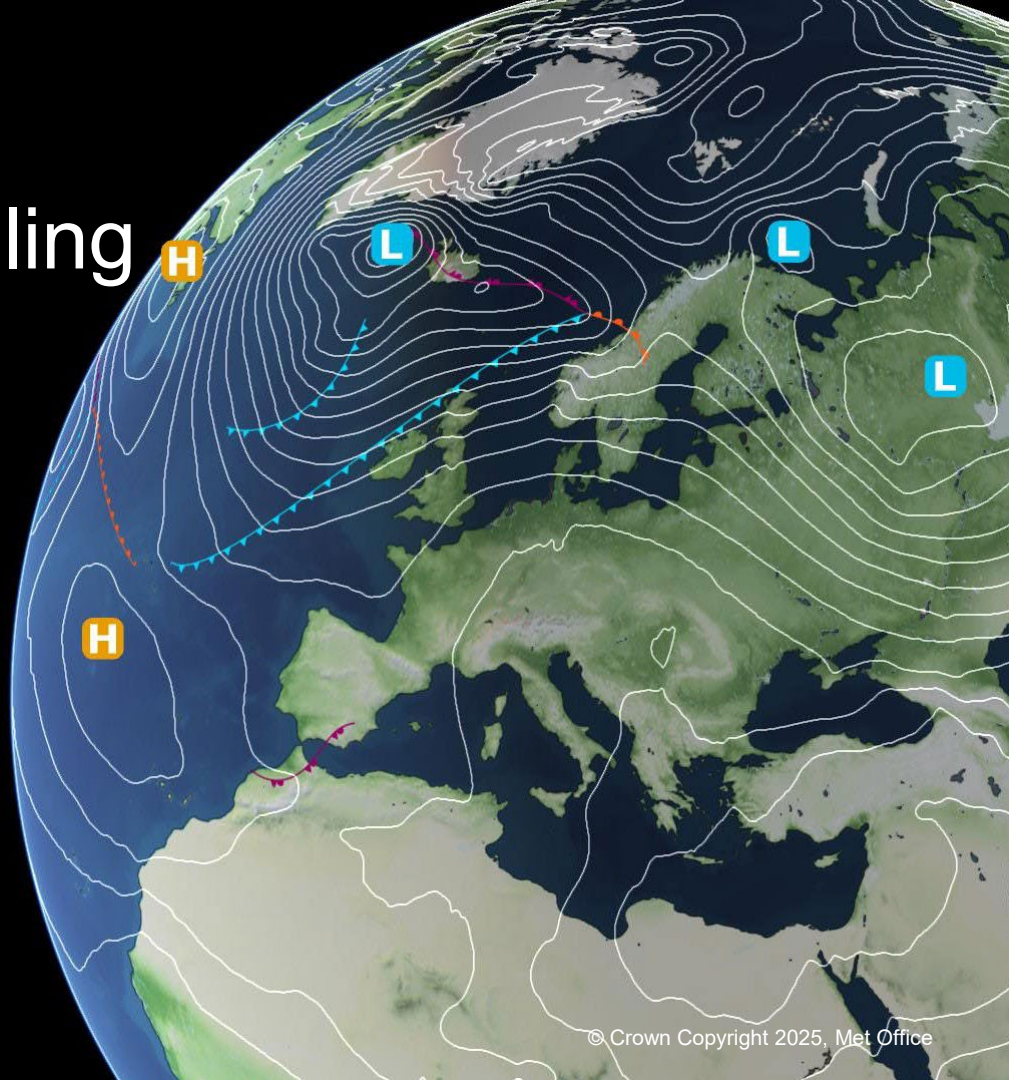


Global Coupled Modelling at the Met Office

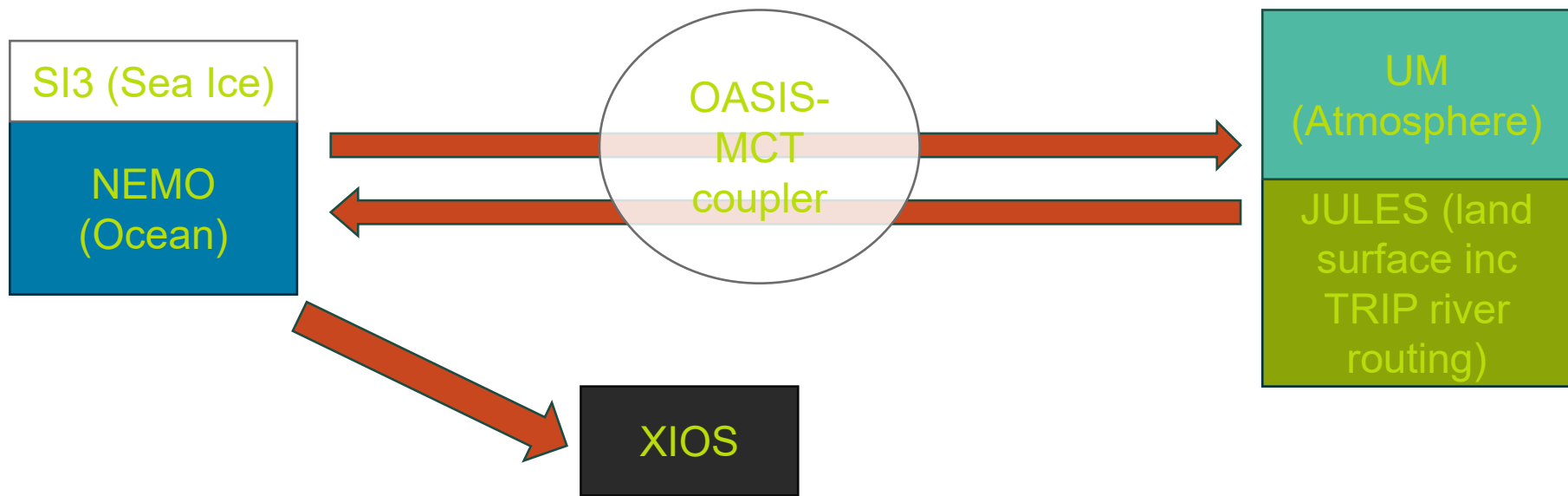
