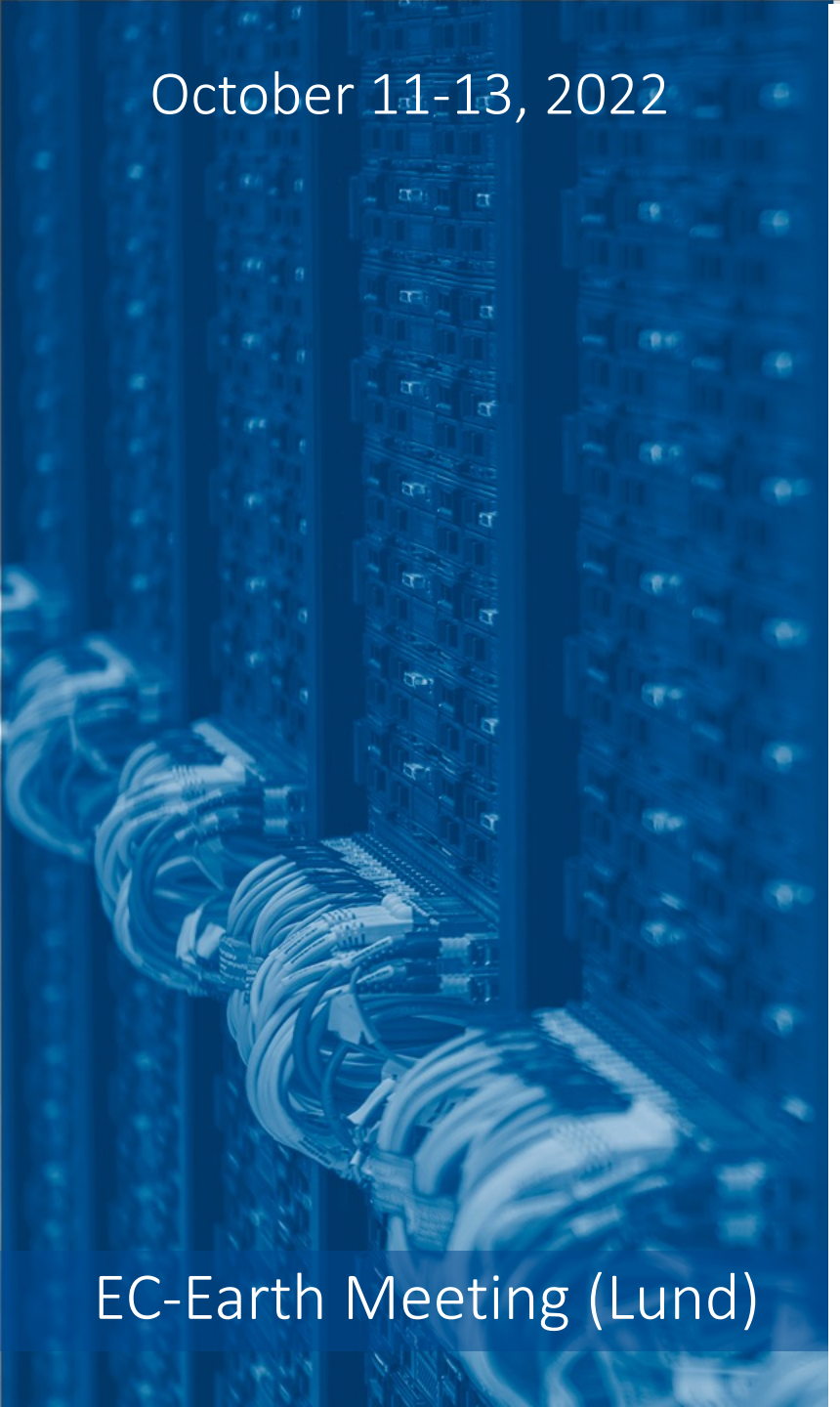

October 11-13, 2022

EC-Earth Meeting (Lund)

Impetus4Change (I4C)

IMPROVING NEAR-TERM CLIMATE PREDICTIONS FOR SOCIETAL TRANSFORMATION

Coordinators: S. Sobolowski (NORCE); D. Bojovic (BSC)
Presenting: P. Ortega

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The overarching objective of I4C is ***to*** *improve the quality, accessibility and usability of near-term climate information and services at local to regional scales to strengthen and support end-user adaptation planning and action.*

Several specific objectives work towards this overarching goal:

