

TAKING ANOTHER LOOK AT THE 3-MICRON ABSORPTION BAND ON ASTEROIDS. E. S. Howell, *Arecibo Observatory, HC 3 Box 53995, Arecibo PR 00612, USA, (ehowell@naic.edu)*, A. S. Rivkin, *Department of Earth, Atmospheric, and Planetary Sciences, MIT, Cambridge, MA 02139, USA*, B. A. Cohen, *Hawaii Institute of Geophysics and Planetology, University of Hawaii at Manoa, Honolulu, HI, 96822, USA*.

Observations of the water absorption band at $3\ \mu\text{m}$ during the past 15 years have shown that many of the low-albedo main belt asteroids have hydrated minerals on the surface. This has been interpreted as evidence of aqueous alteration, and suggests that these asteroids may be related to meteorites rich in serpentine and/or saponite. However, questions have been raised concerning the depths of the bands, and systematic differences between the reflectance spectra of asteroids and meteorites. A new generation of infrared spectrographs, in particular SpeX at the NASA Infrared Telescope Facility (IRTF), has allowed a better look at the $3\text{-}\mu\text{m}$ spectral region than ever before. These new observations may help us to reconcile some of these differences, and indicate that the asteroid and meteorite spectra are really more similar than previously thought. Upon re-examination of the continuum and thermal emission removal, using spectral data at longer wavelengths than was previously available, we find that the asteroid absorption band depths have been underestimated, and closely resemble the bands measured for many CI and CM meteorites.

Figure 1 shows the spectrum of asteroid 2 Pallas, which has been well observed over many years. Photometry obtained by Lebofsky (1980) has been overlain on the spectrum we obtained using SpeX in August, 2001. There is a good match of the slope of the band, but there is an offset in band depth when using the new continuum determination. Since the continuum

in the $1\text{-}2.4\ \mu\text{m}$ region is generally flat for C-type asteroids (and related B, F and G types), the continuum is also assumed to be linear between 2.4 and $3.5\ \mu\text{m}$. The assumption is made that $3.5\ \mu\text{m}$ is out of the absorption band. Laboratory data often shows that the band edge is closer to $4\ \mu\text{m}$ for many hydrated silicates (e.g. Miyamoto and Zolensky, 1994). The thermal emission contribution has been estimated by adjusting model parameters until the reflectance at $3.5\ \mu\text{m}$ matches that at 2.2 (or $2.4\ \mu\text{m}$ in some cases). This procedure underestimates the band depth if the band edge is really closer to $4\ \mu\text{m}$. The SpeX data gives us a better estimate of the true band shape and extent than was possible with previous instruments. If the continuum is calculated with the same assumptions used in reducing the photometry, then we obtain the spectrum in Figure 1 labeled "old continuum", which matches the photometric data very well. The band depths using previous assumptions will be re-examined, and compared to the values determined for meteorites.

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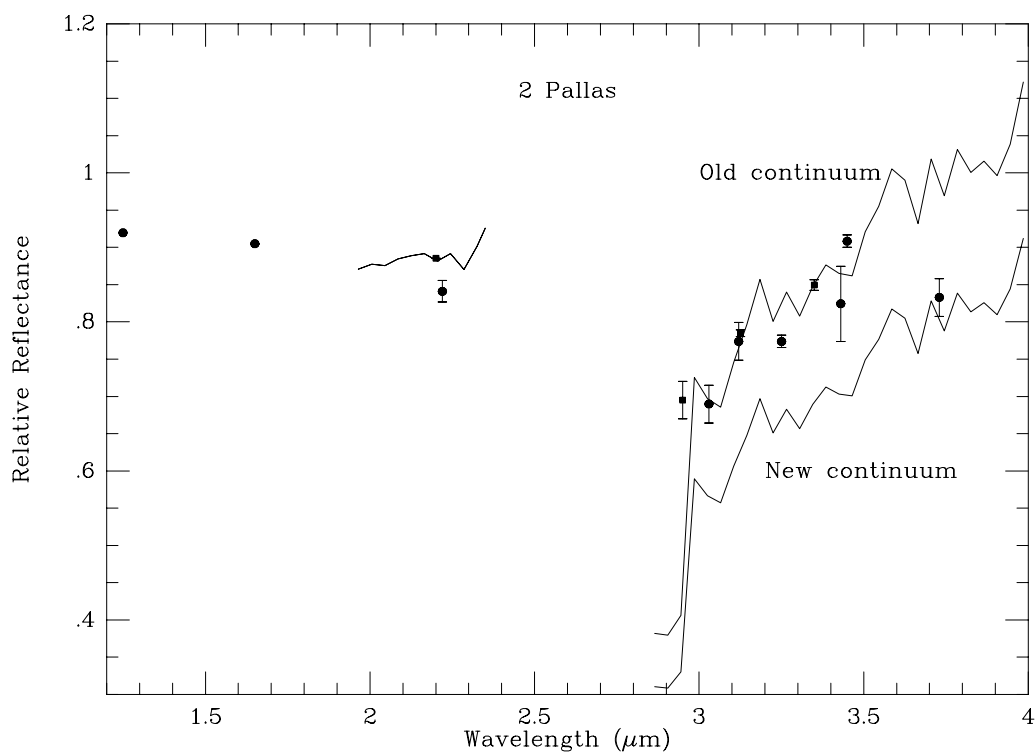


Figure 1: The spectrum of 2 Pallas is shown above. The 3- μm observations were taken in August 2001 using SpeX at the IRTF. The photometry was obtained in 1978 and 1987. The lower spectrum (labeled new continuum), is assuming that 4 microns is the long wavelength band edge. If instead, the spectrum is reduced assuming that 3.5 microns is the band edge, the spectrum (labeled old continuum) then matches the photometry.