



Goddard Space Flight Center 2009 Sample Student Projects

Required Academic Level

Freshman/Sophomore
Undergraduate, Junior/Senior
Undergraduate

Category

Space Science

Subcategory

Planetary Science

Project Title

Analysis of High Spectral Resolution Propane Spectra

Project Description

The Composite Infrared Spectrometer on the Cassini spacecraft has been obtaining spectra of Titan's atmosphere. These observations have produced a wealth of new and exciting scientific results about the satellite's atmosphere. Researchers have found chemical compounds and isotopes that were previously undiscovered in Titan's atmosphere, and we have a better understanding about the details of the physical properties such as temperature. Each such discovery reveals the complexity that is Titan's atmosphere and improves our ability to understand the dependencies within this entity. However, extracting information about the chemical compounds and physical properties involves considerable effort in modeling the observed spectrum using properties of the chemical compounds from laboratory measurements. Limits in our understanding of Propane's infrared spectral properties is constraining ability to probe for other chemical species on Titan. We plan to extract these important characteristics of Propane using prior laboratory spectral measurements. The goal for the student is to utilize existing (IDL based) computer algorithms and analyze the data and generate the properties of interest. The project requires careful and methodical comparison of the products of these codes to the data in an iterative operation that seeks an optimal match. It presents a unique opportunity for a motivated student for exposure in an active scientific field, and to directly participate in an important research effort.

Mentor's Expectation of Student

The student is expected to develop a working knowledge of IDL (a scientific programming environment), be motivated to understand the basics of spectroscopy (related to the project), learn the basics of numerically comparing a mathematical model to data, methodically characterize the previously obtained laboratory spectra using these models as instructed by the mentor, and maintain a rigorous record of the results from each step. The Propane spectroscopic parameters derived from processing each spectrum must be tabulated. The errors for each of the parameters must also be included. A final report should present a summary of the effort.

Discipline of Project and/or Background Needed to successfully complete the project

Analysis; Calculus; Physics; Computer Science

Skills

Critical Writing, Problem Solving, Research, Technical Writing, Linux/Unix, Macintosh, IDL