MAPPING OF THE 185NM ABSORPTION FEATURE ON THE ICY SATELLITES OF SATURN. E. M.
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Introduction: The icy satellites of Saturn are
mostly composed of water ice, with the addition of a
contaminant, not clearly identified to date. In the Far-
Ultraviolet (FUV) domain, the spectra of the inner icy
moons of Saturn are all very dark, with I/F values
nearby zero for wavelength short-ward 160 nm; around
165 nm, they all exhibit a characteristic water ice ab-
sorption band. According to the FUV optical constant
measurements of Warren and Brandt (2008), water ice
present a flat profile longward 165 nm, as seen on Fig-
ure 1. The grain size and roughness of the surface act
on the position of the absorption band and its intensity
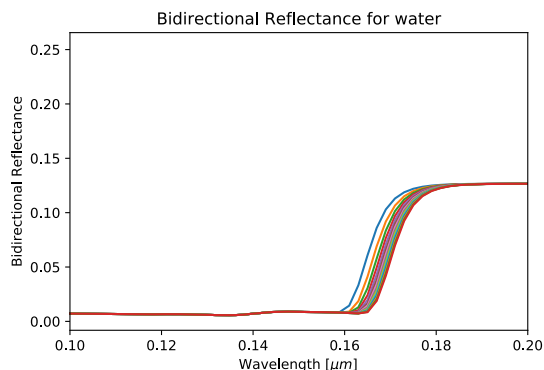respectively.

Figure 1 – Water ice absorption edge from a Hapke
model.

Nevertheless, data acquired during the 13+ years of
the Cassini mission show that on some instances the
spectra of icy satellites such as Mimas, Enceladus,
Dione, Tethys or Rhea exhibit an absorption feature
located around 185 nm, as shown on Figure 2. This
transient absorption feature has been observed on most
icy satellites spectra through the mission, on disk-
integrated and disk-resolved observations. Its width in
wavelength and its I/F value exhibits some variations,
suggesting a complex absorber(s). Here, we are pre-
senting a comprehensive picture of the location of this
absorption feature on the inner moons of Saturn.

To date, no known contaminant (NH3, H2O2,
tholins, etc..) is able to reproduce this feature and more
UV laboratory measurements on a variety of molecules
are needed, at icy satellite temperature. Potential in-
strument artefacts or spacecraft exhaust source were
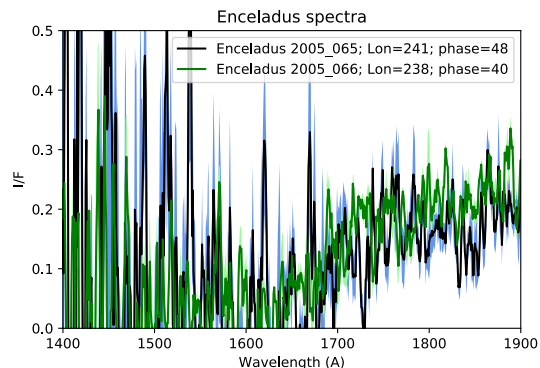also ruled out as the cause the absorption feature.

Figure 2 – Enceladus spectra showing the 185 nm ab-
sorption feature on day 2005_065.

Using a k-nn (nearest-neighbors) pattern recogni-
tion technique, we first fitted and smoothed Cassini-
UVIS observed spectra, the k-nn method allowing for
the preservation of the spectral features. Then, we
modeled this smoothed spectra using the Hapke theory
with water ice only. We assumed a roughness of 20
deg and only the shadow hiding opposition effect. In-
put parameters for the Hapke model (single scattering
albedo, asymmetry parameter, opposition effect pa-
rameters) were based on the results obtained by the
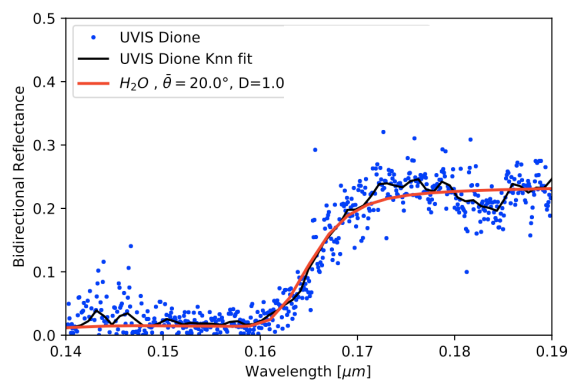photometric model of Royer and Hendrix (2014) [1].

Figure 3 – Hapke and k-nn best fit of a Dione spec-
trum.

Using disk-integrated observations, we are present-
ing a low resolution contour map of the potential ab-
sorber(s) at 185 nm. Mapping the location of this ab-
sorption feature is complementary to a composition
model and can lead us toward understanding the cause
of such absorption. Similar distribution across satellites

or correlated distributions with the lense shapes observed on Tethys and Dione would imply an exogenic source.

References:
[1] Royer and Hendrix (2014) *Icarus, 242*