



Variability of Saturn's Tropospheric and Stratospheric Temperatures: Discovery of Non-Seasonally Dependent Time Variability and Characterization of Slowly-Moving Thermal Waves

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A longitudinal study of Saturn's temperature field in the upper troposphere (80–300 mbar atmospheric pressure), and in the stratosphere (~30 mbar), has been conducted at NASA's Infrared Telescope Facility, and has included higher spatial resolution imaging from the Keck and Subaru Observatories. The study includes thermal images taken as early as 1995, with Saturn observed as a secondary target during Galileo-support observations of Jupiter. High-SNR thermal imaging of Saturn started in 2003. The thermal images of Saturn were taken through a series of discrete filters sensitive to the opacity of well-mixed components of Saturn's atmosphere: H₂ and CH₄. One of the primary changes documented by these data is the response of the atmosphere to seasonal forcing by insolation, but other features are also detectable. One of these is the oscillation of the equatorial stratospheric temperature which roughly suggests a 4-year cycle, similar to Jupiter's "QQO" (quasi-quadrennial oscillation). Another is the ephemeral nature of zonal thermal waves. These are present with amplitudes between 0.25 and 0.75 Kelvins near 16, 28, 38 and 52 °S (planetocentric) latitude at one time or another, but they are not always present - unlike similar bands of higher amplitude in Jupiter. A fuller picture of these phenomena will result by combining them with the more spectrally complete but less frequent observations by Cassini's Composite Infrared Spectrometer (CIRS).