

**REFLECTANCE SPECTRA OF MEMBERS OF VERY YOUNG ASTEROID FAMILIES.** C. R. Chapman, B. Enke, W. J. Merline, D. Nesvorný, P. Tamblyn, and E. F. Young, Southwest Research Inst. (Suite 300, 1050 Walnut St., Boulder CO 80302 USA, cchapman@boulder.swri.edu).

**Introduction:** Several asteroid families or clusters have very young dynamical ages [1]. The Veritas family of C-type asteroids, Karin cluster within the S-type Koronis family, and the Iannini cluster (S-like) formed about 8.3, 5.8, and <5 My ago, respectively. A family associated with Datura is extremely young, 0.45 My [2]. If space weathering modifies asteroid spectra on timescales comparable to or longer than several My, then we may expect different spectra for members of these recently formed families than for older families. We use the SpeX instrument on the IRTF (in low-resolution prism mode) to study infrared reflectance spectra of members of these young families. We observe selected young asteroids, controls (e.g. members of the Themis family and non-Karin members of the Koronis family), and G-type comparison stars.

**Observations:** Spectra in Fig. 1 were obtained on 11 nights between June 2005 and July 2006. Although the sky quality was generally good, we had some difficulty characterizing extinction resulting in slight uncertainties in the overall slopes of spectra. Also there is jitter for faint asteroids beyond 2 $\mu$ m and near the 1.4 and 1.9 $\mu$ m water bands. In Fig. 1, the spectra are averaged within wavelength bins of 0.025 $\mu$ m. An average spectrum is calculated for each asteroid each night. Nightly averages are then averaged to yield spectra in Fig. 1, for asteroids observed on multiple nights.

**Discussion:** The timescale for space weathering processes that modify reflectance spectra of S-type asteroids is an important issue [3]. It can be seen that spectra for the young Iannini and Karin family asteroids are slightly less red than typical Koronis members, which may be a subtle reflection of their comparative youth. However, if space weathering modifies ordinary chondrite-like spectra to mature S-type spectra (like the Koronis family), then the Iannini and Karin family asteroids are near the end of their spectral evolution after only a few million years. The very young asteroid Datura is a Q-type with deep band and has only begun to evolve toward S-type maturity.

Assuming that the Veritas and Themis families are of the same inherent composition, then the different average spectra for these families may reflect space weathering trends. Whereas Themis spectra show a U-like shape in this wavelength range, the young Veritas members tend to show a slightly bluish slope with a hint of an inverted U-like shape, as has been previously noted [4,5]. It is possible that the effects of space weathering are more prominent at these longer wavelengths for C-types than for S-types.

**References:** [1] Nesvorný D. et al. (2003) *Ap.J.* 591, 486-497. [2] Nesvorný D. et al. (2006) *Science* 312, 1490. [3] Chapman C.R. (2004) *Ann. Rev. EPS* 32, 539-567. [4] Chapman C.R. (2008) *ACM* #8391. [5] Ziffer J. (2008) *AAS/DPS#40*, #60.06.

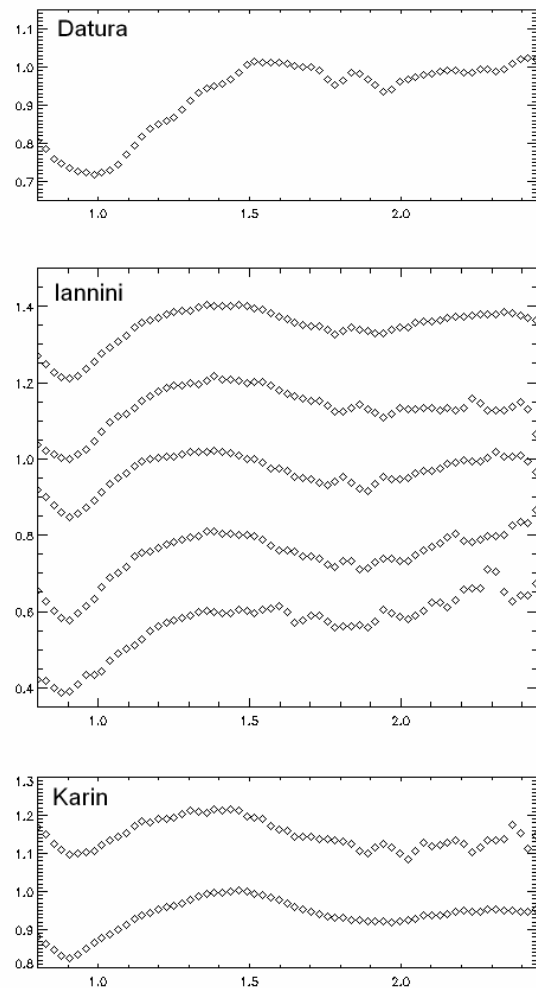


Fig. 1. Average spectra for asteroids, grouped by family. All spectra are from 0.8 to 2.45 $\mu$ m, normalized to 1.0 reflectance at 1.5 $\mu$ m (but vertically displaced by 0.2). Within each part of the figure, asteroid numbers from top to bottom are: Datura: 1270. Iannini: 1547, 151032, 4652, 81550, 87239. Karin: 10783, 832. Koronis: 1289, 1423, 167, 208, 2574, 3032, 311, 4863, 5338, 534. Veritas (Part 1): 10793, 1086, 15066, 19845, 2147, 28022, 28546, 29891. Veritas (Part 2): 31743, 490, 49622, 5592, 5594, 6343, 7612. Themis: 1027, 2114, 2297, 3591, 4470, 468, 492, 656, 8591, 90.

