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The role of atmospheric blocking in the context of large-scale climate modes

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On occasions the prevailing westerly circumpolar flow in the extra-tropics is suppressed by the presence of a quasi-stationary high pressure system referred to as atmospheric blocking. Both, the relatively long life-time (days to weeks) and the predilection for the Northern Hemispheric Atlantic-European and Pacific sector prompts considerations of a possible linkage between blocking and large scale climate modes (e.g. North Atlantic Oscillation — NAO, Pacific North American pattern — PNA).

Several statistically-based studies highlight in particular the correlation between blocking over the Atlantic and the negative NAO phase. A dynamical explanation of the core/relation of these phenomenons is still open and not well understood. Here a recently developed blocking indicator (2D distribution, 6 hourly time resolution) is applied on the whole ERA-40 ECMWF-reanalysis period (1958 - 2001) for the Northern Hemisphere. The focus is set on the Atlantic and Pacific basin for the NAO and PNA respectively. In this study we adopt a twofold strategy.

First a statistical composite analysis indicates significant correlation (anticorrelation) between blocking occurrence in the North Atlantic/Pacific and the negative (positive) NAO/PNA phases. Second an event-based approach is adopted that identifies every single blocking track during the opposed pattern phases. Distinctively different blocking tracks and hence different genesis and lysis regions are found between the opposed phases of the climate variability patterns in each basin. Furthermore, to get some insight whether blocking events can modify/determine the pattern index values, these index values are investigated during every individual blocking track. Evidence is given, suggesting that in particular long-lasting blocking events might be of importance in the determination of the negative NAO phase. In comparison, these findings do not hold for the Pacific sector and the PNA index which indicates that here other factors

are important.

Together, the two approaches shed some new light on the variability of large-scale climate modes and their relation to atmospheric blocking.