

ESTIMATING THE DEGREE OF SPACE WEATHERING ON KORONIS FAMILY ASTEROIDS: PRELIMINARY RESULTS OF ECAS OBSERVATIONS. A. Domokos¹ and P. Wiegert¹, ¹Dept. of Physics and Astronomy, The University of Western Ontario, London ON, N6A 3K7, Canada (adomokos@uwo.ca).

Introduction: At present, there is no reliable means of estimating the degree of space weathering that has taken place on airless bodies such as asteroids. Hiroi et al. [1] recently proposed a new method to do this using an ECAS-type filter system. From May – September 2007, a series of ground-based photometric observations of Koronis family asteroids were carried out in four ECAS colors to test the proposed method. We will present the preliminary results of our observations and attempt to extrapolate those results to a broader population.

Background: It can be difficult to characterize the amount of weathering on the asteroids via “standard” methods (e.g. color plots using band ratios) due to the effects of grain size and viewing geometry on their reflectance spectra. As an alternative, Hiroi et al. [1] suggest that ECAS filters may be used to measure negative inflections in the spectrum at 420 nm and 550 nm, which are associated with space weathering. As the degree of weathering at the surface of a body progresses, those inflections will tend towards zero and the spectrum will become smoother. The inflection parameters, C_b and C_v , are determined using the equations:

$$C_v = \frac{(1 - R_v / R_w)}{\lambda_w - \lambda_v} - \frac{(R_v / R_w - R_b / R_w)}{\lambda_v - \lambda_b} \quad (1)$$

$$C_b = \frac{(1 - R_b / R_v)}{\lambda_v - \lambda_b} - \frac{(R_b / R_v - R_u / R_v)}{\lambda_b - \lambda_u} \quad (2)$$

where R_x and λ_x correspond to the reflectance and center wavelength, respectively, of filter band x . Through laser-irradiation experiments, Hiroi et al. [1] found that C_b and C_v are not significantly affected by variations in grain size or phase angle up to 60°.

Data Collection: The Koronis family is located at $a_p = 2.83$ - 2.95 AU, with $e_p = 0.03$ - 0.10 and $\sin i_p = 0.0345$ - 0.0400 . Observations were carried out between May and Sept. 2007 using the Elginfield 1.2m telescope at UWO and the 1.8m Plaskett Telescope at the Dominion Astrophysical Observatory. Of the 27 Koronis members observed, both C_b and C_v can be computed for 16 asteroids. C_b can be determined for 23 and C_v can be determined for 21.

Our targets have absolute magnitudes $H = 8.96$ to $H = 13.4$. Since H is a function of diameter, a range in H corresponds to a range in the collisional cross-section available for weathering. Smaller asteroids are statistically younger than larger bodies, so a range in sizes should also correspond to a range in relative

ages, which are generally known for Koronis members.

Data Analysis: Photometry is still in progress for our Koronis dataset. Thus far, the colors obtained with our instruments are in good agreement with expected standard values and the standard fields measured with our filters transform well to those reported by Tedesco et al. [2].

Once the inflection parameters have been determined for our targets, we will look for a relationship between the parameters and the targets’ absolute magnitudes and orbital elements. We would expect to see an increase, on average, in C_b and C_v with increasing H . We may be unlikely, however, to see much variation of C_b and C_v with the orbital elements, as our targets are not very broadly spread in proper a , e , i space. The preliminary results of this analysis will be presented.

In addition to our observations, Zellner et al. [3] obtained ECAS colors for 589 asteroids, of which 13 are Koronis members. We have observed four of the same Koronis members looked at by Zellner et al., as well as several other bright non-Koronis asteroids. We hope to calculate C_b and C_v for the Zellner et al. [3] dataset as a means of applying our results for the Koronis family to a much broader population.

Conclusion: Through our study, we hope to determine whether ECAS is indeed a useful means of estimating the degree of space weathering on bodies in space and if so, whether our results for the Koronis family can be extrapolated to a broader population. In addition, since the relative ages of the family members are known, an indicator of the amount of weathering that has taken place within Koronis may also provide a means to better constrain the time scale of weathering processes.

References: [1] Hiroi, T. (2006) *LPS XXXVII*, Abstract #1396. [2] Tedesco, E. F. et al (1982) *Astron. J.*, 87(11), 1585-1592. [3] Zellner, B. et al. (1985) *Icarus*, 61, 335-416.

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