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Minimal dynamical systems model of the northern hemisphere jet stream via embedding of climate data

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We derive a minimal dynamical model for the northern hemisphere mid-latitude jet dynamics by embedding atmospheric data, and investigate its properties (bifurcation structure, stability, local dimensions) for different atmospheric flow regimes. We derive our model according to the following steps: i) obtain a 1-D description of the mid-latitude jet-stream by computing the position of the jet at each longitude using the ERA-Interim reanalysis, ii) use the embedding procedure to derive a map of the local jet position dynamics, iii) introduce the coupling and stochastic effects deriving from both atmospheric turbulence and topographic disturbances to the jet.We then analyze the dynamical properties of the model in different regimes: i) the one that gives the closest representation of the properties extracted from real data, ii) one featuring a stronger jet (strong coupling), iii) one featuring a weaker jet (low coupling), iv) modified topography. We argue that such a simple model provides a useful description of the dynamical properties of the atmospheric jet.