Tim Graham, Dan Copsey



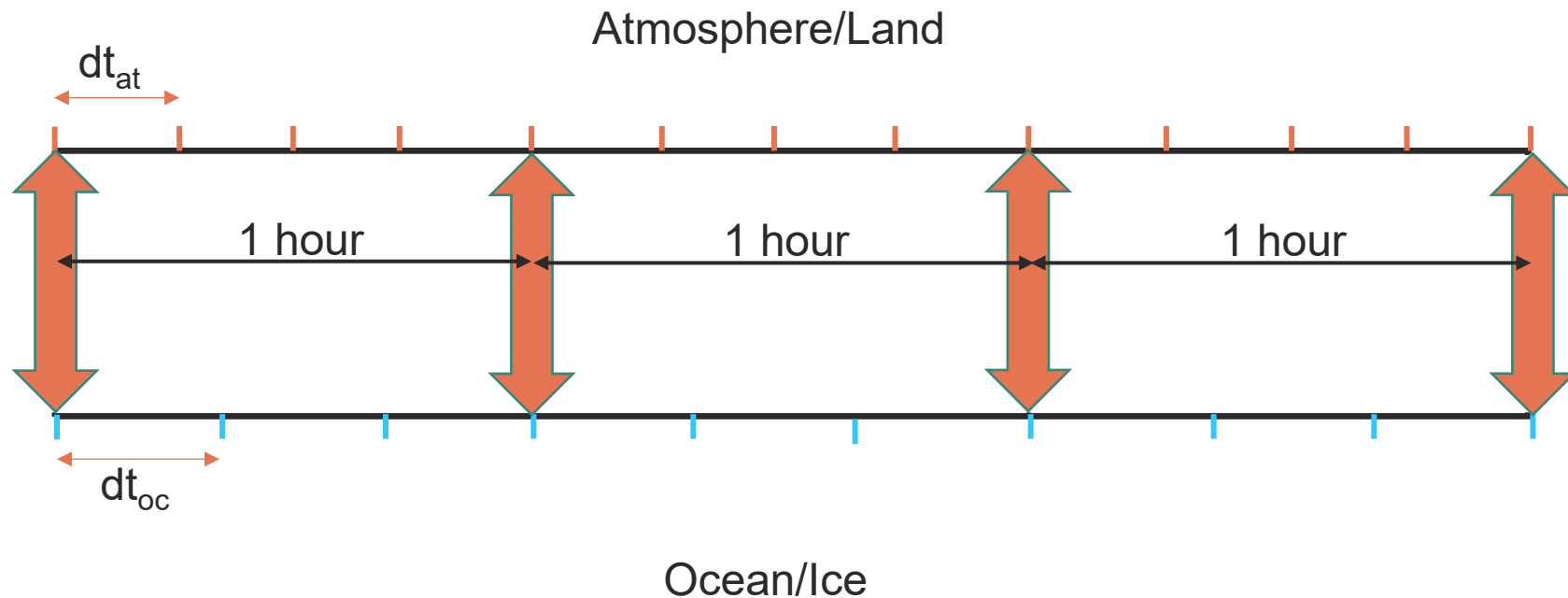
Global Seamless Physical Model



Components of the Global Coupled Model - GC5