1. Improve understanding and flow of climate information through knowledge networks
2. Address persistent shortcomings to deliver seasonal to decadal predictions of improved quality
3. Develop novel methods to downscale predictions to local scales
4. An improved assessment of hazards translated into usable information for local risk assessments
5. Make advances towards the goal of end-to-end seamless climate services
6. Through transdisciplinary co-production approaches develop fit-for- purpose "Adaptation support packs" at municipal scales through our so-called urban Demonstrators
7. Ensure high impact and visibility through robust and targeted communication and engagement
8. Commit to Open Science through development of open access tools and exploitation of data/model outputs via relevant platforms thereby ensuring improved accessibility and usability of climate knowledge.

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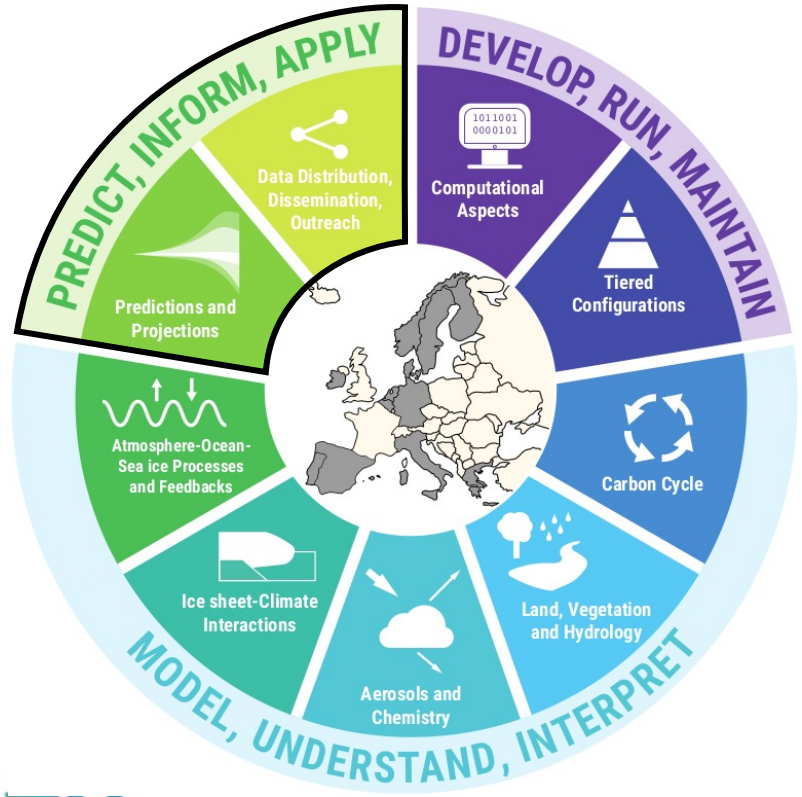

