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Spectropolarimetry of the Deep Impact Target 9P/Tempel 1 Dust Coma

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Spectral variations in polarization of scattered light are governed by the properties of the scatterers. This makes spectropolarimetry a powerful tool in remote sensing of cometary dust. The wavelength dependence of the polarization is mainly controlled by the composition (through the complex refractive index of the material), the scattering geometry (phase angle), and the size distribution of the dust. We used the new IfA-designed high-resolution spectropolarimeter (R∼12000 to 49000, from 540nm to 990nm) mounted on the AEOS 3.7m telescope on Haleakala, Maui to characterize the size and composition of dust grains ejected from the comets. We will present the polarization measurements of comet 9P/Tempel 1 both pre- and post-impact which show a dramatic change in wavelength dependence. The gradient of the degree of polarization was "flat" (4% at 650nm falling to 3% at 950nm) just at impact (6-7UT integration) whereas an hour after impact (7-8UT integration) the gradient changed to "blue" (7% at 650nm falling to 2% at 950nm). This may indicate a high content of low complex refractive index material (e.g. silicate and ices) in the dust released at impact, consistent with other observations (e.g. thermal, spectroscopic). Support for this work was partially provided through the NSF and also through University of Maryland and University of Hawaii subcontract Z667702, which was awarded under prime contract NASW-0004 from NASA.