Coupling methodology



What fields do we couple?

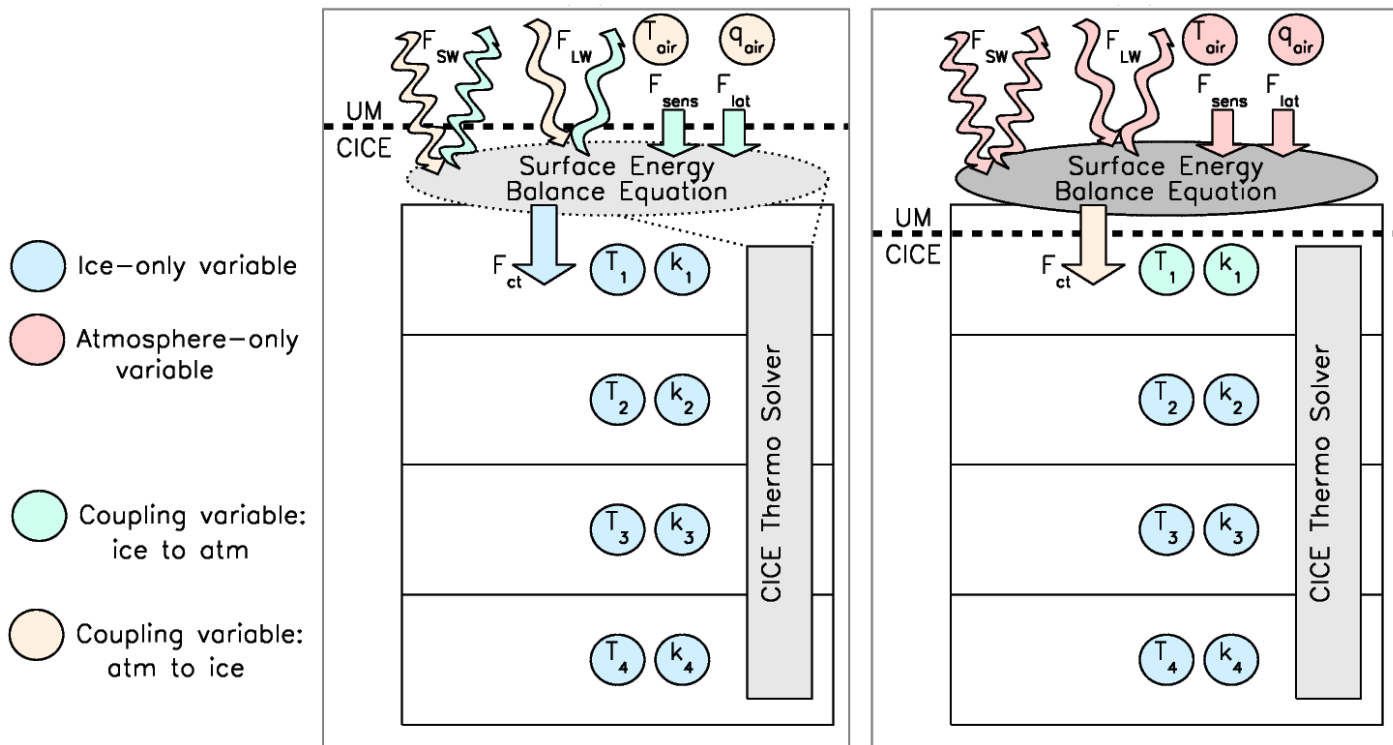
Ocean to Atmosphere (instantaneous)

