Supporting Information for "The Sensitivity of Euro-Atlantic Regimes to Model Horizontal Resolution"

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Introduction

Two pieces of supplementary data are presented. Firstly, we show the results of computing regime clusters for ERA-Interim reanalysis using 10 EOFs instead of 4 (as done in the main text), demonstrating that there is almost no difference between the two. Secondly, a figure supporting the improvement in persistence of the blocking regime is included here to support the discussion of section 3.3 in the main article.

Impact of using more EOFs

As noted in the main text, no notable differences were found in our results when using 10 EOFs (explaining more than 80% of the variance) as opposed to just 4. This is because the regime clusters identified are virtually identical, for both reanalysis and model data, in either case. This is demonstrated for ERA-Interim in Figures 1 and 2, showing the regime patterns in both cases. The reader may verify that the patterns are virtually indistinguishable from each other.

Impact on the Blocking regime

As explained in Section 3.3 of the main text, a persistence probability for each regime was computed for every DJF season of the concatenated datasets. These probabilities form a climatological distribution which show how persistent the given regime tends to be. Histograms were plotted, and a reverse log-normal distribution was fitted to these. Note that a reverse log-normal distribution is a distribution Y such that $1 - Y$ is log-normal. This was deemed to be a good fit to the histograms by eye, respecting the fact that high persistence is much more likely within any given season than low persistence (that is, the histograms have long tails). The fit was done with the Python package 'scipy', which has a standard routine for fitting log-normal distributions, essentially just by fitting a normal distribution to the logarithm.

Figure 3 shows the result of this fitting for the three models (low and high resolution) and re-analysis. The conclusions of the main text can be readily confirmed.

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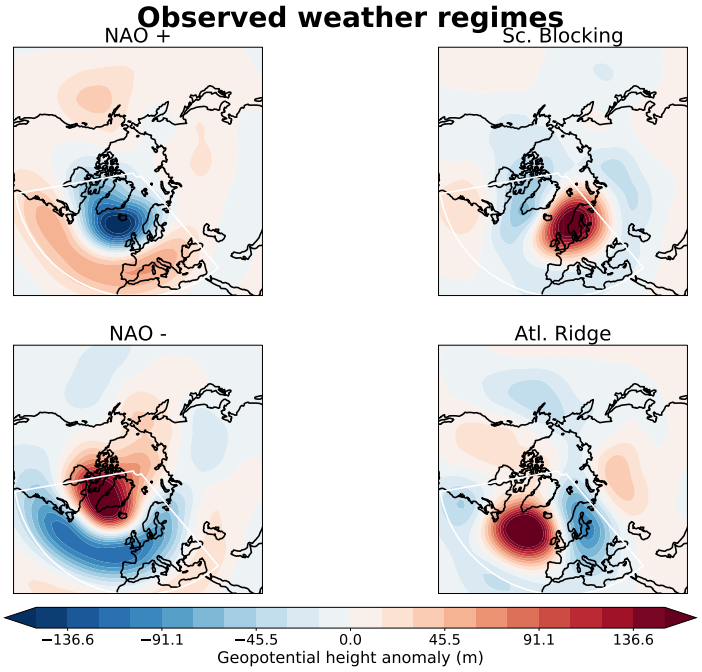

Figure 1. Spatial patterns of the four regimes defined by the cluster centroids for ERA-Interim (1979-2010), when using 4 EOFs in the phase space decomposition.

