1.2-to 3.5-μm OBSERVATIONS OF ASTEROID 4179 TOUTATIS. D.T. Britt[1], E.S. Howell[1], J.F. Bell[2], and L.A. Lebofsky[1]. (1) Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721. (2) Planetary Geosciences Division, SOEST, University of Hawaii, Honolulu, HI 96822.

Introduction: The close Earth approach of the Apollo asteroid 4179 Toutatis during the winter of 1992-1993 has provided a unique opportunity for detailed ground-based observations of a near earth asteroid (NEA). Because of their relatively small size NEAs are usually far too faint to be observable by most ground-based instruments. This opposition by Toutatis was, however, exceptionally favorable. Toutatis approached within 0.03 AU of Earth and was as bright as 11th visual magnitude. This made the object observable in a wide variety of wavelengths including radar, thermal IR, near IR, and visual.

Observations: We obtained 1.2-to 3.5-μm photometry of Toutatis on the night of January 3-4, 1993. Howell observed Toutatis with a 1.2-to 2.5-μm CVF spectrophotometer, using the Multiple Mirror Telescope on Mount Hopkins in Arizona. Within two hours of that observation, Britt and Bell obtained J, H, K, 2.95 μm, 3.12 μm, and 3.35 μm broad-band filter photometry using NASA's Infrared Telescopic Facility at the Mauna Kea Observatory in Hawaii. Since Toutatis has a very slow rotation period of approximately ten days, these observations are essentially of the same area on the object [1]. During the observations Toutatis was at or very near zenith, visual magnitude was approximately 12.8, phase angle was 15.2°, and the distance from Earth was approximately 0.182 AU. Toutatis was only 1.158 AU from the sun, so the 3.0 μm data has a substantial thermal contribution.

Results: Only preliminary data reductions have been done. The 1.2-to 2.5-μm CVF data show an absorption band centered near 2.0 μm suggesting that pyroxene is a major contributor to the spectrum of Toutatis. In addition, the spectral slope between the broad-band J and K filters (1.25 and 2.2 μm respectively) is about 6-10%, which is a modest red slope for an S class asteroid. The shape of the CVF spectrum obtained at the MMT was closely matched by the J, H, K broad-band filter data from the IRTF. The thermal correction for the 3.0 μm data is particularly challenging because Toutatis is very close to the Sun, rotates very slowly, and radar images show it to have a very complex shape [2]. Preliminary reductions of these data indicate that Toutatis is, as expected for an S class asteroid, anhydrous, but standard thermal models do not apply directly to this object and further work remains to be done.

References: [1] Spencer, J.R. (1993) Personal Communication. [2] Ostro, S.J. (1993) Personal Communication.