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Analysis of Titan´s haze from Cassini/ISS observations

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Abstract

In-situ observations made by Huygens combined with recent analysis of the optical properties of the haze enable to model the radiative transfer in the Titan atmosphere and interpret observations with a very good accuracy. However, the haze layer presents spatial and temporal inhomogeneities in its optical properties as a result of the particle horizontal transport. These variations in the haze distribution are evident from the observed variations of its geometric albedo along the last decades (see e.g. Lorenz et al. 2004). In this work we will describe how we analyze variations in the optical properties of the haze through the analysis of images taken by the Cassini Imaging Science Subsystem (ISS). The analysis of the images is undertaken by radiative transfer simulations.

1. Description of the model

Since the analysis of images is undertaken for any viewing geometry, the simulations require the use of a full three-dimensional radiative transfer model in spherical geometry. In this work we use a Monte-Carlo radiative transfer model in spherical geometry (Tran, 2005). The phase function, single scattering albedo and density of the particles present in the main haze layer are taken from Tomasko et al. 2008.

2. Analysis

In order to analyze the optical properties of the haze, we simulate light scattered from Titan's atmosphere and then we compare the model results with images taken by the ISS cameras. I/F measurements at the limb can provide data to derive vertical profiles of haze optical properties. As example, **Figure 1** shows the ratio between I/F simulated with the Monte-Carlo model for different values of the scale height (H) that describes the vertical haze opacity above 80 km, and an image taken by ISS cameras in the violet filter. In this example, best results are obtained for H=50 km.

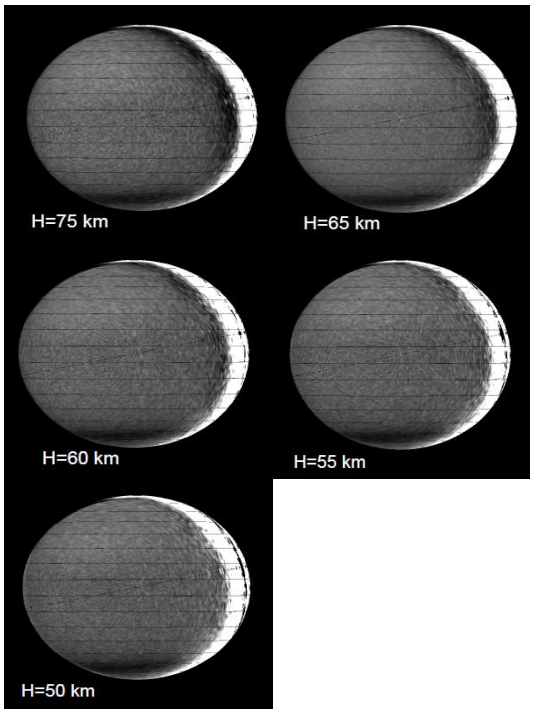

***Figure 1**: Ratio between I/F simulated with the Monte-Carlo model and measured by ISS in the violet filter.*

References

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