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Dynamics of the error and Lyapunov instability of a moist low-order climate model

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Seasonal and climate forecasts are affected by errors originating from both the initial conditions and the model uncertainty, in particular associated with the coupling between the different climate components. In this talk, we investigate the dynamics of both errors in the context of a low-order moist climate model, and identify the different error-growth regimes depending on the respective amplitudes of both errors. We also relate this dynamics to the Lyapunov instabilities of the system.

The coupled atmosphere-ocean (slab) model used has been developed by Lorenz (1984). It is a low-order model containing only a few key processes essential in the dynamics of the climate of a global atmosphere. It is a moist general circulation model including total water as a prognostic variable. The surface is an ocean which exchanges water and heat through evaporation and precipitation. The circulation is driven by solar heating and the thermodynamics of water is included. The model is reduced to 27 variables.