Geophysical Research Abstracts
Vol. 20, EGU2018-14433-1, 2018
EGU General Assembly 2018

Seasonal to annual ocean forecasting skill and the role of model and observational uncertainty

Stephan Juricke (1,2,3), Dave MacLeod (3), Antje Weisheimer (3,4), Laure Zanna (3), and Tim Palmer (3)

(1) Jacobs University Bremen, Bremen, Germany (s.juricke@jacobs-university.de), (2) Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany, (3) University of Oxford, Department of Physics, Oxford, UK, (4) European Centre for Medium-Range Weather Forecasts (ECMWF), Reading, UK

Forecasts on seasonal timescales present a major challenge and rely on an adequate simulation of the coupled land-ocean-atmosphere system. In this context, accurately modelling the slowly evolving ocean is essential, as it carries anomalies much longer than the more rapidly fluctuating atmosphere. In this study we analyse the predictive skill and reliability of ocean forecasts in a seasonal forecasting system. Furthermore, we assess the effects of accounting for model and observational uncertainties.

10-month forecast skill of the seasonal ensemble forecasting system of the European Centre for Medium-Range Weather Forecast will be discussed, with a focus on the ocean component at 1° horizontal resolution. For essential quantities such as sea surface temperature and upper ocean 300 meter heat content the ocean forecasts are generally underdispersive and skilful beyond the first month mainly in the tropics and parts of the North Atlantic.

Novel stochastic perturbation techniques are used to estimate model uncertainties in highly parametrized oceanic processes such as eddy induced advection. Accounting for these parametrization uncertainties has a positive impact on both reliability (from month three onwards) as well as forecast skill (from month eight onwards). Skill improvements extend also to atmospheric variables such as two meter temperature, mostly in the extratropical Pacific but also over the mid-latitude American continents, leading to improved skill in both oceanic and atmospheric fields.

Additionally, observational uncertainties - as determined from two reference reanalysis used for ocean forecast skill evaluation - are analysed. The choice of the observational reference affects the diagnosed forecast skill and reliability throughout the entire ten-month forecasts but mostly during the first three months.

Hence, while model uncertainty impacts the skill of seasonal forecasts, observational uncertainty impacts our assessment of that skill. Future ocean model development should therefore not only aim to reduce model errors but simultaneously assess and estimate uncertainties.