## LadHyX Seminar – October 14, 10:45

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## Describe and estimate energy transfers in the turbulent atmosphere of the gas giants

The strong zonal (i.e. east-west) jet flows on the gas giants, Jupiter and Saturn, have persisted for hundreds of years. Zonal jets are large-scale features ubiquitous in planetary atmosphere and result from multi-scales interactions in rapidly rotating turbulent flows. We run a Global Circulation Model (GCM) of Saturn's atmosphere using the new dynamical core called DYNAMICO, with an unprecedented 1/2 degree horizontal resolution and coupled with Saturn physical packages. At steady state, strongly energetic, zonally dominated, large-scale structures emerge scaling with Rhines' theoretical scale. Spectral analysis reveals a strong anisotropy of the kinetic energy spectra conform to the predictions of the zonotrophic turbulent regime. By computing spectral energy and enstrophy fluxes we confirm the existence of a double cascade scenario related to the 2D-turbulent theory in Saturn-like atmospheric dynamics. To further investigate the complex interactions between anisotropic turbulence and the formation of zonal jets, we run a new laboratory experiment designed to emulate planetary like flows. By computing similar statistical analysis we directly confront flow properties in the laboratory, in the GCM and with the most recent observations of the gas giants. We finally explore the possibility of a new diagnostic for turbulent characteristics based on potential vorticity measurements in planetary flows.