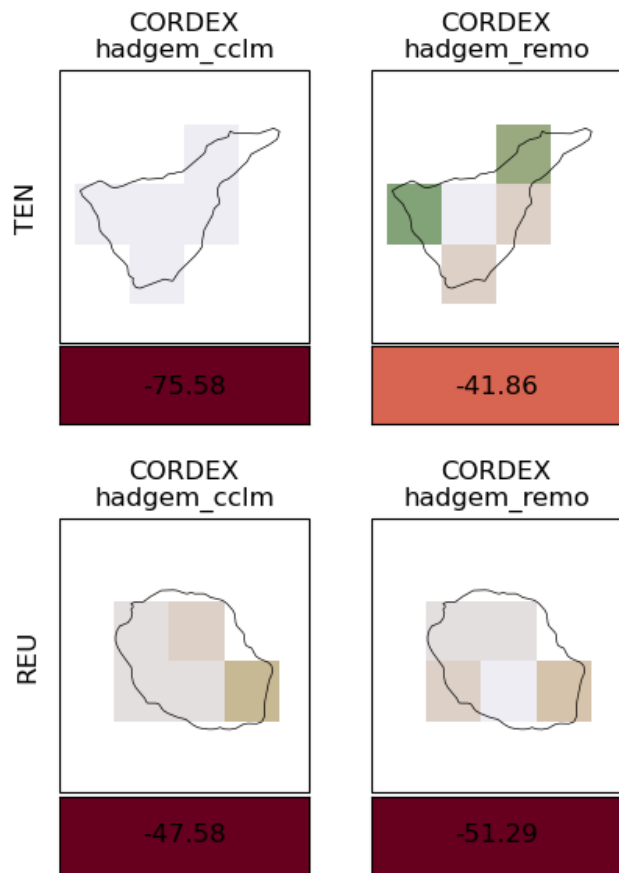
LOCAL GRANULARITY – remote locations

Observations

