

American Geophysical Union Spring Meeting  
1–4 June 1999, Boston, Massachusetts, U.S.A.  
Abstract P31A-06, *Eos, Transactions of the American Geophysical Union*, Spring Meeting  
Supplement, v. ??, n. ??, p. ??, 1999.

**The Martian Surface, Atmosphere, and Poles as Observed by the Mars Global  
Surveyor Thermal Emission Spectrometer Experiment**

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The surface of Mars has been studied using the Thermal Emission Spectrometer (TES) instrument during the aerobraking, science phasing, and early mapping phases of the Mars Global Surveyor mission. The TES spectra contain information on the atmospheric dust, water-ice clouds, CO<sub>2</sub>, water vapor, and surface materials, which are present in each spectrum in varying abundances. Separation of these components has been accomplished using both radiative transfer and factor analysis methods that model the composition and temperature of the atmospheric constituents. A basaltic surface component composed primarily of pyroxene and plagioclase has been identified. A significant accumulation of hematite has been mapped within a localized zone with relatively sharp boundaries approximately 300 km in diameter centered near the equator at ~5°W. The growth and decay of several 1997 regional dust storms was monitored and has been analyzed using TES data. The abundance of atmospheric dust and water-ice clouds has been determined and has been mapped in space and time. Temperature retrievals have been performed using the 15 μm CO<sub>2</sub> absorption feature, and used to study the dynamics of the atmosphere. The detailed behavior of the south polar cap has been monitored and initial estimates of the surface properties have been made.