Title: 'The Role of Ocean Eddies in Global Climate Predictability from Days to Decades'

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Abstract: There is a continually increasing demand for near-term (i.e., lead times of 2-4 weeks up to a couple of decades) climate information. This demand is partly driven by the need to have robust forecasts to support adaptation and response strategies, and is partly driven by the need to assess how much of the ongoing climate change is due to natural variability and how much is due to anthropogenic increases in greenhouse gases or other external factors. Here we discuss results from a set of state-of-the-art climate model prediction and predictability experiments in comparison with observational estimates that show that an assessment of predictability, and indeed, robust predictions from days to decades, requires models that capture the variability of major oceanic fronts and ocean eddies, which are, at best, poorly resolved and may even be absent in current sub-seasonal to interannual prediction systems, and in the decadal climate predictions experiments made as part of Intergovernmental Panel on Climate Change. The research described here is based on the hypothesis that the dynamic and physical process associated with ocean eddies and the accompanying interactions with the atmosphere have a large and robust impact on decadal predictability. The experiments and results quantify this effect through diagnostic predictability and prognostic "perfect" model predictability experiments with a particular focus on North Atlantic climate variability. Specifically, we found two regions along the Gulf Stream front that have prominent and statistically significant decadal time-scale oscillations in both observational estimates and the high-resolution global climate model but were absent from the model with IPCC class ocean model resolution. We demonstrate the predictability of this variability and its teleconnections with terrestrial climate.