

Dynamics (Session III) Plenary Discussion

The Dynamics Session focused primarily on general circulation modeling, the effect of rotation on predicting dynamics, and the role of macroturbulence in driving circulation. General circulation models can somewhat predict the zonal wind jet structure on a giant planet, and models show that fast rotating planets are less efficient at poleward heat transport. Stellar distance and atmosphere mass also play a role with efficiency increasing with larger atmospheric mass, lower density, larger solar flux, and longer radiative time scales. More controversial was the role of macroturbulence vs. an inverse energy cascade in driving wind jets.

The discussion included the need for long-term observation (“time-domain science”) of atmospheric dynamics. Current data that can constrain some of the details of these models (beyond the general large scale circulation) are noisy and incomplete. Simple snapshots do not show the full dynamical regimes present. Moist processes are missing or crudely represented in most planetary dynamical models despite their possible importance on a number of planets.

Overall, dynamics appears to be the area in which more effective communication with other disciplines is most needed, given the jargon that permeates the field. Many participants expressed a desire to understand the definition of potential vorticity, and other terms, in simpler, more intuitive, language.