- SST
- Surface Currents
- Ice fields (all on categories):
 - concentration, thickness, melt pond fraction, melt pond depth, temperature, conductivity

Atmosphere to Ocean (hourly mean)

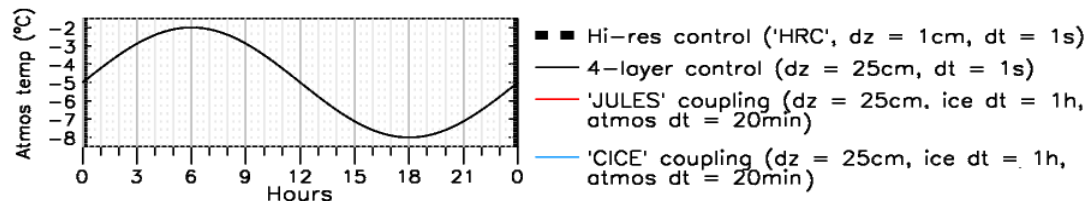
- Heat/Freshwater Fluxes
- Wind stress
- Ice fluxes
- River runoff

Met Office sea ice coupling

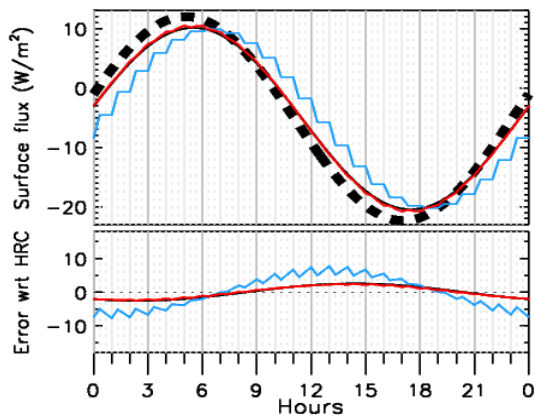


Coupling: Impact on surface heat flux

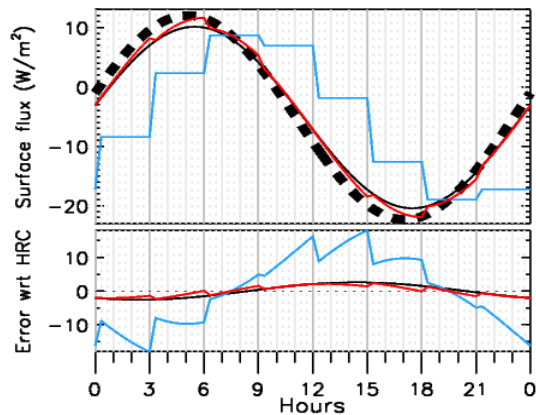
West et al., (2016): 1-D idealised study



