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Alternative Indices for the Warm–Season NAO and Precipitation Variability in West Greenland

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ABSTRACT

Observed precipitation records from Kangerlussuaq, Greenland, and atmospheric variables from the NCEP–NCAR reanalysis were used in a statistical analysis to elucidate controls on the seasonal variation of precipitation and develop indices that may be potentially useful for analyzing precipitation variability in paleoclimate and future climate change investigations. Three distinct patterns of correlation between precipitation and the 500–hPa geopotential height were found to represent three dominant atmospheric patterns that strongly influence precipitation for different times of the year. All three patterns show a relation to the North Atlantic Oscillation signature found in the first empirical orthogonal function of the 500–hPa height field. Spatially dependent indices were developed based on the 500–hPa geopotential field. The correlation coefficients between precipitation at Kangerlussuaq and these indices range from –0.38 for winter to 0.64 for the warm season (May–September). The warm–season index herein is the first index reported in the literature that correlates significantly with precipitation during the warm season. Correlations of these indices with precipitation in Oslo, Norway, are high and are of opposite sign to west Greenland indices for the winter and summer months. This indicates that they are good representations of the atmospheric patterns associated with the North Atlantic Oscillation and the west Greenland–northern Europe “seesaw.” High correlations are also found with precipitation measured at Nuuk, Qaqortoq, and Upernavik, Greenland.

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