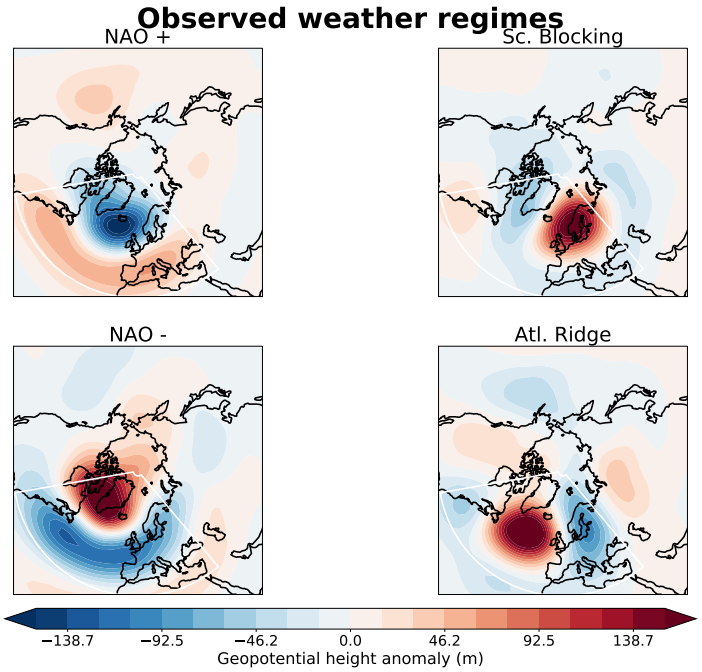

Figure 2. Spatial patterns of the four regimes defined by the cluster centroids for ERA-Interim (1979-2010), when using 10 EOFs in the phase space decomposition.

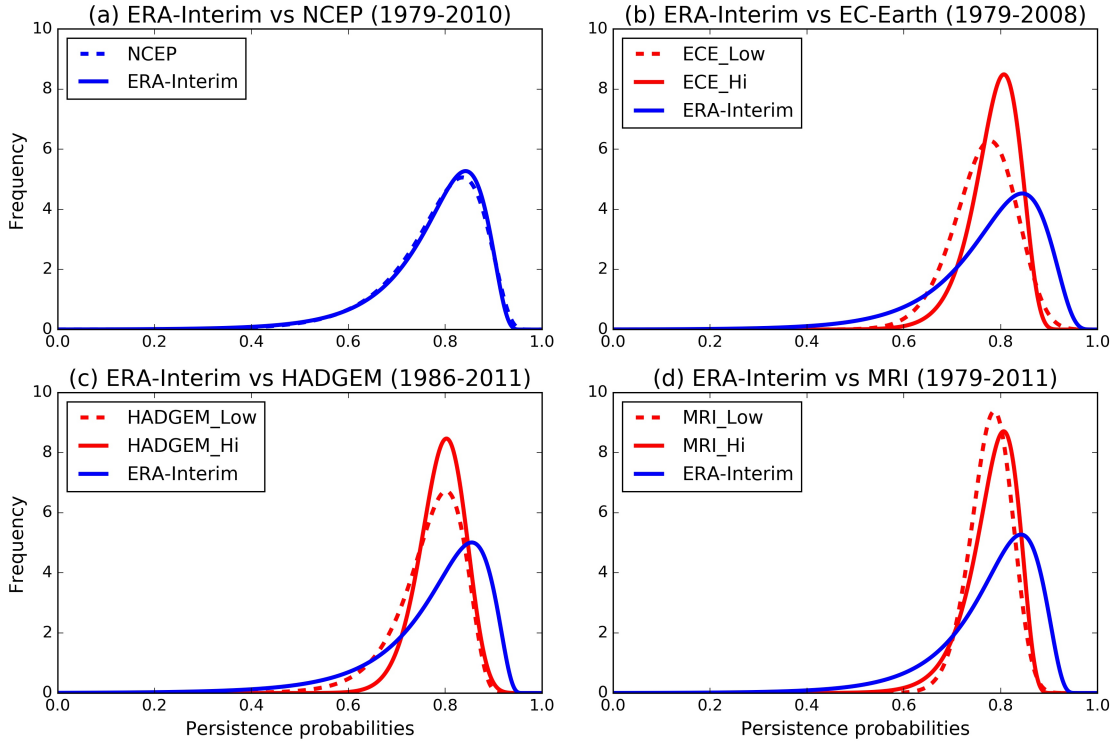

Figure 3. Persistence statistics for the blocking regime, diagnosed by computing persistence probabilities across each DJF season and fitting a reverse log-normal distribution to these. The thick blue line in each is distribution of ERA-Interim for the time-period covered by the model simulation: (a) ERA-Interim and NCEP (stipled blue) over the period 1979-2011. In (b), (c) and (d), model data is shown alongside ERA-Interim over the equivalent time-period. The red lines show model distributions, with thick red representing the high resolution model and stipled red representing the low resolution model. All three model simulations for each resolution were concatenated prior to computation.