SEARCHING FOR EVIDENCE OF UV/BLUE SPACE WEATHERING IN S-COMPLEX ASTEROID PHOTOMETRY FROM THE SLOAN DIGITAL SKY SURVEY. Faith Vilas[1] and Amanda R. Hendrix[1], [1]Planetary Science Institute, 1700 E. Fort Lowell Rd., Suite 106, Tucson, AZ 85719, USA, fvilas@psi.edu.

Introduction: In the inner Solar System (semi-major axis, a < 3.2 AU), the space weathering of S-complex asteroid surfaces is manifested in grain coatings caused by a combination of vapor deposition of submicroscopic iron, solar wind irradiation, and micrometeorite or heavy ion bombardment of the bodies' surfaces. Space weathering has been identified as the source of spectral differences between ordinary chondrite meteorites and their proposed parent bodies, the S-complex asteroids [e.g., 1]. The onset and length of time for space weathering effects to alter the reflectance spectrum of an object can lead to information about the object's age and processing history.

Background: In previous work, we show that the spectral effect of space weathering in the ultraviolet (UV)/blue spectral region for S-complex asteroids is consistent with the addition of iron or iron-bearing minerals [2]. This effect is reflected in spectra of minerals due to changes in the spectral reflectance properties of non-opaque minerals in the 150- to- 450-nm wavelength range [3]. Opaque materials (such as elemental iron or ilmenite) are dominated by surface scattering, controlled by Fresnel reflection, and are therefore spectrally flat over a wide range of wavelengths from the UV to the infrared (IR) [3]. Non-opaque mafic silicate minerals (e.g., pyroxenes, olivines, and feldspars) experience a decrease in brightness as they transition from reflectance dominated by volume scattering to reflectance dominated by surface scattering in the 150- to- 450-nm range [3]. Therefore, we expect planetary surfaces containing iron-bearing opaques that have experienced space weathering to be less spectrally "red" and potentially brighter in the 150- to- 450-nm range than fresher planetary surfaces with smaller amounts of iron-bearing minerals. Further, we expect to see the onset and effects of space weathering on these surfaces more rapidly in the UV/blue than in the VNIR wavelengths, as short wavelengths are more sensitive to the thin coatings on grains that could be the result of weathering processes. As this could be a key method of studying age-related processing of asteroids, we have pursued this line of research.

We found evidence to support this effect in UV/blue photometry acquired by spacecraft data, most strongly evident across a spectral range of 300 to 400 nm [2]. The limited amount of available UV observations of asteroids caused us to investigate whether we could observe this effect across a slightly relaxed spectral interval of 320 - 400 nm. We tested and confirmed this possibility with ground-based high-resolution spectra of many of the same asteroids (limited by the availability of the asteroid during observing runs) [4].

Increasing the Available Sample of S-Complex Asteroids: We want to sample a large number of S-complex asteroids for evidence of space weathering in the UV/blue spectral region. In particular, we want to study smaller, faint asteroids. The largest sample of existing small body photometry is the Sloan Digital Sky Survey (SDSS) Moving Object Catalog. The SDSS has two filters with short wavelengths, u' (3540Å) and g' (4750Å). The u' filter is within our range of interest; an algorithm has been established to convert SDSS values to the Johnson B filter value. These two wavelengths measure a longer-wavelength spectral interval.

We first determined whether the effect we have seen could be investigated using only two spectral values corresponding to the Johnson U (360 nm) and B (440 nm) filter wavelengths. Figure 1 contains the UV/blue slope determined from photometry at the wavelengths of 360 and 440 nm (to simulate the U and B filters) from asteroid reflectance spectra [4] compared to reflectance spectra of ordinary chondrite meteorite samples across the same spectral range [4]. The separation of space-weathered asteroid photometry vs laboratory spectra of fresher ordinary chondrite samples is still apparent.

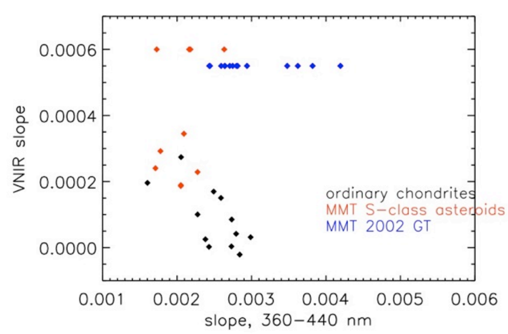

Figure 1. The simulated U and B filter UV/blue slope of S-complex asteroid spectra (including NEA 2002 GT) obtained using the MMT Observatory Blue Channel spectrograph plotted against the VNIR 550 to–1640-nm spectral slope where available. VNIR spectral information was not available for slope values at the top of the figure, including 2002 GT values; these are incuded to show the variation in UV/blue slope.

The SDSS Moving Object Catalog contains photometry for over 220,000 known asteroids. Using spectral parameters to divide S-complex from C-complex and other asteroids, we have started the process of mining these asteroids, and extending the parameters obtained to the study of the equally large unidentified SDSS MOC sample. These results will be presented.

References: [1] Nogushi T. et al. (2011) *Science, 333*, 1121 – 1125. [2] Hendrix A. R. and Vilas F. (2006) *AJ, 13*2, 1396-1404. [3] Wagner et al. (1987) *Icarus, 67*, 14-28. [4] Vilas F. and Hendrix A. R. (2013) *2013DPS* abstract #101.07.