

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

Aadvik Vashist Jason Barnes

October 20, 2022

We document the evolution of the North-South Asymmetry (NSA) of Titan’s haze albedo during the Cassini mission between 2004 and 2017. We use co-added visible and near-infrared images taken by the Cassini Visual and Infrared Mapping Spectrometer (VIMS) instrument from fourteen Titan flybys to enhance the contrast of the NSA. Over a half-Titan year, we observe a near-complete transition in the NSA boundary latitude across the geographic equator from the Southern to Northern hemisphere, including a 3-year loss in albedo contrast several years after the vernal equinox. The NSA disappearance matches observations of a reversal of the NSA in Hubble images before winter solstice between 1997-2000 (?) and in Space Telescope Imaging Spectrograph images between 2017-2019 (?). A comparison of NSA images taken at similar times but at different phase angles shows the NSA boundary is detectable, albeit with less contrast, at high phase angles (~ 90 degs). We find several VIMS cube images further support a small yet detectable tilt between the super-rotating atmosphere and the solid body of Titan, as previously suggested in an analysis of 890 nm images from the Cassini Imaging Science Subsystem (ISS) by ?.