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Vertical cloud structure models of Jupiter's South Equatorial Belt fade

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One of the most striking changes in the belts and zones of Jupiter as observed at visible wavelengths, occurs in the South Equatorial Belt (SEB) that cyclically, and with a non well defined period, transforms from its usual dark (low albedo) belt stage to a bright (higher albedo) zone like stage known as a "fade" of the belt. Currently, no models of the cloud structure of the SEB have been developed to explain such global albedo change. At the end of 2009 and in coincidence with the solar conjunction the SEB suffered its last observed fade. In this work we analyze Hubble Space Telescope WFC2 and WFC3 images from 2008 to 2010 that characterize for the first time the absolute reflectivity change of the SEB from a belt to a fade stage, in the wavelength range from the near ultraviolet to the near infrared including deep methane band absorption at 890 nm. The geometrical and wavelength dependence of the reflectivity is modeled by means of a radiative transfer code to retrieve the accompanying changes in the SEB vertical cloud structure during the event. Results point to a substantial increase in the cloud density at the ammonia condensation level together with changes in the absorption and size of the particles located above it. We also present measurements of the zonal winds in the SEB prior and during the fade stage based on the HST imaging and in high-quality images submitted to the International Outer Planet Watch PVOL database. Apparently, the albedo change is not accompanied by a substantial dynamical change in the zonal winds indicating that, as observed in other Jovian phenomena, the upper cloud structure changes do not affect substantially the global circulation of the region.

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