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How confident are predictability estimates of the winter North Atlantic Oscillation?

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Predictions of the winter NAO and its small signal-to-noise ratio have been a matter of much discussion recently. Here we look at the problem from the perspective of 110-year-long historical hindcasts over the period 1901-2010 performed with ECMWF's coupled model. Seasonal forecast skill of the NAO can undergo pronounced multidecadal variations: while skill drops in the middle of the century, the performance of the reforecasts recovers in the early twentieth century, suggesting that the mid-century drop in skill is not due to a lack of good observational data. We hypothesize instead that these changes in model predictability are linked to intrinsic changes of the coupled climate system.

The confidence of these predictions, and thus the signal-to-noise behaviour, also strongly depends on the specific hindcast period. Correlation-based measures like the Ratio of Predictable Components are shown to be highly sensitive to the strength of the predictable signal, implying that disentangling of physical deficiencies in the models on the one hand, and the effects of sampling uncertainty on the other hand, is difficult. These findings demonstrate that relatively short hindcasts are not sufficiently representative for longer-term behaviour and can lead to skill estimates that may not be robust in the future.

See also: Weisheimer, A., D. Decremer, D. MacLeod, C. O'Reilly, T. Stockdale, S. Johnson and T.N. Palmer (2019). How confident are predictability estimates of the winter North Atlantic Oscillation? *Q. J. R. Meteorol. Soc.*, **145**, 140-159, doi:10.1002/qj.3446.