International workshop on seasonal to decadal prediction
Toulouse, France, 13-16 May, 2013

An assessment of the representation of N. Atlantic blocking and jet-stream variability in a state-of-the-art seasonal prediction system.

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Within any given seasonal period, the frequency of occurrence, intensity and persistence of N. Atlantic atmospheric blocking strongly influence the seasonal anomalies over different regions of the European continent. Blocking is also known to affect the occurrence of extreme weather events, such as cold spells, heat waves and floods (extreme precipitation). On the other hand, the variability of N. Atlantic blocking and Rossby wave breaking is inextricably linked to the North Atlantic Oscillation and the variability of the jet-streams in the Euro-Atlantic sector. The fundamental, large-scale dynamical mechanisms responsible for the above-mentioned influences are arguably in play also in a state-of-the-art coupled global circulation models. Hence, the realistic representation of the statistical characteristics of N. Atlantic blocking and jet-stream variability can be considered as a necessary condition for skillful seasonal forecasts (successful prediction of seasonal anomalies and occurrence of extreme events).

With this in mind, we examine the representation of the N. Atlantic blocking and jet-stream variability in the CMCC semi-operational seasonal forecasting system. Our data set consists of 88 seasonal forecasts with 9 ensemble members each, covering the period 1989—2010. The seasonal frequency of occurrence, average intensity and persistence of N. Atlantic blocking in the model forecasts are compared with observations (ERA-Interim) and the corresponding skills are documented. Similarly, we examine the representation of jet-stream variability comparing the modeled and observed projections of zonal wind fields at 250 hPa onto the corresponding leading variability patterns in the Atlantic sector (strongly correlated with the NAO and the Eastern Atlantic teleconnection patterns). Finally, to examine the role of the above-mentioned influences in the model climate, we examine the model error in the representation of N. Atlantic blocking events and the mean jet-stream configuration for selected cases of least successful forecasts.

We discuss the need of reducing model biases in the representation of the jet-streams and N. Atlantic blocking variability ―together with other fundamental biases― so as to achieve better quality seasonal forecasts.