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A Dynamical Systems Characterisation of Atmospheric Jet Regimes in a Simple Model and Reanalysis Data

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Atmospheric jet streams are typically separated into primarily "eddy-driven", or "polar-front" jets and primarily "thermally-driven", or "subtropical" jets. Some regions also display "merged" jets, resulting from the (quasi) co-location of the regions of eddy generation with the subtropical jet. The different location and driving mechanisms of the two jet structures, plus the intermediate "merged" jet, issue from very different underlying mechanisms, and result in very different jet characteristics. Here, we link our understanding of the dynamical jet maintenance mechanisms, mostly issuing from conceptual or idealised models, to the phenomena observed in reanalysis data. We specifically focus on developing a unitary analysis framework, grounded in dynamical systems theory, which may be applied to both the model and reanalysis data and allow for direct intercomparison. Our results provide a proof-of-concept for using dynamical systems indicators to diagnose jet regimes in a versatile, conceptually intuitive and computationally efficient fashion.