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EC-EARTH 4

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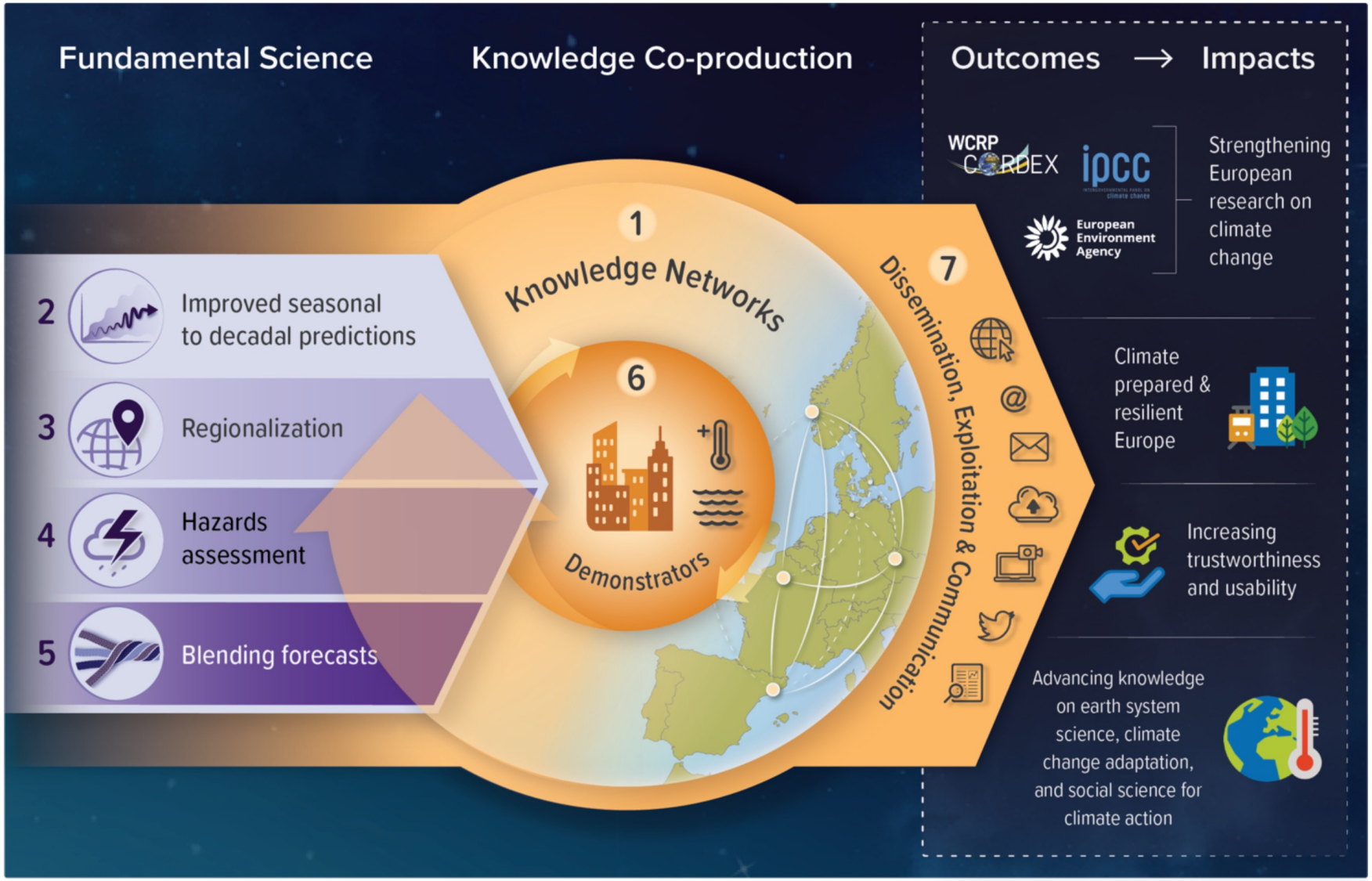

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	Development	Implementation
WP2	▪ Understanding limitations and current prediction systems ▪ Novel methods to mitigate model errors	▪ Perform ensemble simulations of improved S2D predictions ▪ Provide societally relevant, actionable information

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EU Partners Involved

NERSC

CERFACS

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UNIVERSITETET I BERGEN

Max-Planck-Institut für Meteorologie

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Associated Partners (via applications to their national funding agencies)

A.M. Obukhov Institute of Atmospheric Physics RAS

TEXAS A&M UNIVERSITY

NCAR

NERSC

EU Partners Involved

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Development

EC-EARTH

Implementation

WP2

- Understanding limitations and current prediction systems
- Novel methods to mitigate model errors

- Perform ensemble simulations of improved S2D predictions
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Several Earth System Models and prediction systems involved

Earth system models	Ocean/atmosphere	Resolutions	Applications
NorCPM	MICOM/ CAM5	SR: 2° oce / 0.8° atm HR: 0.25° oce and atm	Supermodelling (SR) Super resolution DA (SR and HR)
EC-Earth3.3	NEMO3.6/ IFS c36r4	SR: 1° oce / 0.8° atm	Supermodelling (SR) Flux-correction (SR)
CNRM-ESM2.1	NEMO3.6/ ARPEGE-Climat6.3	SR: 1° oce / 1.5° atm	Particle-filter (SR)
MPI-ESM	MPIOM/ ECHAM6	SR: 1 ° oce / 2° atm VHR: 0.1° oce / 1° atm	Supermodelling (SR) Eddy-resolving predictions (VHR)
CESM	POP2/ CAM5-6	SR: 1° oce / 2 ° atm VHR: 0.1° oce / 0.25° atm	Supermodelling (SR) Eddy-resolving predictions (VHR)

