Monday morning (11am-1pm)

-Arnaud Czaja (Imperial College): Welcome, scope of workshop.

-Helen Dacre (Reading University): *The role of moist processes and moisture availability in determining cyclone intensity & precipitation*

-Chris Roberts (ECMWF) *The atmospheric response to increased ocean model resolution in the ECMWF Integrated Forecasting System: a seamless approach*

-Nick Dunstone (Met Office): TBC

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Monday afternoon (2.30pm-5.30pm)

-Shoshiro Minobe (Hokkaido University, Sapporo): *TBC*

-Malcolm Roberts (Met Office): *TBC*

-Rhys Parfitt (Florida State University): *TBC (by Skype)*

-Benoit Vannière, Pier Luigi Vidale (Reading University): *TBC*

-Claude Frankignoul (UPMC, Paris): *Investigating the Local Atmospheric Response to a Realistic Shift in the Oyashio Sea Surface Temperature Front*

-Robert Lee (Reading University): *Impact of Gulf Stream SST biases on the global atmospheric circulation*

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Tuesday morning (10am-12.30)

-Justin Small (NCAR): *Storm track response to ocean fronts in the high resolution simulations at NCAR*

-Xiaohui Ma (Ocean University of China, Qingdao): *Kuroshio eddies, Storm Track and Climate Variability in the North Pacific (by Skype)*

-Sybren Drijfhout (Southampton Uni and KNMI): *Gulfstream eddies modulate Eastern North Atlantic atmospheric variability.*

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Brian Hoskins?

Sophia Ashby? (heat flux feedbacks)

Rhys Parfitt (FSU)?

Liping / Ric Williams(response of ocean to jet shifts)

Chris Roberts

Title: ***The atmospheric response to increased ocean model resolution in the ECMWF Integrated Forecasting System: a seamless approach***

Authors: C. D. Roberts, F. Vitart, M.A. Balmaseda, and F. Molteni

Abstract

This study evaluates the sensitivity of the European Centre for Medium-Range Weather Forecasts Integrated Forecasting System (ECMWF-IFS) to an increase of ocean model resolution from $\sim$100 km (LRO) to $\sim$25 km (HRO). Initialized ensemble forecasts and climate integrations are used to investigate the wintertime response of the North Atlantic region at timescales of weeks to decades. The presented analysis includes an assessment of changes to mean biases, variability, and subseasonal predictability. The benefits of increased ocean resolution on the mean state are lead-time dependent. At subseasonal lead times (weeks 1-4), Sea surface temperature (SST) biases in LRO and HRO configurations are similar and inherited from the ocean initial conditions. At multidecadal timescales, mean differences are dominated by severe biases in the LRO configuration, which include a North Atlantic cold bias and a breakdown in the relationship between $\nabla ^2$SST and convergence in the marine atmospheric boundary layer (MABL). Some elements of variability, such as blocking and the intensity of the storm track, respond to mean biases and are more sensitive to ocean resolution at longer lead times. Other aspects of variability, such as the intensity of air-sea interaction over the Gulf Stream, are highly sensitive to ocean resolution at all lead times. Finally, increased ocean model resolution is associated with a modest increase to subseasonal predictability in the northern extratropics. The positive impact is most evident at longer lead times (i.e. week 4) and is strongest over Europe.

Robert Lee

Impact of Gulf Stream SST biases on the global atmospheric circulation

Robert W. Lee[1,2], Tim J. Woollings[3], Brian J. Hoskins[2], and Keith D. Williams[4]

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2 University of Reading, Reading, UK
3 University of Oxford, Oxford, UK
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The UK Met Office Unified Model in the Global Coupled 2 (GC2) configuration has a warm bias of up to almost 7 K, which is associated with surface heat flux biases and potentially related to biases in

the atmospheric circulation. The role of this SST bias is examined with a focus on the tropospheric response by performing three sensitivity experiments. The SST biases are imposed on the atmosphere-only configuration of the model over a small and medium section of the Gulf Stream, and also the wider North Atlantic.
We show (Lee et al., 2018) that the dynamical response to this anomalous Gulf Stream heating (and associated shifting and changing SST gradients) is to enhance vertical motion in the transient eddies over the Gulf Stream, rather than balance the heating with a linear dynamical meridional wind or meridional eddy heat transport. Together with the imposed Gulf Stream heating bias, the response affects the troposphere not only locally but also in remote regions of the Northern Hemisphere via a planetary Rossby wave response. The sensitivity experiments partially reproduce some of the differences in the coupled configuration of the model relative to the atmosphere-only configuration and to the ERA-Interim reanalysis.
These biases may have implications for the ability of the model to respond correctly to variability or changes in the Gulf Stream. Better global prediction therefore requires particular focus on reducing any large western boundary current SST biases in these regions of high ocean-atmosphere interaction.

Key words: HadGEM3-CG2, sensitivity experiments, western boundary currents, vertical motion, planetary waves

References
Lee, R. W., and Coauthors, 2018: Climate Dynamics, doi: https://doi.org/10.1007/s00382-018-4083-9