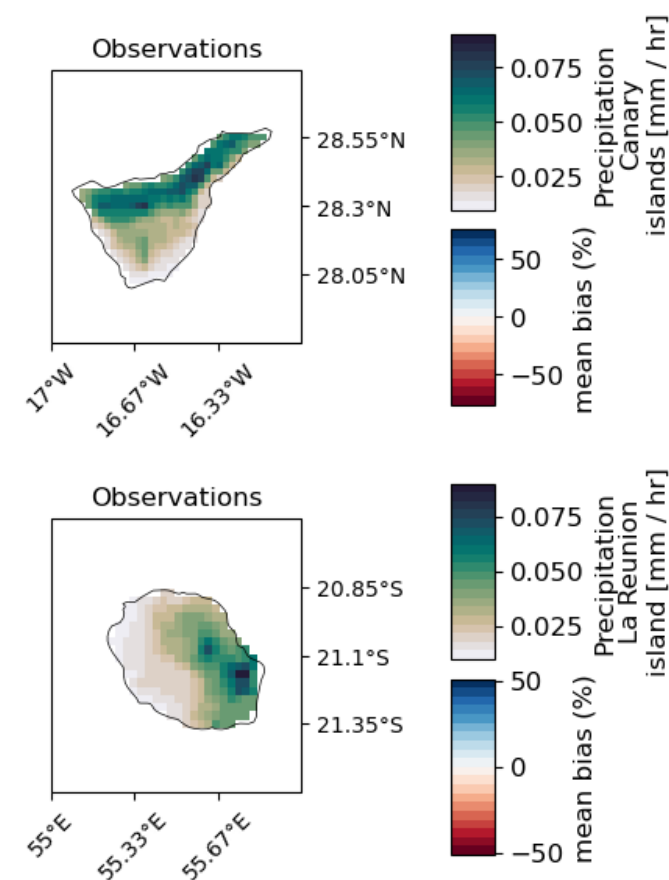




LOCAL GRANULARITY – remote locations