1-hourly coupling

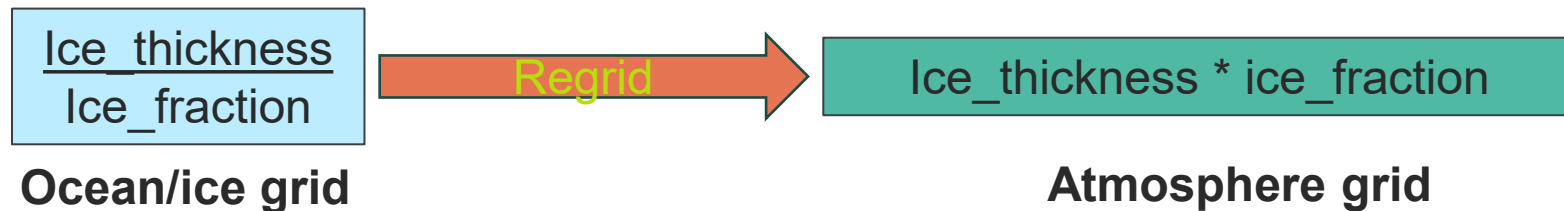


3-hourly coupling



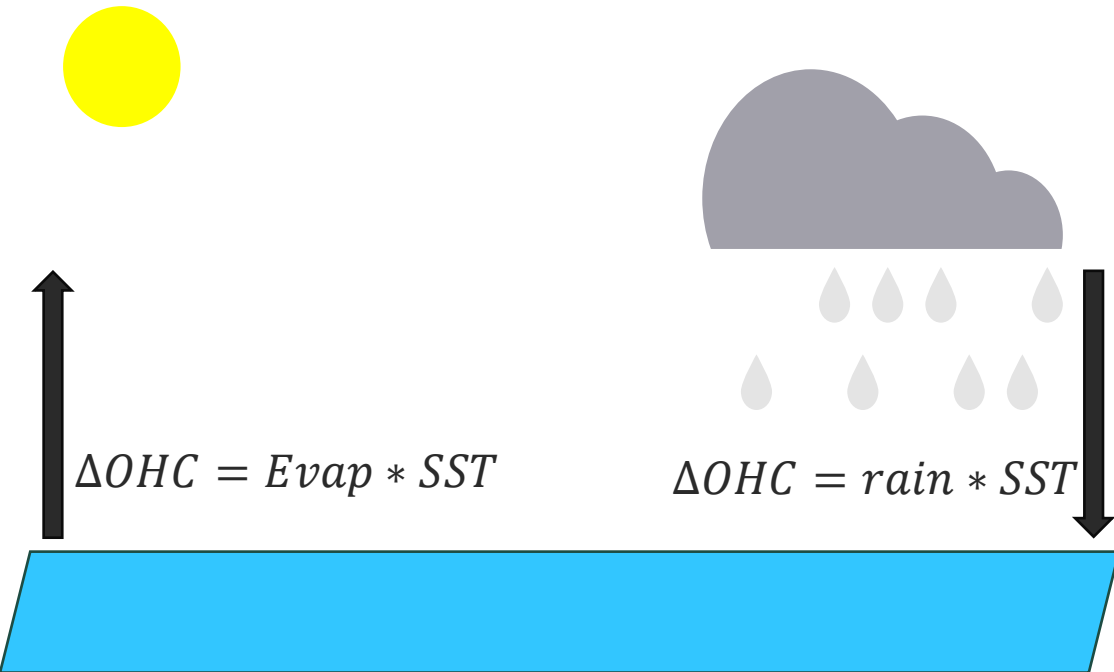
Conservation

1. NEMO land sea mask interpolated to create fractional UM land sea mask. UM uses coastal tiling
