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Synoptic view of latitudinal shifts in the North Atlantic eddy-driven jet stream

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Jet streams are bands of strong westerly winds in the extratropics and are a key feature of the atmospheric circulation. They experience large variability over a range of time scales, and influence regional weather and climate.
Of interest here is the synoptic evolution of the North Atlantic eddy-driven jet stream. In the North Atlantic there are three preferred jet stream latitudes (Woollings et al. 2010). Eddy fluxes help maintain the jet in these locations, but not necessarily preferentially over any other location.
Other studies have shown that changes in jet latitude are linked to breaking Rossby waves, which can provide a positive feedback to amplify and maintain jet shifts.
However, there remain open questions about what mechanisms are responsible for the jet shifts, why these jet locations are preferred, and what role upstream atmospheric conditions in the Pacific play.

The present study identifies episodes when the latitude of the North Atlantic jet is persistent in ERA-Interim reanalysis data and investigates from a dynamical point of view: 1) how these episodes develop, 2) how they are sustained, and 3) why they decay. We do so by analyzing eddy-mean flow interactions during these episodes, using diagnostics such as eddy momentum flux convergence, barotropic production, and Rossby wave breaking, all of which are potentially important mechanisms for the variability of the eddy-driven jet. The goal is to establish a synoptic view of changes in jet location, similar to what has been done for the North Atlantic Oscillation.

References:

Woollings, T., A. Hannachi, and B. Hoskins, 2010: Variability of the North Atlantic eddy-driven jet stream. Q. J. R. Meteorol. Soc., 136, 856–868