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Large deviations of atmospheric jets

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Rare or extreme events are of great interest in climate and other systems. Few studies address these statistics from a dynamical perspective. Classical statistical approaches, for instance closures or stochastic averaging usually describe typical states or low order statistics only. Large deviation theory is a very interesting alternative to these classical methods. It can in principle describe both typical fluctuations and extreme fluctuations. We consider the dynamics of atmosphere jets in a quasi-geostrophic framework and compute the large deviation rate function of the zonally averaged Reynolds stress, the most interesting quantity for the dynamics of the jets. In the limit where a time scale separation exists, we compare theoretical with empirical measures of these rate functions. This allows us to discuss the long time evolution of the jet. One goal is to predict the dynamics that may lead to change of regimes and change of attractors in atmospheric jet dynamics.