FAR-ULTRAVIOLET PHOTOMETRIC MODELING OF THE ICY SATELLITES OF SATURN. E. M. Royer1 and A. R. Hendrix2, 1LASP, University of Colorado, Boulder, CO (Emilie.royer@lasp.colorado.edu), 2Planetary Science Institute (PSI), Tucson, AZ

Introduction: We present here an analysis of ultraviolet disk-integrated phase curves of the five inner moons of Saturn: Mimas, Enceladus, Tethys, Dione and Rhea. Orbiting inside the E-ring, these icy moons experience weathering processes such as E-ring grain bombardment and cold plasma ions, neutrals and energetic particles impact on their surfaces.

The Cassini UltraViolet Imaging Spectrograph (UVIS) instrument, operating at FUV wavelengths, from 118 to 190nm, probes the uppermost layers of the regolith and is uniquely suited to studying these exogenic processes, leading to a better understanding of the surfaces' evolution and the saturnian environment [1]. We display here (Fig. 1) phase curves at 180 nm for the leading and trailing hemispheres as well as for the Saturn and anti-Saturn hemispheres of each satellites.

Methods: Our data set covers a wide range of phase angles, from 6.8 to 163.9 degrees for Tethys for example. Our analysis is completed by using a Hapke model [2] to retrieve the photometric parameters of these surfaces, such as the single scattering parameters, the opposition effect parameters (where possible) and information on the roughness. The model is based on the presence of a shadow-hiding opposition effect (SHOE) and does not include coherent backscattering. The single scattering function is modelized by a double Henyey-Greenstein function.

Results: Photometric properties of the surfaces of icy satellites are affected by exogenic processes, and this can be particularly important in the ultraviolet regime. The icy moons of Saturn analyzed here are all located in the E ring and their leading hemisphere (except for Mimas) is predominantly affected by E-ring grain bombardment, which is expected to decrease with the distance from Enceladus, as the E-ring density diminishes [3]. We found Tethys to have a brighter leading hemisphere than Dione in the FUV, consistent with this hypothesis. Comparisons of photometric properties of these surfaces will bring key answers about the dynamics of the E-ring grains and their weathering effects on the icy surfaces [4,5,6].


Figure 1: Hapke best fit of the leading and trailing hemispheres at 180 nm of Mimas, Tethys and Dione.