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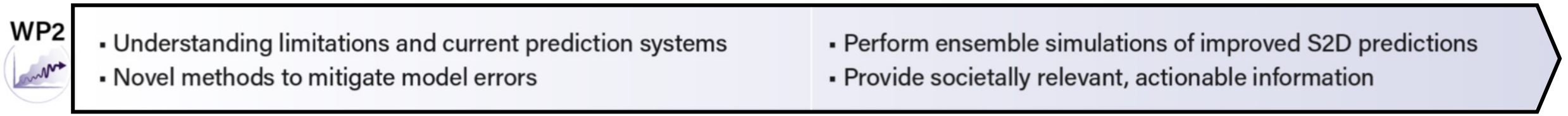
Task 2.1 Understanding limitations in current prediction systems



Focus on **decadal prediction large ensembles** (DCPP + new I4C ones)

- Multi-model analyses to understand impact of mean state biases and the realism of key atmospheric teleconnections on the predictive skill on different regions
- Impact of model resolution on those errors
- Ultimate interest on the signal-to-noise problem and predictability of extreme events (frequency/magnitude)

Task 2.2 Novel methods to mitigate model errors

WP2

- Understanding limitations and current prediction systems
- Novel methods to mitigate model errors
- Perform ensemble simulations of improved S2D predictions
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Supermodelling

EC-EARTH 3.3

A smarter ensemble approach – the supermodel

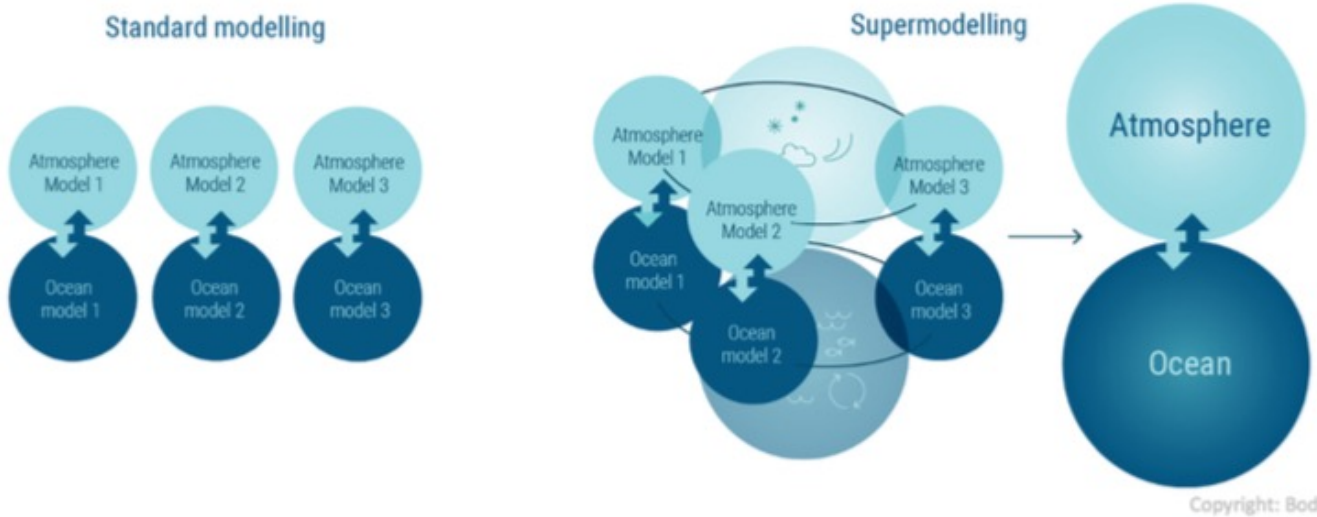

Figure 1: *A supermodel is an optimal dynamical combination of models that is superior to its individual constituent models. It performs better than the standard approach of combining outputs of separately performed model simulations.*

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Task 2.2 Novel methods to mitigate model errors

