



Factors influencing sub-seasonal forecast skill of Greenland Blockings

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Greenland blocking (GL) resembles the negative phase of the NAO and features a strong positive Z500 anomaly over Greenland and a zonally aligned negative anomaly stretching from the eastern North Atlantic into Northern Europe. The prevailing westerly flow is then deflected southward and extends into the Mediterranean. It causes melting events of the Greenland Ice Sheet which can impact global sea-level rise and has strong downstream impacts on Europe. It occurs year-round, although is more common in winter (11.7%) compared to summer (9.1%). GL is forecast with good ability by S2S models. This skill is driven by the performance in winter, when GL is persistent. In this study, we explore whether the skill of GL blocking can be linked to external meteorological drivers or the prevalence of specific meteorological features. Re-forecasts using the European Centre for Medium-Range Weather Forecasts for the 1999-2019 period are considered and compared against ERA Interim reanalysis over the same period. We focus on the factors affecting the skill, as depicted by the Brier Skill Score, from lead times 6 to 10 days, where the skill is 30% to 70% smaller than the skill at lead time 1 day.

Results show that most of the GL blocking events associated with low skill occur in spring. In this season, the model fails in forecasting the transition from Scandinavian Blocking to Greenland Blocking, in opposition to the rest of the seasons, when this transition is well predicted. The analysis of the role of large-scale processes that affect GL skill reveals that half of the forecasts of GL events initialized up to 30 days after a sudden stratospheric warming shows poor skill. In addition, the forecasts of GL events initialized with an active MJO in phase 6 and 7 present good skill whereas those forecast GL events initialized during an active MJO in phase 2 to 4 show poor skill. This link between large-scale factors and skill offers potential guidance in operational forecasting.