2. Fields are weighted by the sea-ice fraction before and after coupling
For example:



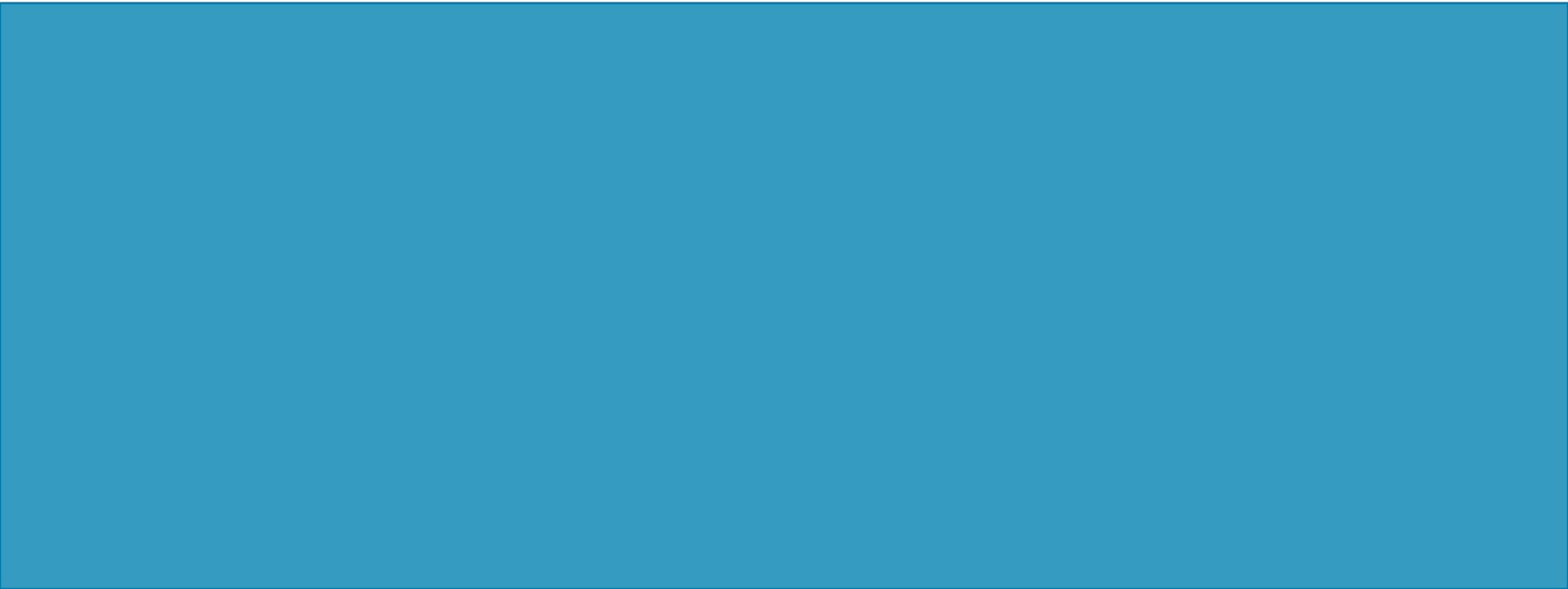
3. Freshwater correction for inland lakes/seas to prevent large SSH drifts. Global conservation but not local.

