Analysis of Titan's Detached Haze Layer with Cassini/ISS instrument

Loaded with photochemical haze, Titan's dynamical atmosphere is slowly evolving through the seasons. Like the ozone layer on Earth, Titan's detached haze layer is a thin coat of aerosols surrounding the upper part of its atmosphere. Since its discovery in the 80's by Voyagers' flybys, it has raised many questions on its content and origin. Thanks to the Cassini mission orbiting around Saturn since 2004, we have the chance to track it over half a Titan year. This thesis carries out a complet survey on Titan's detached haze layer observations taken continuously by the ISS instrument during the whole mission. At first, we present the processing pipeline developed to calibrate and navigate the raw data coming the PDS. Then, we characterize the aerosols optical properties seen inside the detached haze layer by coupling a fractal aggregate model with a simplified version of the radiative transfer equation. Thereafter, these new constrains are used as input into a more complex radiative transfer model in the limb geometry in order to extract globally the extinction profiles of the haze in the upper atmosphere. These systematic surveys allow us to follow the spatial and temporal evolution of the detached haze layer from the beginning to the end of the Cassini mission. Finally, we took a special care on the disappearance of the detached haze after the vernal equinox and its recent reappearance in 2016, just before the summer solstice.