Construction
of the coupled Danish Climate
Model (DKCM)

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Motivation

To develop an ***efficient, fully*** coupled climate model that can simulate the earth climate and climate variability through seasonal to multi-century time scales for long-term climate studies.

The model will be used in RT2A for stream 2 simulations

- **Efficient:**

  The main cost of running a coupled model is on the atmospheric module, while the cost on the coarse grid ocean module is relatively insignificant

 — Use **an efficient atmosphere model, meaning the Atmospheric DKCM**

- **Fully coupled:**
  — The coupled system does not use flux adjustments while maintaining a stable control climate

The atmospheric component of **DKCM**

- Constructed by combining the dynamical core of the ARPEGE/IFS and the ECHAM5 physical parameterization package.

- Runs very efficiently compared to a Eulerian model => about 8 times faster than ECHAM5;

- Simulates the current climatology with reasonable skills. The systematic errors in A-DKCM are comparable with those in ARPEGE and ECHAM5.

Structure of the DKCM
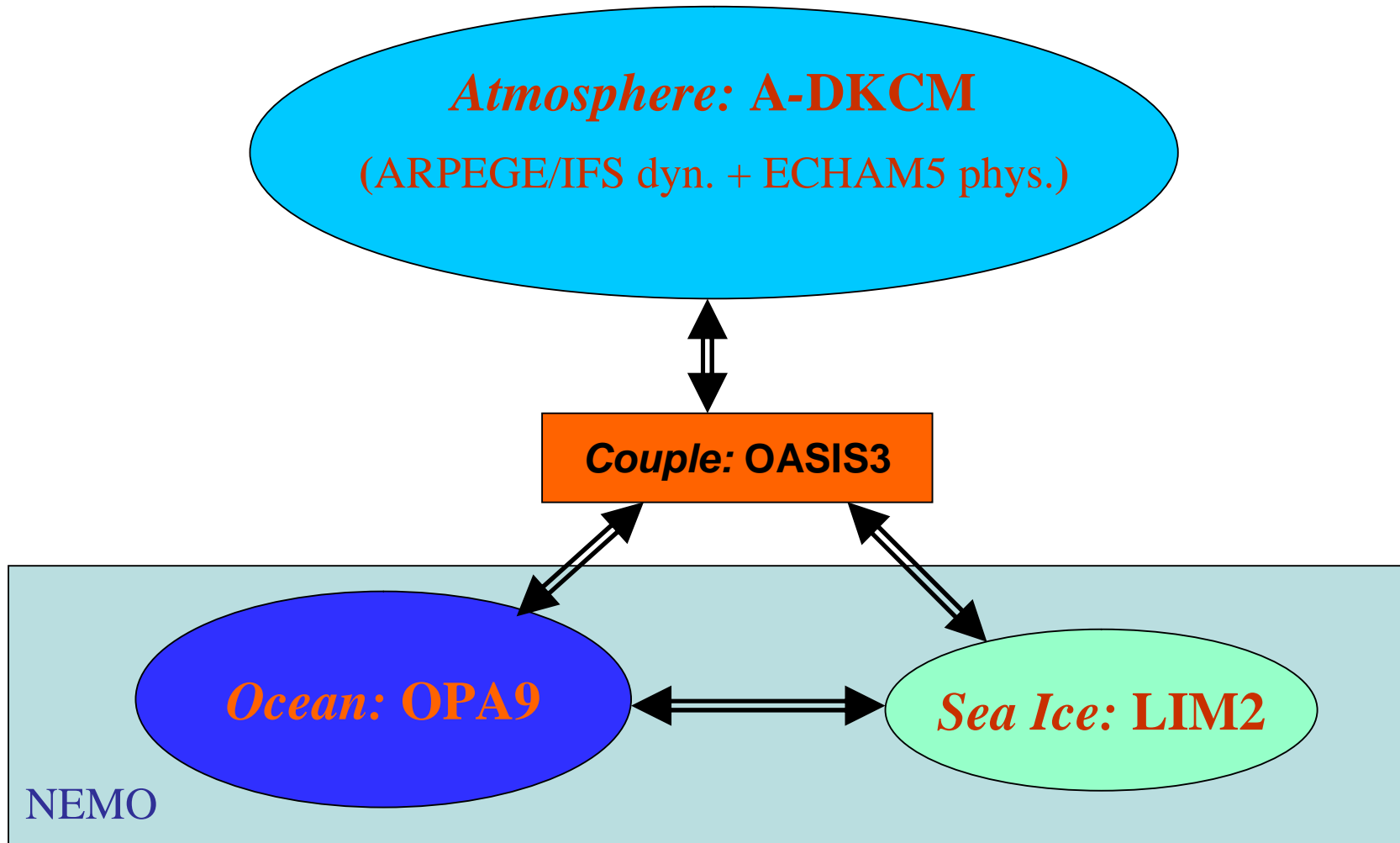
Target Resolution of DKCM
(for ENSEMBLES)

- **Atmosphere**:
  - T63 linear, reduced Gaussian grid;
  - 31 vertical layers.

- **Ocean**: (ORCA2)
  - $2° \times 2° \cos \varphi$ with increased meridian resolution to 0.5° near the equator;
  - 31 vertical levels spread from surface to 5000m depth, with 10 levels in the top 100m.

Initialization and spin-up

- **Atmosphere**: initialized from the end of an one-year run of the A-DKCM using observed SSTs and sea ice.

- **Ocean**: initialized using the output of the climatologically forced ocean-only experiment starting from obs. mean potential temperature and salinity and at rest with the forcing of heat and water fluxes taking from the A-DKCM run.

- **Spin-up** of multicentury to allow the simulated climate to approach equilibrium.

Current status

- Working on putting different components together;
- Tuning and spin-up run on the way
  - a runable version in the autumn.