ATMOSPHERIC WAVE STRUCTURE DERIVED FROM MARS GLOBAL SURVEYOR HORIZON SENSOR DATA

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Introduction:
The Mars Horizon Sensor Assembly on the MGS orbiter monitors the orientation of the spacecraft relative to the limb by sensing atmospheric emission in the 15 μm CO_2 band. These data are used to maintain nadir pointing for the remote sensing instrument suite. The fields of view normally straddle the limb in four directions: forward and aft along the spacecraft's polar orbital path, and to both sides.

As an engineering device, the MHSA benefits from Mars' atmosphere being spatially bland at 15 μm. However, the derived radiance data carry information about the thermal state of the atmosphere, which is subject to diurnal, seasonal, latitudinal, and dust-storm related variations, as well as wave phenomena. The Mariner 7 IRS, Mariner 9 IRIS, and Viking IRTM all demonstrated such variability. The attached figure shows a map of nighttime temperatures for L_s 270-275º in 1999.

Status:
The MHSA has now been monitoring global atmospheric thermal behavior continuously for nearly two Martian years since the start of the mission's mapping phase in May 1999. Since August, 2001, the spacecraft orientation has been tilted in the pitch axis much of the time to minimize use of attitude control gas; this has affected the performance of the MHSA for retrieving atmospheric radiances.

Analysis: Analysis of the data from the MHSA (temperatures at four to six Mars local times with good spatial coverage) does permit isolation of high-frequency tidal components that are not available from the lesser diurnal coverage provided by nadir views only (as for the TES instrument). Analysis of GCM column temperature results provides a tool by which observed temperatures can be interpreted. This is especially true when wavenumber:frequency deconstructions are performed on data obtained with incomplete spatial coverage or temporal frequency. In such situations, analysis of model results at a variety of samplings (complete, time-of-day limited, etc.) allows for comparison of the fidelity with which various wave features 'pass' through the sampling and analyses.