# Running Multi-model multi-member HR experiments

## JRA1/WP9

IS-ENES2 General Assembly, Paris, January 2017

# JRA1 and M4HR experiments

**D9.6**: Run a M4HR ensemble experiment, i. e.

- Multi-model: at least 3 ESMs

- Multi-member: at least 10 members

- High-resolution: 20-50 km

as one job on a single machine with

- Enhanced efficiency (w.r.t. start of project)

while considering

- Models, IO, post-processing, work-flow

# Software components

| | |
|---|---|
| Models: | CNRM-CM, EC-Earth, HadGEM, NorESM, CESM-NEMO |
| Coupler: | OASIS3 → OASIS3-MCT |
| IO: | CDI and XIOS |
| Post-processing: | CDO |
| Work-flow: | Autosubmit and Cylc |

How to organise on the scale of

**collaboration, coordination, convergence?**

# D9.6: Scope change

3 HR models x 10 members on
1 system with 1 work-flow manager:

- Synchronised model development roadmap between institutes (CMIP6!)

- Large computational resources at relatively short notice

This turned out impossible.

Instead: Build and analyse an M4HR demonstrator.

# Demonstrator implementation

New objective: Run

- two ensemble members

- of two models (CNRM-CM5, EC-Earth3)

- in high-resolution configuration (T351/T511+ORCA025L75)

- on a single machine (MareNostrum3)

- in a single job submission step (Autosubmit).

# Results

- Demonstrator defined (previous slide)

- Autosubmit extended with multi-model features

- Appropriate model configurations provided (incl. Porting to MN3)

- Autosubmit configuration implemented

- Experiments made and performance assessed

- Demonstrator user guide and package provided

- Document D9.6 written (almost)

# M4HR computational performance

| | Demonstrator | | 2014 version | |
|---|---|---|---|---|
| | ARPEGE-NEMO | EC-Earth | ARPEGE-NEMO | EC-Earth |
| Model version | 5 | 3.2 | 5 | 3.1 |
| Platform | MareNostrum III | MareNostrum III | Curie | Ekman |
| Speed (SYPD) | 3.5 | 1.2 | 5.0 | 2.6 |
| Actual speed (ASYPD) | 0.11 | | 1.60 | n/a |
| Computing cost (CHPSY) | 2783 | 14521 | 5190 | 10353 |
| Energy cost (JPSY) | 50.8 | 294.5 | n/a | n/a |
| Memory bloat | 12.8 | 19.0 | n/a | n/a |
| Data Output cost (%) | 1.50 | 1.12 | 1.40 | n/a |
| Data intensity (GB/CH) | 0.0053 | 0.0045 | 0.3 | n/a |

# Thank you for your attention!

# JRA1/WP9 deliverables

- D9.1: Initial model performance analysis

- D9.2: Improved coupler performance

- D9.3: Workflow tool assessment

- D9.4: IO server benchmarks

- D9.5: CDO performance analysis

- D9.6: M4HR implementation and analysis