Workshop – natESM strategy

21. February 2022, virtual meeting

Pre-exascale simulations at a very high resolution with FOCI-OpenIFS

Special task work on Levante
FOCI-OpenIFS

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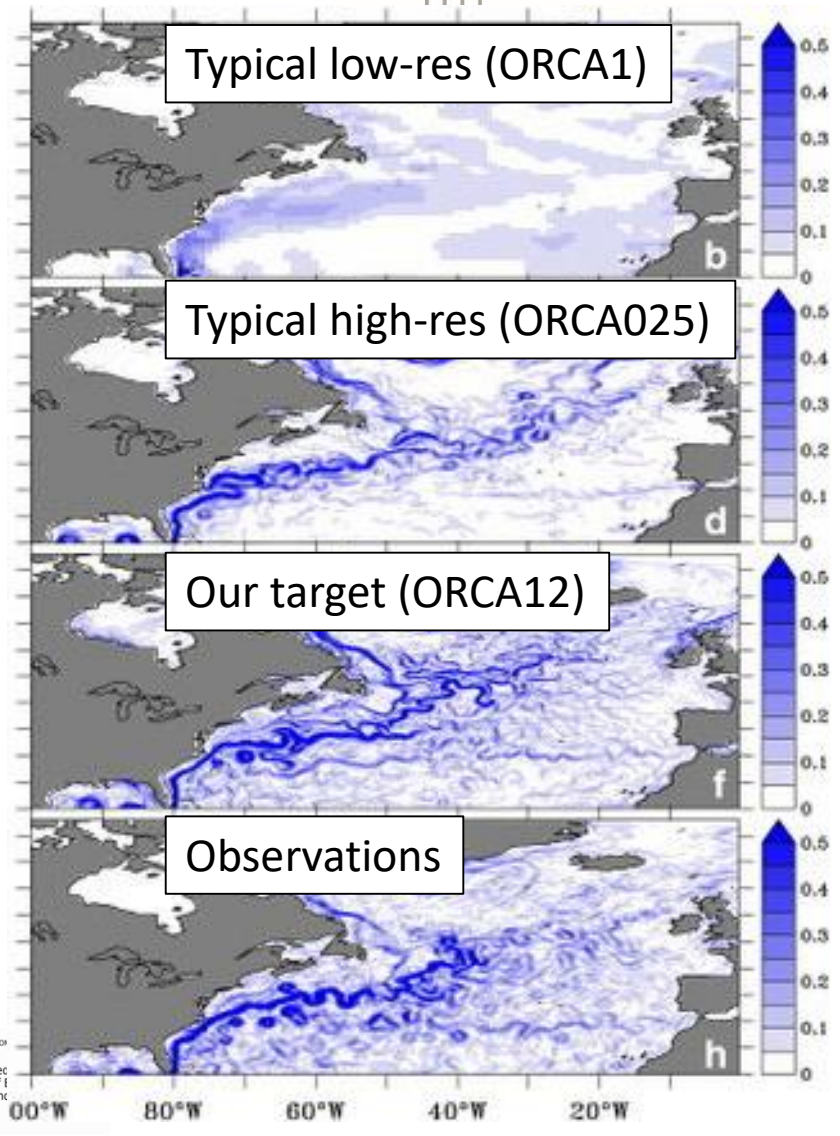


Surface speed (Marzocchi et al. (2014)

