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Northern Hemisphere teleconnection patterns in ensemble simulation from 1500 to 2100

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The climate variability of the atmospheric circulation is characterized by a number of preferred patterns, the so-called teleconnection patterns. These patterns, like the North Atlantic Oscillation (NAO) or the Pacific North American (PNA) pattern, modulate the heat, moisture and momentum fluxes, and influence the strength and the location of major cyclone tracks. Studies show that not only the low-frequency variability connected to teleconnections changes with time, but also the centers of action shift. Thus, there is still a need to understand the low-frequency variability and the stability of these teleconnections.

A detailed analysis is undertaken of teleconnection patterns of the Northern Hemisphere in an ensemble of GCM simulations for the period 1500-2100 and a 1990 control simulation. Four transient simulations are performed with the Community Climate System Model (version 3.0, CCSM3), using time-varying greenhouse gas, solar, and volcanic forcing functions (and the A2 scenario for 2000-2100).

The Northern Hemisphere teleconnection patterns defined by teleconnectivity of the 1000-hPa and 500-hPa geopotential height show that the locations of the centers of action are not stable in time. For the period 1500-2000 the ensemble simulations show no clear connection to natural and anthropogenic forcing functions suggesting that the instability of teleconnection patterns and their low-frequency behavior is dominated by internal atmosphere-ocean dynamics.