Known conservation issue – heat content of water



- No prognostic for heat content of water in the atmosphere
- Assume that rain doesn't change temperature of the ocean
- Compensate for change in ocean volume by adding a flux of enthalpy ($rain * SST$)

Future Plans



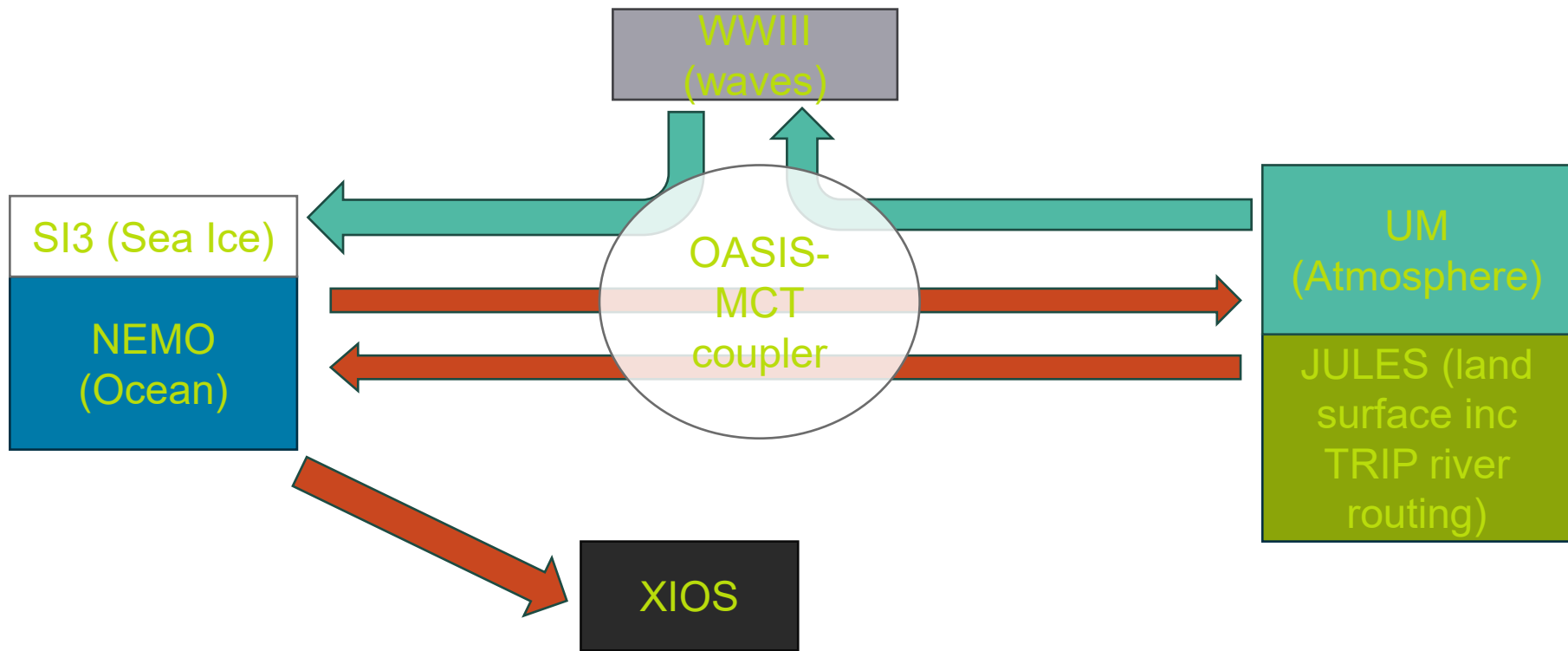
High resolution NWP trailblazer

- Plan to compare N2560-ORCA12 to N1280-ORCA025
- Based on GC5 plus CoMorph-A convection scheme
- O(120) start dates initialised every 3 days between September 2020-September 2021
- Long term aim to run alongside Met Office parallel suite as a testbed for new developments.

Progress:

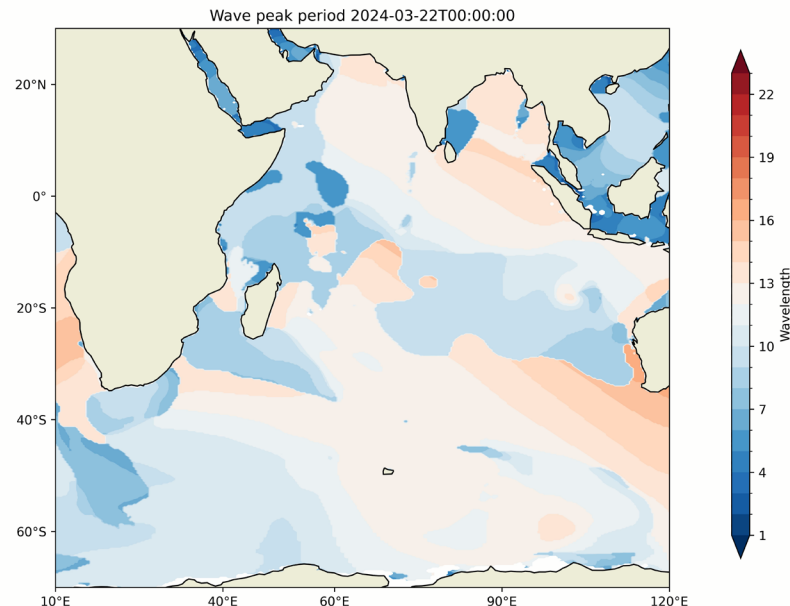
- Expect to start runs this week
- Assuming everything goes well we will be sharing data with partners
- Hosting an assessment workshop sometime in the Autumn.

Including a wave model (testing in GC5)

