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Flow-dependent sub-seasonal forecast skill for Atlantic-European weather regimes and its relation to planetary- to synoptic-scale processes

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Sub-seasonal numerical weather forecasts (10 – 60 days) primarily aim to predict the evolution of the large-scale circulation and its associated surface weather on continent- and multi-daily scales. In the extratropics, this atmospheric variability is depicted best by so-called weather regimes. Here, we assess the ability of sub-seasonal reforecasts of the European Centre for Medium-Range Weather Forecasts (ECMWF) to predict 7 year-round weather regimes in the Atlantic-European region. We first investigate how well the forecasts reproduce frequency, length, and transitions of the weather regime life cycles. We then show that the average forecast skill horizon varies by several days for different weather regimes, seasons, and initial planetary-scale flow states. In a final part, we provide first insight into how synoptic-scale processes, more specifically warm conveyor belts, and their inherent intrinsic predictability limit might affect this flow-dependent sub-seasonal weather regime forecast skill.