Super-rotation of Venusian atmosphere in the equatorial region may be caused by the density driven separation

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On Venus, the clouds move nearly 60 times faster than the rotation of the planet. Super-rotation of the Venusian atmosphere is an intriguing phenomena and the reasons are still unclear. The super-rotation is possibly due to Venus being tidally locked to Sun as a consequence of which the planet experiences maximum heating in the equatorial zones causing meridional flows in the lower latitudes. The latent heat trapped by the Carbon dioxide gradually rises above due to its increased kinetic energy, which increases the motion of the cloud layers over time. Previous works done shows that the clouds are highly unstable in the altitude ranging from 49-55Km and below 30Km as per Zasova et al 2006 (doi:10.1016/j.pss.2007.01.011). This work shall put forth a possibility of density driven separation of cloud layers and its viscosity which helps in the super-rotation of the clouds. Similar hypothesis were presented by Lebonnois et al 2017 (DOI: 10.1038/NGEO2971). Using the known densities of atmospheric constituents, and applying the principles of viscosity and fluid dynamics, a simulation in COMSOL Multiphysics is done and analyzed for the flow behavior in the atmospheric layers ranging between 20Km and 80Km with respect to it’s horizontal distance. The possible reasons regarding the flow will be discussed considering the solar convection in the equatorial region.

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