Observed and simulated zonally asymmetric zonal wind patterns under NAO conditions

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The North Atlantic Oscillation (NAO), coexistent meridional oscillation of subpolar Icelandic low and the subtropical Azores high dominates the Northern Hemispheric winter climate. Variability in the circulation of NAO may activate the extreme weather events, such as the enhanced zonal winds, in northeast America, Atlantic and Eurasia. On the other hand variability in the zonal wind patterns effects the position of the NAO events. It is more relevant to investigate the interaction between NAO and the weather patterns during the winter time since NAO is powerful during winter. Hence the wintertime weather systems are highly altered by such an impact. Analysis indicate that negative and positive phases of NAO mainly modulate the local cyclonic and anticyclonic wave characteristics and hence the zonally asymmetric circulation of the middle atmosphere. Zonal asymmetries in the weather patterns originate from ocean-continent temperature gradients and topographical contrasts after all solar incident radiation is almost uniform over the longitudes. Thus zonally asymmetric patterns for certain variables such as zonal winds show strong seasonal dependence and highly correlate with the climatological position of the NAO mainly in the winter hemisphere. In this study longitudinal differences in the zonal wind is analyzed in order to observe its strong influence on the evolution of NAO. Zonal asymmetries of zonal wind is examined by evaluating the deviation from zonal mean of the long term annual average of both winter and spring months from December to April. Zonal winds up to 100km for winter and spring is examined between 2006-2100 using CMIP5 MPI-ESM-MR RCP4.5 scenario for the extratropical and the polar latitudes. Additionally ERA5 reanalysis data is used to identify the ability of CMIPS Reference Period (RP) data to capture the observed patterns for the years from 1979 to 2005.

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