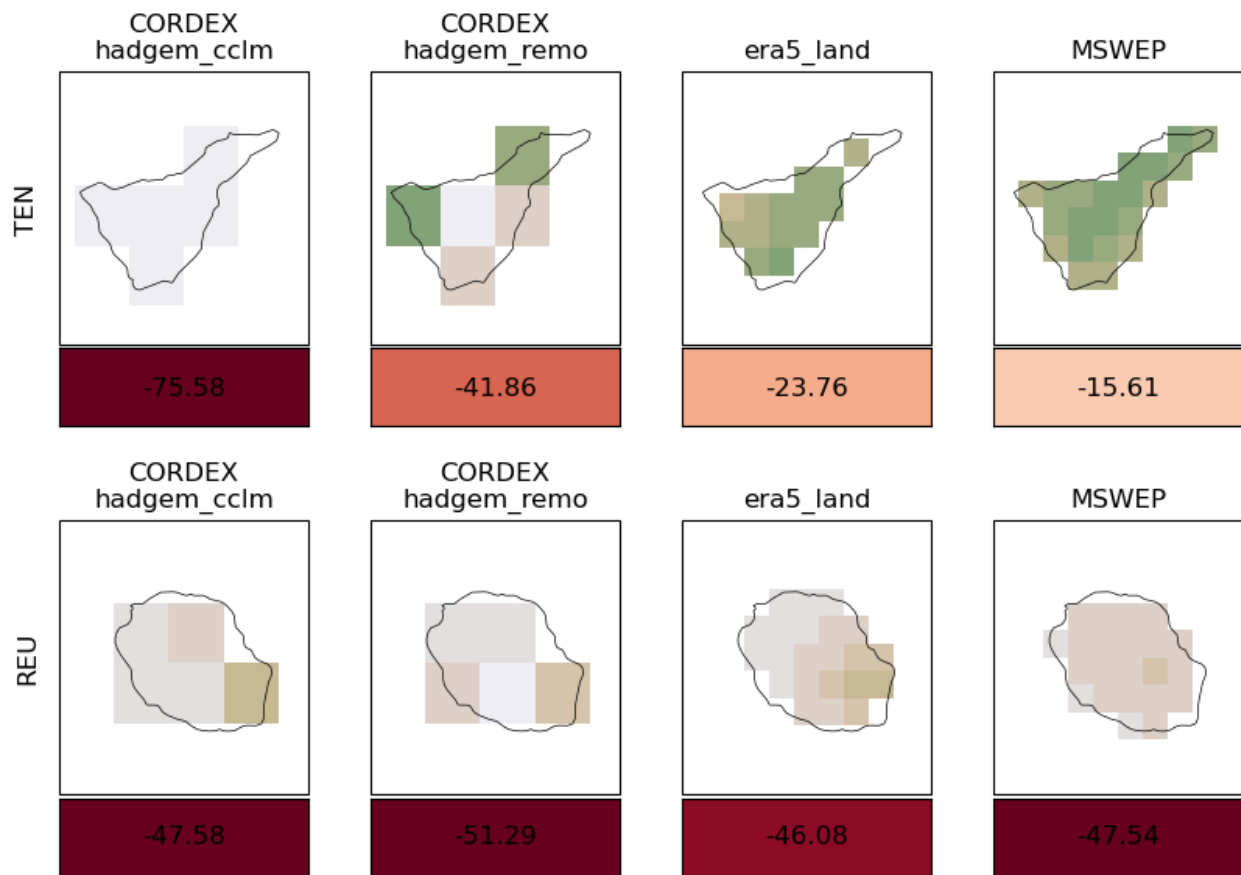


Observations

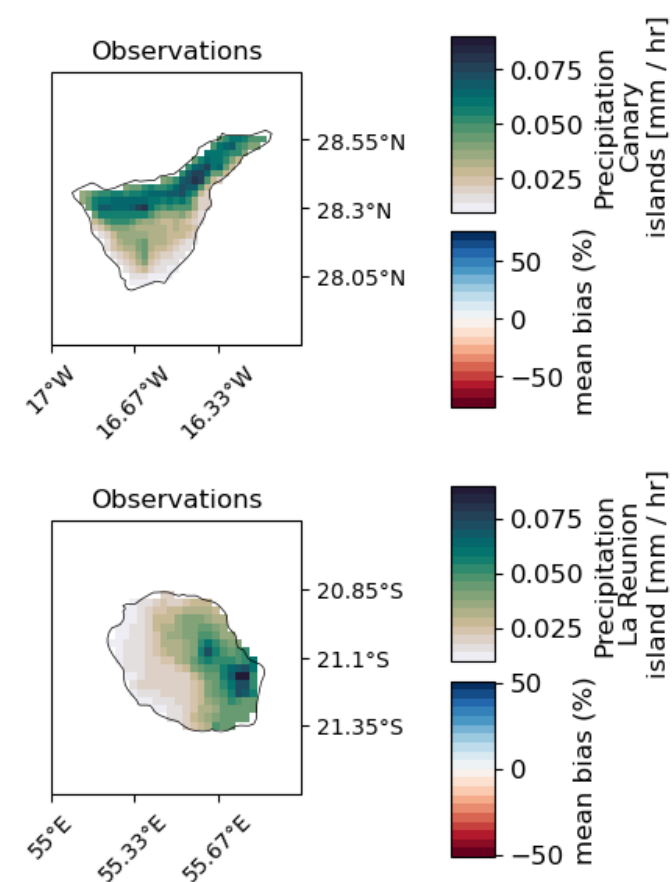




