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Hadley Circulation in the Venusian Atmosphere

All characteristics underneath the Venusian atmosphere, composed of opaque and reflective clouds, are obscured. The Venusian atmosphere of superrotating retrograde motion has unknown causes, and in observing wind speeds at different latitudes on Venus, a description of the trajectory of the clouds will be revealing of the origins of its superrotation. There exist theories of Hadley circulation being the dominant force causing Venus' superrotation. The purpose of this experimentation is to identify whether features of the Hadley cell are present on the lower altitude Venusian clouds as theorized. A database of several thousand images taken of Venus at the NASA Infrared Telescope Facility under the auspices of the Southwest Research Institute in Boulder, Colorado was used in this study. There were various procedures for image analysis and experimentation comprised of the usage of a myriad of image processing software. Trigonometry calculations were used to derive the distance as a feature on Venus traveled at different planes. The results suggest that features of Hadley circulation appear on Venus. Wind-speeds became progressively faster with the lowering of the latitude from the northern to southern hemisphere, ranging from ~140 to ~535 kilometers an hour (km/hr). Polar vortex shapes seemed evident at the southern pole with seemingly abnormal speeds of 533 km/hr. Winds appeared to converge towards the equator and follow the Hadley model of winds, adiabatic heating and cooling, and speeds as function of three-dimensional location. Wind pattern analysis reveals prominent features of Hadley circulation in wind trajectory and in the speed differentiation.