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Zonal Asymmetries in the NAO

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The Annular Modes dominate the low-frequency variability in the mid-latitudes, as well as the response to various forcings. Dynamical studies in zonally-averaged cases typically attribute their prominence to a forcing by baroclinic eddies, which feed back on fluctuations of the latitude of the jet.
We examine whether this paradigm holds in the case of the NAO.

In the North Atlantic, the mean jet displays a SW to NE tilt; but the wind anomalies linked with the NAO are much more zonal. As a consequence, the NAO represents a latitudinal shift of the eddy-driven jet in the western part of the Atlantic, but a see-saw between a single and double jet in the east. These two different types of jet variations, i.e. western jet shift and eastern jet speed, are well correlated independently of the definition of the NAO.

Both types of anomalies are forced on average by baroclinic eddies. The anomalous eddy momentum fluxes linked with the NAO represent a shift of the climatology in the western Atlantic, but an intensification in the East. Closer to the surface, the eddy heat fluxes increase throughout the basin during the positive phase. Looking at daily time-scales, eddy heat fluxes lag the NAO index but lead the eddy momentum forcing in the east, yielding a possible mechanism for the eastward extension of the NAO.
These results could suggest that a remote forcing would be more efficient in forcing the NAO if located in the western part of the Atlantic.