LOCAL GRANULARITY – remote locations

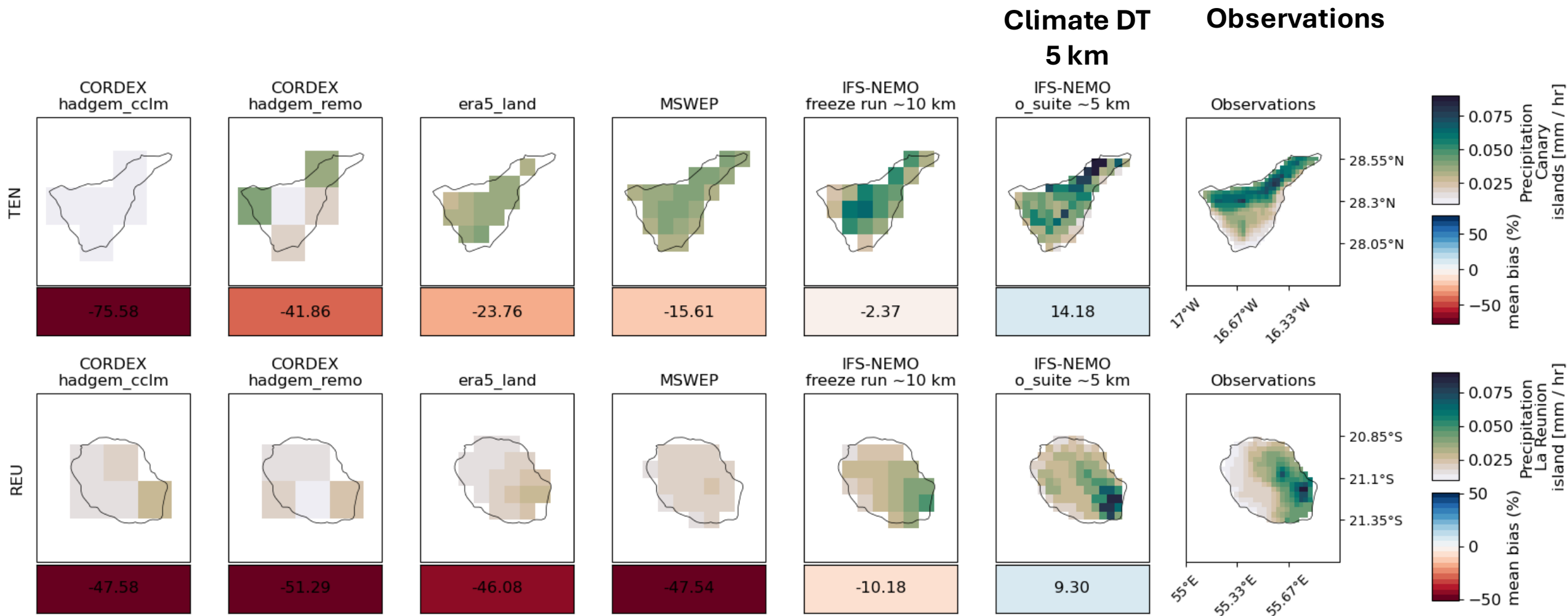


Observations



