



## **A mechanism of PNA influence on NAO**

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A possible link between the Pacific/North American pattern (PNA) and the North Atlantic Oscillation (NAO) is investigated. Both patterns are determined by performing principal component analysis (PCA) on monthly mean 500hPa geopotential-field, and rotating the first ten components (varimax criteria). Different analysis data sets (NCEP, ERA40) and GCM long control runs for present day climate (ECHAM4/OPYC3, 300 years, ECHAM5/OM1, 505 years) are investigated.

Evidence is presented that the link between the patterns is established by travelling baroclinic waves in the Atlantic storm track. In phases of a negative PNA, a positive anomaly of 500hPa geopotential height develops over Florida, while a negative anomaly is apparent over Canada. These anomalies lead to the advection of warm and moist air from the Gulf of Mexico and cold air from Canada. This influences the baroclinic wave activity in the region near Newfoundland through changes in upstream baroclinicity and also through anomalous latent heat content of the lower tropospheric air masses.

The GCMs show significant anti-correlation between PNA and NAO ( $r=-0.37$  in ECHAM4,  $r=-0.22$  in ECHAM5), and there are phases of a particularly strong anti-correlation between the NAO and the PNA, hence the mechanism of the link is significantly enhanced. There is no significant correlation of the indices in the analysis datasets, but two findings suggest that this could be due to long term climate variability rather than a model artefact: a) According to NCEP and ERA40, there is also a phase (1973 to 1994) of significant anti-correlation in the reanalysis data. b) considering only winters where PNA and NAO have opposite sign, the significant increase storm track activity near Newfoundland known from the model runs found is also found. The same holds for periods out of the model runs with correlations as low as in observational data. The mechanism is apparently stronger in ERA40 than in NCEP data.

There is also indication of a coupling of the proposed mechanism and the strength of the circumpolar stratospheric vortex. On the other hand, a coupling of the mechanism with the SST patterns over the North Atlantic could not be revealed.