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Scientific Motivation and Requirements for Future Space Astronomy and Solar System Science Missions (2)

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SURVEYING THE 217.5 NM EXTINCTION FEATURE WITH A SMALL SATELLITE

Abstract

The 217.5 nm extinction feature in the ultraviolet (UV) was identified by Stecher (1965). A broader investigation was conducted with IUE in 1979, however this feature was never explored systematically. The WSO/UV telescope planned to launch in 2019 is promising, but UV extinction is not included in its primary mission. We propose here a small and relatively inexpensive mission that will enable a deeper study and provide physical insights into the nature of the 217.5 nm extinction. Results obtained until now show that the central wavelength of the feature is stable at 217.441.7 nm (Fitzpatrick Massa 1988) and its profile can be described as a Drude profile of A/A_v vs. $1/\lambda$ for different R_v 's (Cardelli, Clayton Mathis 1989) Establishing the existence of the feature, as well as studying its strength and distribution, can be done using two bore-sighted UV cameras, one with a narrow-band filter and one with a broad-band filter, both centered around 217.5 nm. The ratio of the fluxes collected by the two cameras will provide a definitive measurement of the absorption strength. Assuming one year of space operation, we will be able to investigate tens of thousands of stars, starting from a complete Gould Belt survey, which will include hundreds of O and B stars. A periodic calibration of the instrument will be conducted using UV standard stars (e.g., Holberg Bergeron 2006) This mission can be performed for a reasonable cost with a small satellite equipped with two UV cameras. The narrow band filter camera shall have a 10 cm wide aperture, while the wider band filter camera shall have a 4 cm aperture. To minimize power consumption as well as for simplicity of design, we propose to use CMOS detectors on both cameras. We will present details of the proposed experiment as well as a preliminary layout of the satellite.

References Fitzpatrick, E.-L. Massa, D. 1985, ApJ 307, 286 Holberg, J.B. Bergeron, P. 2006, AJ 132, 1221 Stecher, T.P. 1965, ApJ 142, 1683 J.A. Cardelli G. C. Clayton J.S. Mathis 1989 ApJ 345,245