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High and Low latitude types of the Downstream Influences of the North Atlantic Oscillation

Jie Song, Chongyin Li, and Wen Zhou
China (song_jie@mail.iap.ac.cn), LASG, Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences

Using reanalysis data, we find that the downstream-propagating quasi-stationary Rossby wave train associated with the North Atlantic Oscillation (NAO) generally propagates along a high (low) latitude pathway during warm (cold) El Niño-Southern Oscillation (ENSO) boreal winters. Consistent with the different propagation directions of the NAO-related downstream wave train, during warm (cold) ENSO winters, the NAO is associated with significant 300 hPa geopotential height anomalies over eastern Siberia (the Arabian Sea, the Korean Peninsula, and the North Pacific), and the near-surface air temperature perturbations associated with the NAO over the high latitudes of Asia are relatively strong (weak). Based on these differences, we argue that the NAO has two distinct types of downstream influence: a high-latitude type and a low-latitude type. Furthermore, we argue that the two types of NAO downstream influence are modulated by the intensity of the subtropical potential vorticity (PV) meridional gradient over Africa. When this gradient is weak (strong), as in warm (cold) ENSO winters, the NAO downstream influence tends to be of the high (low) latitude type. These results are further supported by analysis of intraseasonal NAO events. We separate NAO events into two categories in terms of the intensity of the subtropical PV gradient over Africa. Composites of the NAO events accompanied by a weak (strong) subtropical PV gradient show that the NAO-related downstream wave train tends to propagate along a high (low) latitude pathway.