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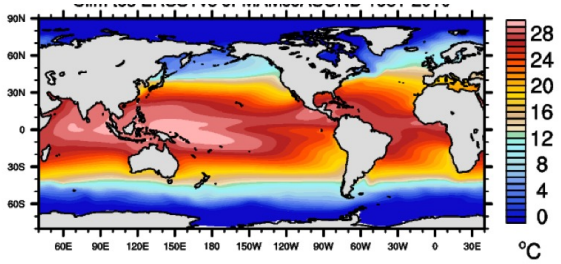
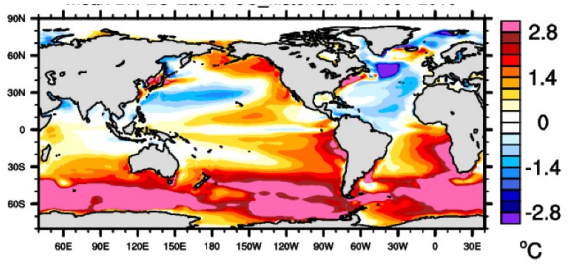
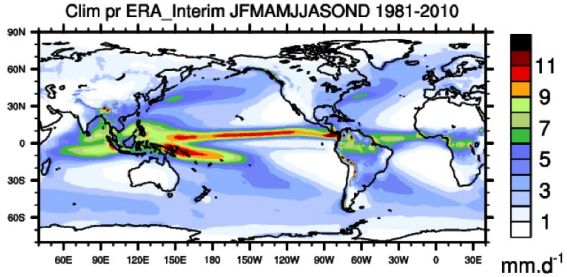
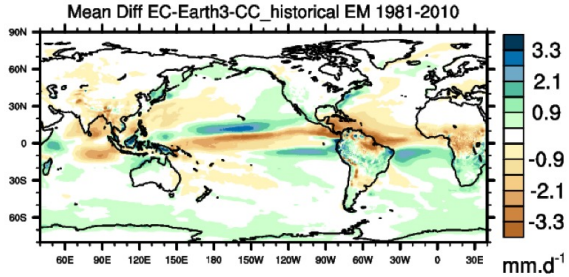
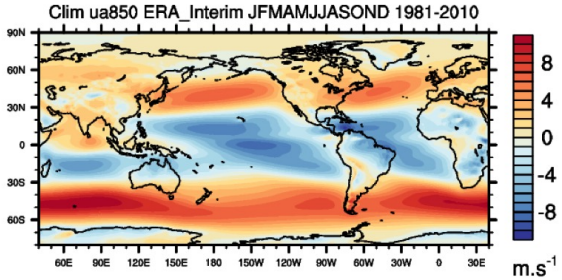
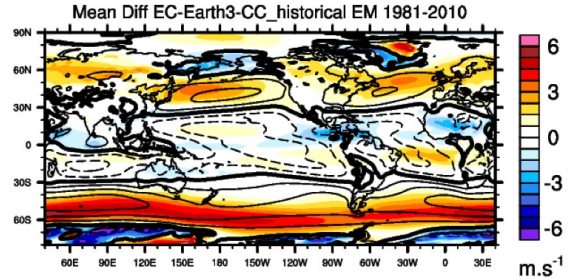
Flux Corrected Predictions

EC-EARTH 3.3

	Historical Climatologies (1981-2010)	Annual mean biases (EC-Earth3.3-CC)
SST		
Precipitation		
SLP		

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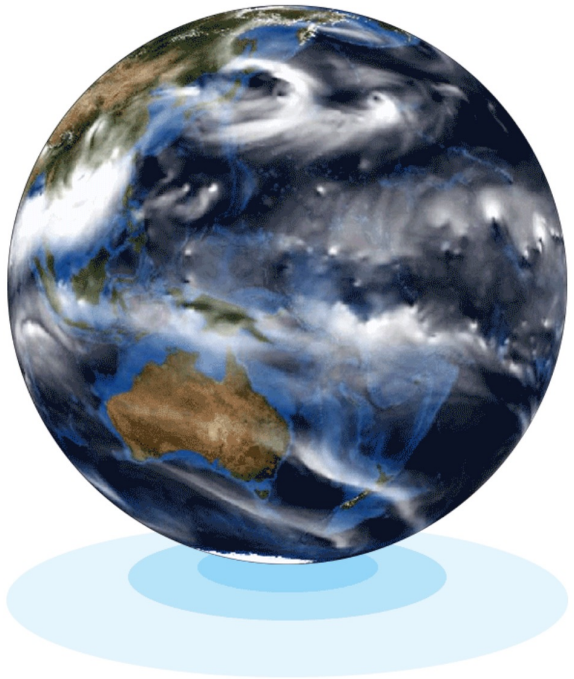

Predictions with VHR (eddy-resolving) **oceans**

- Performed with two systems (MPI-ESM-ER and CESM)
- Both will run with VHR ocean and a coarse atmosphere
- LR counterparts will be run to determine the added value of resolution
- Improvements expected on the signal-to-noise problem
- A super-resolution model will be developed with NorCPM via a machine-learned emulator of the HR in the LR version

