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Madden-Julian Oscillation influence on North Atlantic weather regimes at medium-range timescales

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Bridging the traditional gap between weather and climate spatio-temporal scales is one of the major challenges facing the atmospheric community. In particular, progress in both medium-range and seasonal-to-interannual climate prediction relies on our understanding of recurrent weather patterns and the identification of specific causes responsible for their favored occurrence, their persistence and/or their transition. Within this framework, we present evidence that the main climate intra-seasonal oscillation in the tropics (Madden-Julian Oscillation -MJO) controls part of the distribution and sequences of the four daily weather regimes classically defined over the North Atlantic-European region in winter. The tropical-extratropical connection is mainly sustained through the alteration of the North Atlantic atmospheric stationary waves in response about two weeks later, to the tropical fluctuations along the equator. Regimes associated with the North Atlantic Oscillation (NAO) are the most affected allowing for medium-range predictability of their phase far exceeding the one week or so usually quoted as the limit. We built a very simple statistical model to quantitatively assess the predictability level and find that the correct sign of the NAO regimes are successfully forecast in ˜70% of the cases based on the sole knowledge of the previous ˜12 day phase and amplitude of the MJO used as predictors. Such a promising skill could be of great importance considering the tight link between weather regimes and both mean conditions and chances of extreme events to occur for European temperature and precipitation. Our findings are useful for further stressing the need to better initialize, simulate and forecast the tropical ocean-atmosphere coupled dynamics at the core of medium and longer range predictability in the northern hemisphere, and known as the Achilles' heel of the current seamless prediction suites.