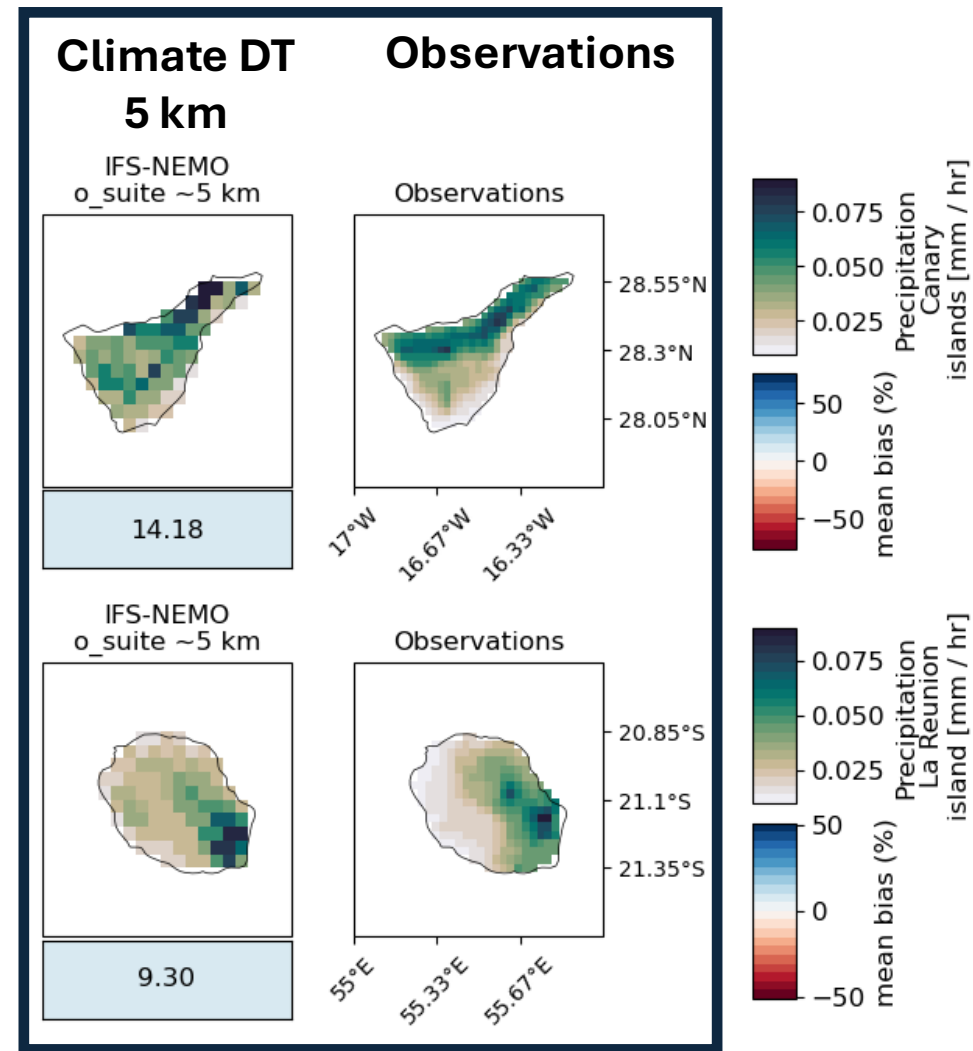
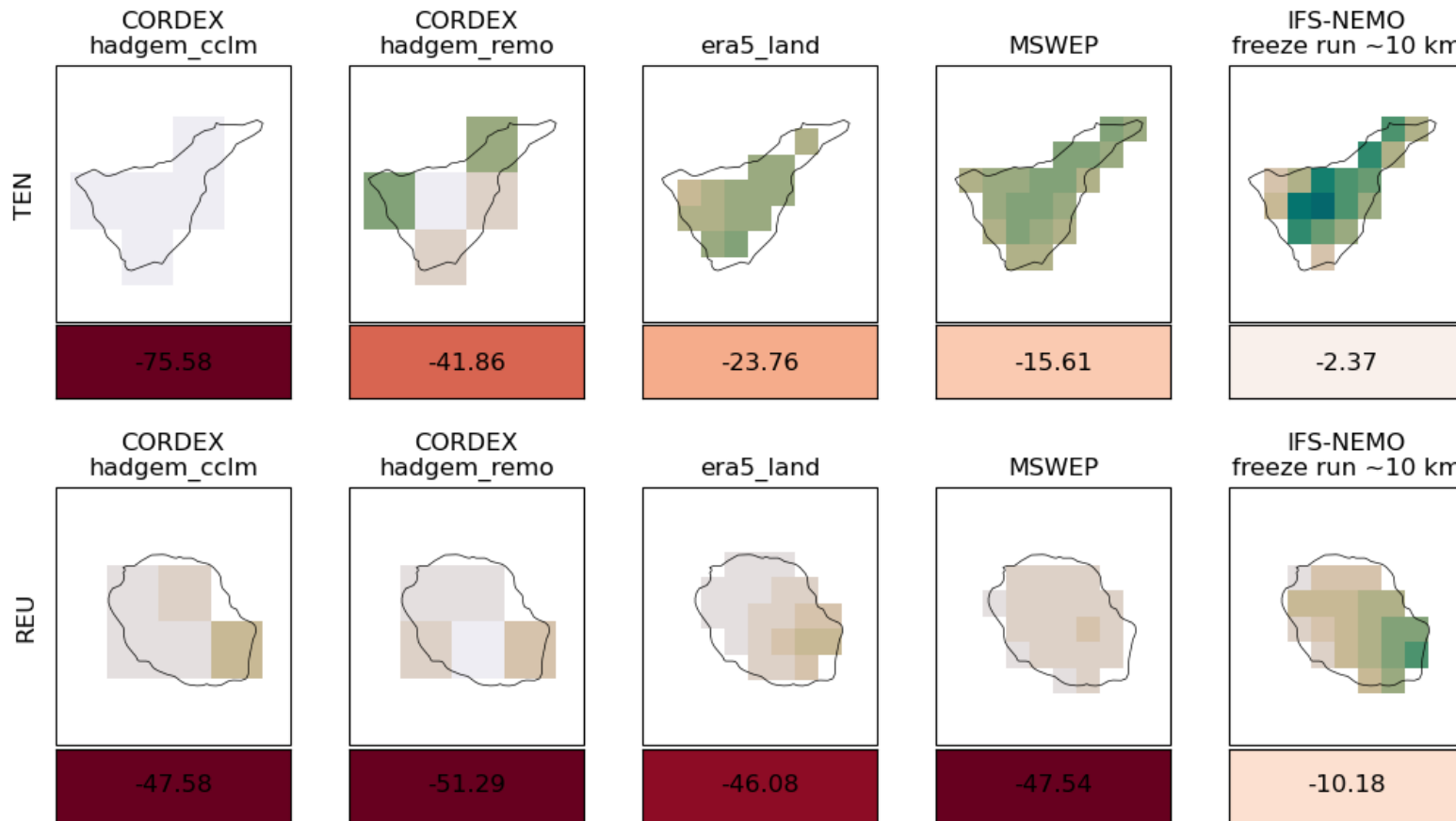


