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Separating eddy driven and subtropical jets in reanalyses

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The distinction between eddy-driven and subtropical jets is conceptually important and well-founded through different driving mechanisms and dominant types of variability. Despite this clear conceptual distinction between the jet types, it is not straightforward to distinguish between these jet archetypes in reanalysis data of individually detected jets.

Inspired by EOF and cluster analyses exploring the variablity between different jets, we here propose a novel and easy-to-apply criterion to distinguish between subtropical and eddy-driven jets. We document that for most ocean basins and seasons, there is a clear bimodality in the occurrence of jets in a potential temperature/wind speed space. These two jet modes in this phase space align well with the conceptual expectations for subtropical and eddy-driven jets regarding their vertical structure as well as their regional and seasonal occurrence.

Surprisingly, the bimodality in phase space is most pronounced in regions such as the western North Pacific during winter, where jets are typically regarded as “merged”, a mixture of eddy-driven and subtropical. Our results thus call into question this typical intepretation of the Pacific jet, and rather suggest that the Pacific winter jet becomes more “merged” in character towards the eastern end of the storm track.