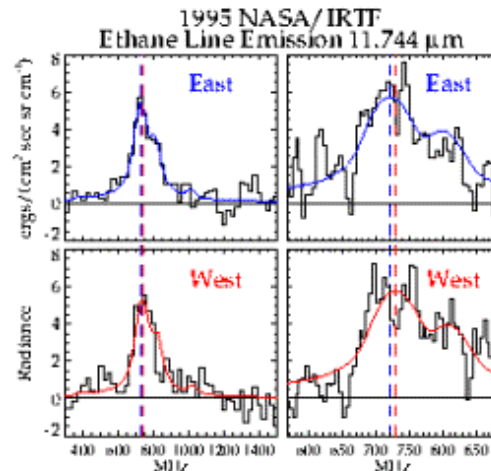
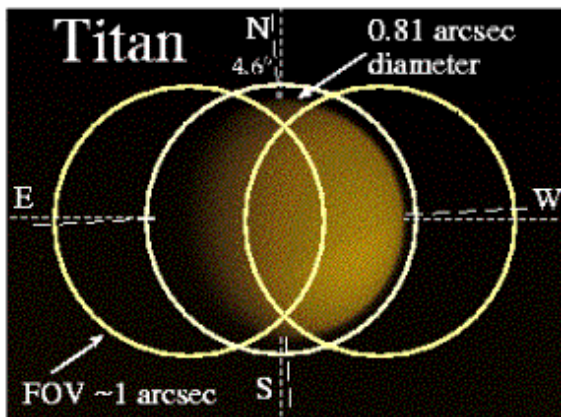


Measuring the Winds on Titan

The first direct measurement of the wind velocity in the atmosphere of Titan was recently obtained by T. Kostiuk et al. (2001, *Geophys. Res. Lett.*, 28, 2361). They used a 10 micron heterodyne spectrometer with a spectral resolution of 10^6 to observe emission lines from ethane (C_2H_6) in the stratosphere of Titan. This instrument was constructed at GSFC and has been installed at the coude focus of the IRTF for the past 10 years. The observations are shown below.



The left figure shows the geometry of the Titan wind measurements. The position of the 1 arcsec instrument field of view on the limbs of Titan (~ 0.81 arcsec separation) is shown on a colorized Voyager 1 image. To carry out the modeling, Titan is divided into elements, each of which contributes to the measured spectrum. The right figure shows the spectra of Titan that were obtained. The modeled line position is indicated by the vertical lines and a small differential velocity shift is observed.

Although the detailed modeling is complex, the analysis shows that the wind speeds are >130 m/sec and prograde at the 94% confidence level. These results are consistent with general conclusions from numerical simulations for the dynamics of Titan's atmosphere which suggest prograde circulation in the direction of surface rotation.

This result provides information regarding Titan meteorology, provides constraints on dynamical theories for slowly rotating bodies, and provides otherwise unobtainable data to plan the trajectory the Cassini Huygens Probe.