EGU21-15705
https://doi.org/10.5194/egusphere-egu21-15705
EGU General Assembly 2021

The relation between the zonal jets and ammonia anomalies in Jupiter

Nimrod Gavriel[1], Keren Duer[1], Eli Galanti[1], Yohai Kaspi[1], and the Juno MWR team[*]
[1]Weizmann Institute of Science, Planetary And Earth Sciences, Israel (nimrod.gavriel@weizmann.ac.il)
[*]A full list of authors appears at the end of the abstract

Juno's six‑channel MWR measurements might reveal information about the structure of the wind profile below the cloud level. These measurements are used to calculate the nadir brightness temperature (T_b), a profile determined by temperature and by the opacity of the atmosphere. This opacity for the relevant frequencies of the MWR is determined mostly by ammonia abundance. The T_b vary considerably between the different channels (indicating on different depths) and between latitudes. Here, we take the T_b as an indicator for ammonia concentration and examine the relation to the zonal jets. We find that different theoretical mechanisms can explain this relation at different latitudes. At the equatorial region, the superrotation is accompanied by vertical upwelling. This vertical advection, driven by a convergence of eddy fluxes directed perpendicular to the axis of rotation, is shown to explain the equatorial ammonia enrichment. At the mid-latitudes, assuming that the ammonia is enriched with depth, alternating Ferrel-like cells framed by opposite vertical velocities redistributes the ammonia, maximizing its meridional gradient where the jet peaks. This hypothesis is well apparent in the data, using both correlation analysis and theoretical arguments. We find that dynamical reasoning, suggesting on vertical velocities through the cloud-level zonal jets, can explain the latitudinal variations in $T_{b,}$ under the assumption that they are caused by ammonia abundance anomalies.

Juno MWR team: Juno MWR team