BLUE VS RED SPECTRAL PROPERTIES OF THE C-COMPLEX ASTEROIDS: MAKING THE UV GREAT AGAIN! F. Vilas[1] and A. R. Hendrix[1], [1]Planetary Science Institute,1700 East Fort Lowell, Suite 106, Tucson, AZ 85719-2395, fvilas@psi.edu.

Introduction: In the next few years, two low-albedo - presumed primitive - near-Earth asteroids will be sampled by the Hayabusa 2 and Osiris REX robotic space probes, returning materials to Earth. We expect to learn a lot from these samples: even with the small volume of material Hayabusa retrieved from near-Earth asteroid 25143 Itokawa, our understanding of composition and space weathering of the more-processed S-complex asteroids increased significantly. Remote sensing remains our primary means of studying the asteroid population of over 700,000 objects. The preparation for these space missions should include the best Earth-based characterization we can attain of similar-type asteroids before these encounters.

Data Sets: We extend asteroid studies that we have done in the UV/blue spectral region to emphasize the C-complex asteroids. International Ultraviolet Explorer spectra of 13 C-complex asteroids (2, 10, 41, 51, 54, 88, 111, 324, 410, 511, 654, 702, 704) in the ~210- to- 320-nm wavelength range [1] are compared with spectra of 6 main-belt C-complex asteroids (41, 54, 165, 253, 326, 3507) were obtained using the MMT 6.5-m telescope coupled with the facility Blue Channel spectrograph, covering the 320- to- 640-nm wavelength range. These asteroids likely contain iron and phyllosilicates and vary in levels of aqueous alteration. The results of our studies in the UV/blue spectral region address two questions. Are there UV/blue spectral attributes that suggest compositional information? Can UV/blue data be used to discern space weathering effects on a C-complex asteroid's surface?

Spectral Differences: A noticeable difference between the C-complex asteroids and the carbonaceous chondrite meteorites is the strength of the UV absorption. The UV dropoff is quite subdued for C-complex asteroids compared to CI and CM meteorite types. The CI and CM chondrites have been naturally heated with aqueous alteration and some metamorphism expected. In addition, we consider the carbon (as graphite) that we expect to contribute as an opaque to the low albedos of the C-complex asteroids. Examining the UV/blue reflectance spectra of the C-complex asteroids, we note differences in the spectral properties at UV wavelengths for asteroids whose VNIR spectra appear the same at longer wavelengths. Figs. 1 and 2 show UV spectra for asteroids (51) Nemausa and (54) Alexandra, both classed as Cgh based on VNIR data, compared to the UV spectrum of (2) Pallas. Significant differences in the absorption exist at wavelengths lower than 400 nm. Figure 3 shows an absorption feature centered roughly at 280 nm in the UV spectrum of 511 Davida, also seen in other spectra, and potentially attributed to FeO.

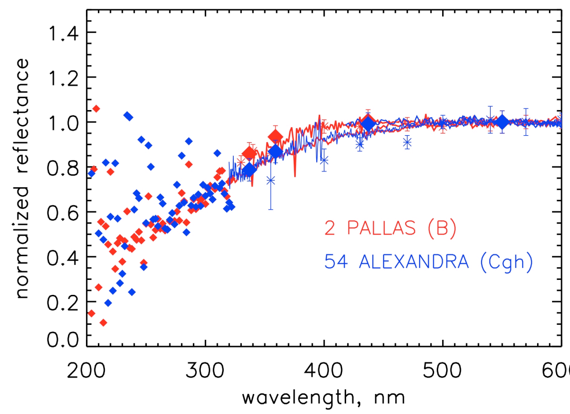

Fig. 1. UV/blue reflectance spectra for (2) Pallas and (54) Alexandra. Scaled to R = 1.0 at 550 nm.

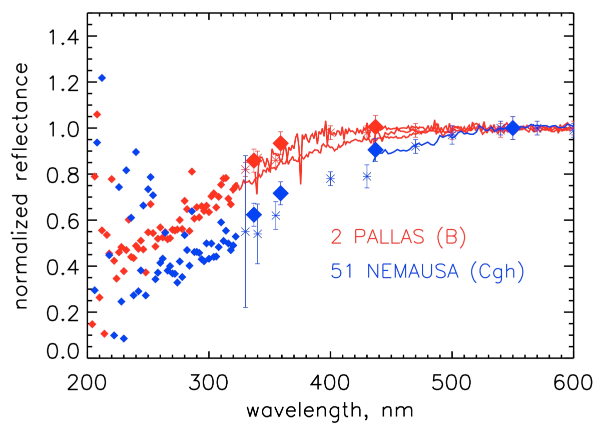

Fig. 2. UV/blue reflectance spectra for 2 Pallas and 51 Nemausa. Note the strong absorption in the spectrum of (51) compared to (54) in Fig. 1, despite the fact that their VNIR spectral characteristics are similar, as indicated in the same taxonomic classification. Scaled to R = 1.0 at 550 nm.

Space Weathering: We have shown that space weathering in the S-complex asteroids is evident in the UV/blue spectral region before it is apparent in the VNIR; this is an effect of the presence of iron in oli-

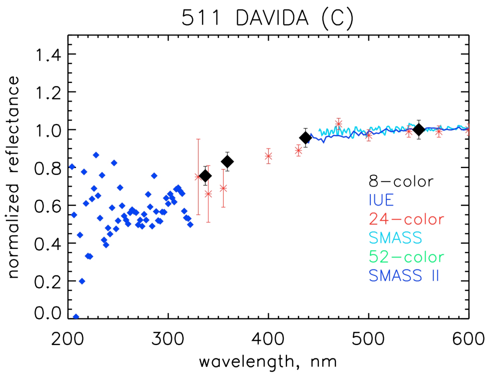

Fig. 3. UV/blue reflectance spectrum of (511) Davida showing the absorption feature at ~280 nm. Scaled to R = 1.0 at 550 nm.

vines [2, 3]. Our modeling supporting the S-complex research, based upon UV/blue observational data, suggests that the effect of adding small amounts of $npFe^0$ to particles from both a hypothetical mineral and a terrestrial basalt shows that the addition of simply 0.0001% $npFe^0$ affects the reflectance at UV/blue wavelengths, while the addition of 0.01% is required to see the visible/near-infrared reddening and diminution of absorption features associated with space weathering [3]. Can space weathering be the root of the differences between C-complex asteroid and CI/CM meteorite reflectance spectra? Most CM2 carbonaceous chondrites have chondrules containing ~ 20 volume % olivines [e.g., 4]; no spectrum of the chondrule contents of CM2 meteorites has been obtained. It is possible that the bluing and reddening effects observed in space-weathered materials are the root of spectral changes (e.g., diminished absorption), as opposed to the darkening by opaque material such as carbon or graphite. We report our most recent results.

References: [1] Roettger, E. E., and Buratti, B. J. (1994), *Icarus*, 112, 496. [2] Hendrix, A. R., and Vilas, F. (2006), *Astron. J*, 1396 – 1404. [3] Vilas, F., and Hendrix, A. R. (2015), *Astron J*, 150, 64. [4]] Howard, K. T. et al. (2015), *GCA*, 149, 206 – 222.

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