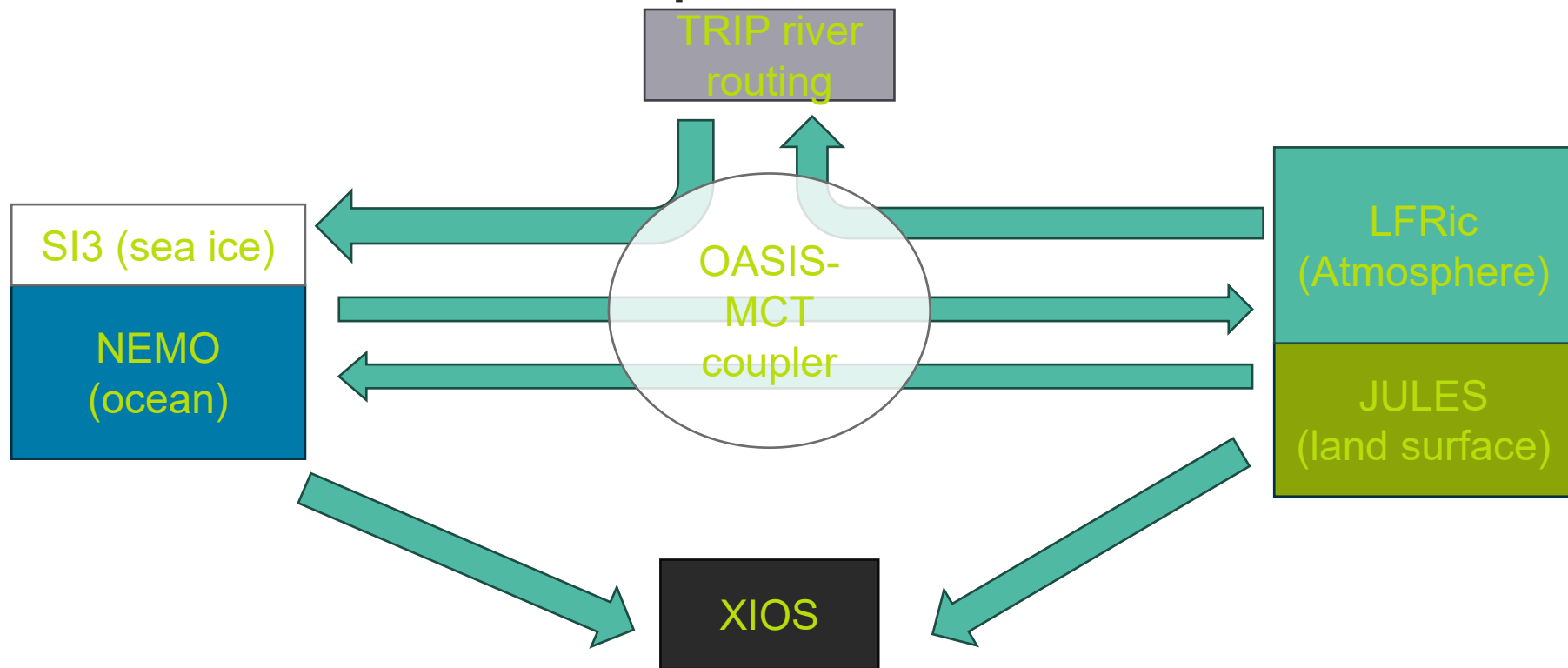


Example forecast of “Kallakadel” event

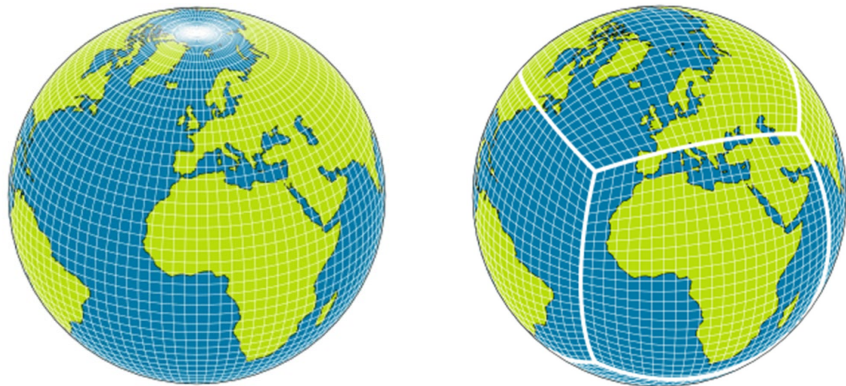
- As well as looking at ocean-wave-atmosphere interactions we are also looking at wave forecasts
- Collaboration with INCOIS (India) on forecasting of long period swell events triggered by cut-off low pressure system in Southern Ocean.
- Significant impact on around low lying coastal communities in Kerala.



The Momentum coupled model



Move to LFRic and cube-sphere grid



- UM reaching limits of scalability
- Problem of very low resolution around the poles
- LFRic coded in domain specific language to allow optimisation for different architectures using PsyClone tool
- New challenges – Arctic is now very low resolution in atmosphere compared to UM and NEMO.

Summary

- The Met Office Global coupled model is used for forecasting across time and special scales.
- Makes use of the OASIS coupler to coupled UM/JULES to NEMO/SI³
- In future:
 - Testing of higher resolution
 - Move to the LFRic atmosphere model (Momentum)
 - Inclusion of interactive waves

Questions?

For more information please contact



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