REFLECTANCE SPECTRA 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: We have been investigating the physical properties of asteroid families (or clusters within families) that have been shown to be very young by studies of dynamical evolution of family members. Our program includes numerous approaches to investigating physical properties, including reflectance spectra, lightcurve studies of spins, and searches for satellites. Various attributes of asteroids evolve with time after formation by catastrophic disruption of a parent body. Very young asteroid families might be expected to reveal initial conditions at the start of such evolution, or at least place constraints on the timescales for such evolution. We focus here on our preliminary studies of infrared spectral reflectance, which might elucidate the nature and rates of space weathering processes that cause asteroid reflectance spectra to change with time.

SpeX Observations: We have used the SpeX instrument on the IRTF on Mauna Kea to study members of three dynamically young asteroid families/clusters, Karin, Iannini, and Veritas. Including observations of controls, chiefly members of the Themis and Koronis families, we have so far reduced spectra from one or more nights for 54 different asteroids. These spectra show the usual noise near two telluric water bands, but well characterize the reflectance from 0.8 to 2.45μm. Our first publication based on these data [1] focused on Karin, the largest member of the Karin cluster; we demonstrated that Karin shows no significant color variations with rotational longitude, calling into question previously published conclusions that it does. Here we present and discuss our observations of other asteroids we have observed from the three young families.

Discussion: We exemplify our studies of these SpeX data in Fig. 1. This shows results from studies of spectra measured on a single night, 19 June 2005. We obtained spectra on 2 members of the Veritas family, 2 members of the Iannini family, 6 Themis family controls, and 4 Koronis family controls. Average reflectance spectra for these families are shown in Fig. 1, along with a single spectrum of 1089 Tama, a typical S-type Flora family member. The Veritas average is based on spectra for 1086 and 5592 while the Iannini average is based on spectra for 1547 and 81550.

As we noted for Karin [1], which we found to be slightly less reddened than typical S-types, the average spectrum for the Iannini family appears slightly less red than is true for typical S-types (e.g. the plotted spectra for 1089 Tama and for the Koronis family controls). This suggests that space weathering has not gone to completion in the several million years since these two S-type families formed. On the other hand, the differences between both Karin and the Iannini average shown here compared with the Koronis average are rather slight, in the context of the full variety of spectra that are classified as S-types (e.g., notice the significant spectral differences between the more olivine-rich asteroid 1089 and the more pyroxene-rich Iannini and Koronis spectra). Neither Karin (not plotted here) nor the Iannini members show the deep absorption bands that one would expect for pristine, non-weathered mineral assemblages. This suggests that space weathering of S-types proceeds rather rapidly, even if it has not gone entirely to completion in several million years.

Reference:

[1] Chapman C. R. et al. (2007) *Icarus, 191,* 323-329.

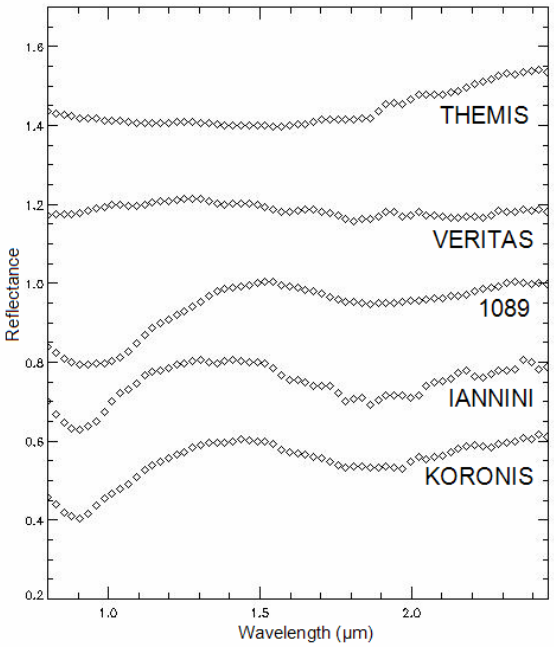

Fig. 1. Infrared reflectance spectra, based on SpeX observations on 19 June 2005. Average spectra are shown for two young families, two older families (controls), and a single Flora family member.