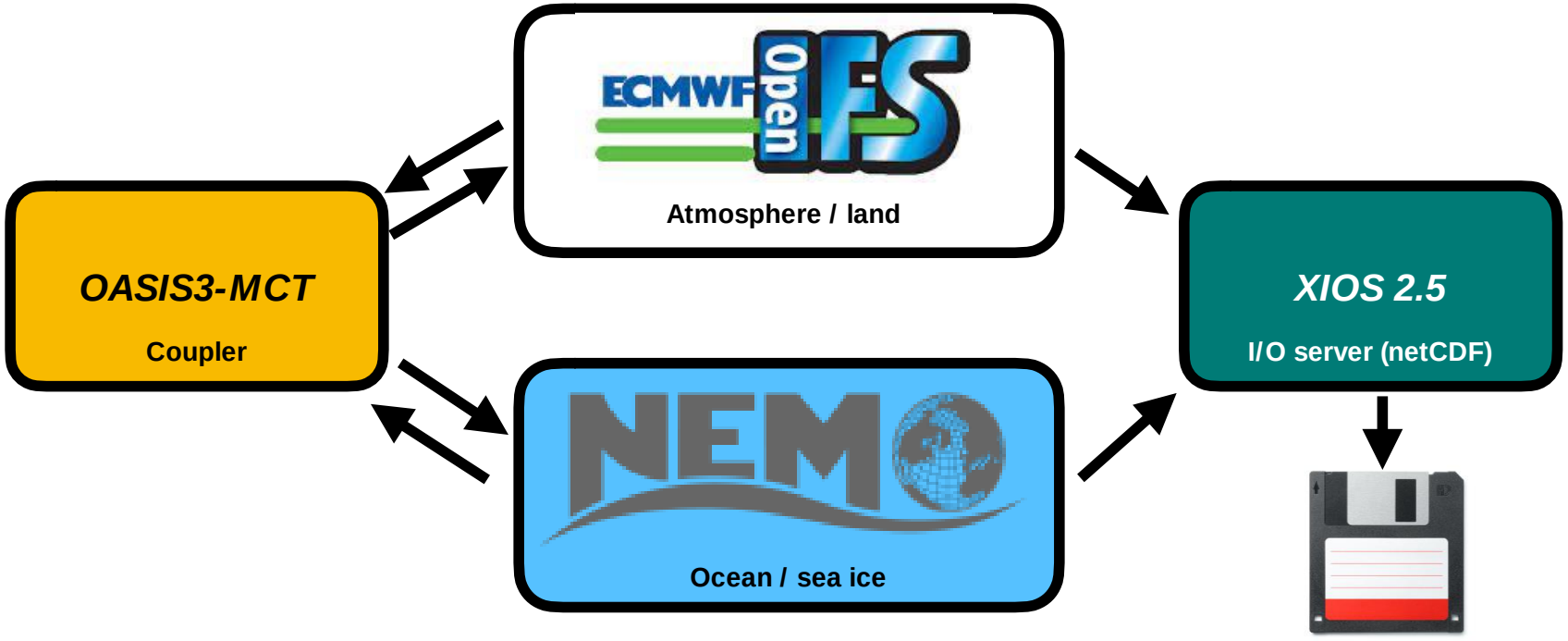
The natESM support team is located at DKRZ and JSC. Based on a DKK initiative of the German Earth System Modelling Community, the overall goal is to build a national ESM strategy for the future.

Description of Planned Work

- **Scope of Request:** 3 months on Levante
- **Criteria for fulfilment**: Coupled model with 16/8 km res. @1 SYPD.
- **Expected scientific and/or performance improvements:** More realistic physical climate. Baseline for nested configurations. Prepare for exascale.

Component	Grid	Time step	Grid points (lon x lat x height)	# cores
OpenIFS 43r3v2 (licensed, ECMWF)	16 km/L137 (Tco639)	900 s	0.23 Billion	~4000 (1000 MPI x 4 threads)
NEMO 3.6/4.2 (LGPL)	8 km/L75 (ORCA12)	300 s	0.99 Billion	~6000
XIOS 2.5 (LGPL)		1hr sfc output 3hr 3D output		~5-10 nodes (depends on memory req.)
OASIS3-MCT4.0 (LGPL)		30 min coupling		

Description of system



Model/Software Application Field

- **Scientific highlights**: Determine scalability of coupled model and identify bottlenecks. Prepare for mesoscale-resolving coupled simulations on exascale HPC. Far beyond HighResMIP (CMIP6).

- **Social relevance**: Demonstrate cutting edge of climate simulations.

- **Plans for further use and dissemination**: FOCI-OpenIFS already is and will continue to be used in a range of projects at GEOMAR.
  OpenIFS is part of AWI-CM3 and EC-Earth4. NEMO is widely used in Europe. NEMO v4.2 for further scalability. Implement nested grid for regionally sub-mesoscale resolving ocean (1/48° or 1/60°).

Brief Overview of Model/Software

- **ESM field**: AOGCM (OpenIFS + NEMO)
- **User group**: FOCI team at GEOMAR + OpenIFS & NEMO users around Europe
- **Targeted simulations**: ~1 year at 8 km ocean and 16 km atm resolution
- **HPC usage**: Plan for Levante (DKRZ)
- **Maintenance**: FOCI team at GEOMAR. OpenIFS from ECMWF. NEMO from European community. OASIS coupler from CERFACS. XIOS from IPSL.