A Temporal Analysis of Cassini/VIMS Limb Brightness Profiles of Titan from 2004-2017

Aadvik Vashist Jason Barnes

October 23, 2023

We analyze the evolution of brightness profiles from Cassini Visual and Infrared Mapping Spectrometer (VIMS) spectral mapping cubes to gain insights into the vertical structure of Titan's atmosphere. Using low-phase angle observations from 2004-2017, we observe changes in the shape of limb brightening profiles with regard to wavelength and time. When densely sampled over a temporal period, these profiles can independently track the development of different atmospheric layers on a global level. We show that Titan's limb brightening depends on the wavelength and varies as a function of time. Moreover, a comparison of the brightness profiles over the northern and southern hemispheres supports existing analyses of atmospheric asymmetry behavior. By using a combination of both limb and asymmetry observations, we are able to develop a greater understanding of the underlying seasonal dynamics of Titan's haze, specifically its vertical structure.