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Jets and storm tracks in γ–plane models

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We will present new results from linear calculations and non-linear simulations of a two-layer baroclinic γ–plane model. The model consists of two interacting levels with dynamical temperature anomalies (as in the Eady model), but by its nature provides a consistent description of the continuous 3-dimensional velocity field inside the domain. Our set-up has realistic jet-profiles, yet has a very low-dimensional parameter space.

The model is shown to exhibit realistic linear baroclinic instability properties. In addition, it is shown that the introduction of a γ–plane term induces a jet and a storm-track that is highly non-linear: it exhibits a realistic spiral jet structure and jet-exit region, as is the case for the observed N. Hemisphere jet on Earth. This seems to imply that the variability of the N. Atlantic jet stream is not the result of complex topographic and orographic boundary conditions in the N. Hemisphere, as recent simulations appear to suggest, but rather the result of the spherical geometry of the Earth, setting the right conditions for relevant non-linear interactions between Rossby waves and the jet.