LOCAL GRANULARITY – remote locations





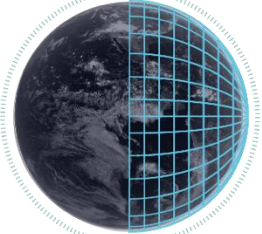
LOCAL GRANULARITY – remote locations





WHAT'S NEXT? PHASE 3

Operate & upgrade digital twins & engine



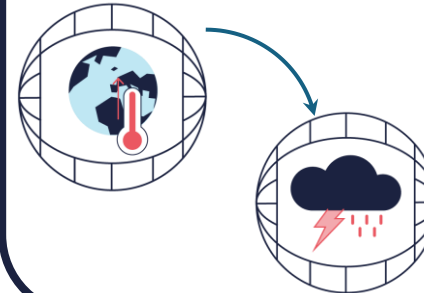
Run regular & bespoke 'what-if' simulations



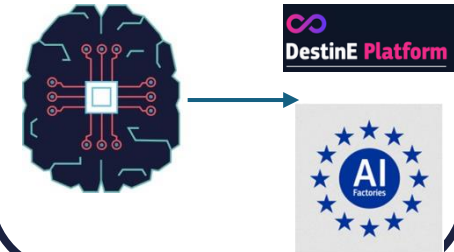
Deliver & enable access to tailored climate, extremes & impact-sector information



Link Climate & Extremes DT for joint storyline simulations



Tailored AI-ready datasets, AI Earth system model & AI solutions



Near-realtime storylines
CMIP7

ForceDestine (IIASA)
On-demand simulations

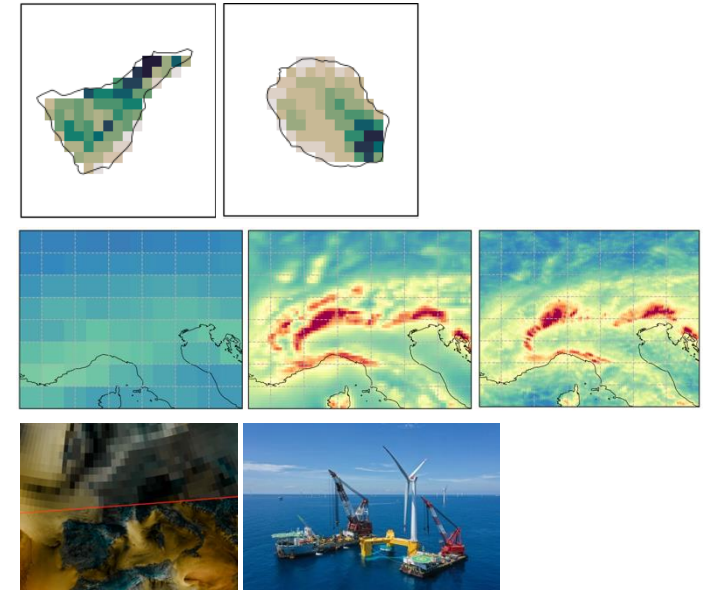
Storyline Visualiser

Climate Emulator
AI-ready datasets



Conclusions: the Climate DT system

- Climate DT provides local insights globally beyond the state-of-the-art
- Contextualizing Climate DT with CMIP and CORDEX simulations enables uptake and is essential for uncertainty quantification
- The Climate DT can adopt the latest scientific and technology breakthroughs in operations, making them accessible to users
- Destination Earth is continuously improving the accessibility and interactivity of the system



interactive visualisations
ML climate emulator
custom future scenarios
AI-ready data sets

platform.destine.eu/climate-dt