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Task 2.3 Performing/evaluating new set of improved S2D predictions

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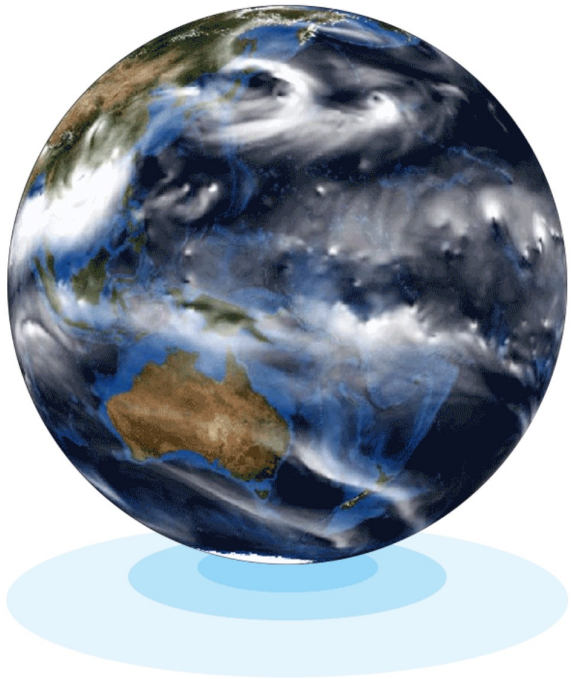
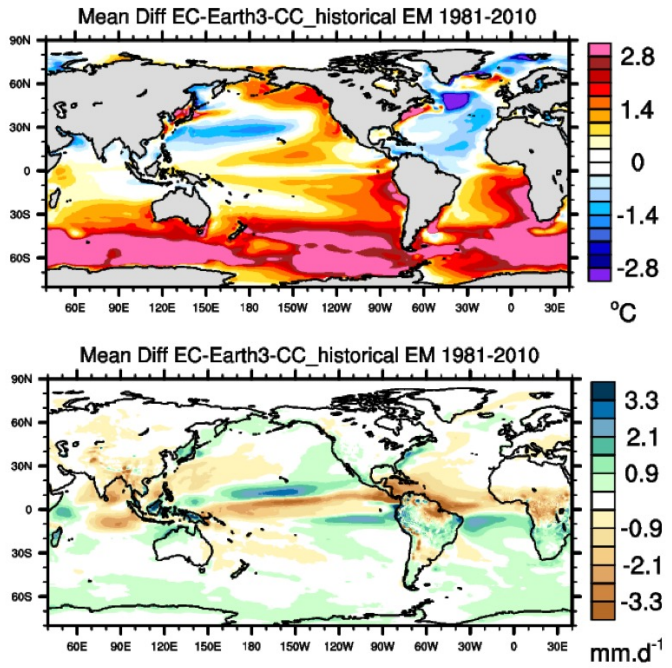
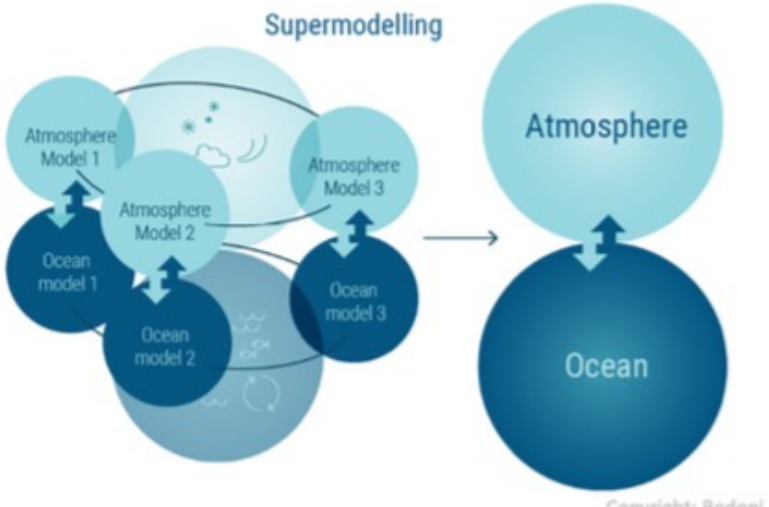
VHR Predictions



Flux-corrected Predictions



Supermodel Predictions



Will jointly contribute to other WPs

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Improving the quality and usability of near-term climate information

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Improved final value chain to transform data to information, information to knowledge and knowledge to action

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