

**INFRARED SPECTRAL SIGNATURES FOR IO'S DARK AND GREEN SPOTS.** J. C.

Granahan<sup>1</sup>, F. P. Fanale<sup>2</sup>, R. W. Carlson<sup>3</sup>, W. D. Smythe<sup>3</sup>, and the Galileo NIMS Team and Galileo SSI Team,  
<sup>1</sup>BAE SYSTEMS, MZ 6300B, 16250 Technology Dr., San Diego, CA 92127 (james.granahan@baesystems.com),  
<sup>2</sup>University of Hawaii, <sup>3</sup>JPL.

**Introduction:** Geissler et al., 1999 [1] identified dark and “green” patches that are spectrally distinct at Galileo SSI (Solid State Imager) wavelengths (0.4-1.0  $\mu$ ). The purpose of this study is to investigate the infrared spectra of these features, as collected by the NIMS instrument (Near Infrared Mapping Spectrometer), at 0.7-5.2  $\mu$  to see if other diagnostic spectral features are present.

**Green Spots:** Let us first review the Geissler et al., 1999 [1] finds. The “golf greens” as observed by the Galileo SSI instrument have a visible spectrum that turn down near one micrometer in wavelength. Figure 1 shows the plot of these spectra. These spectra were collected in the region near Prometheus, Culann, and Chaac. The Galileo NIMS instrument also acquired data in this region. This data was acquired during the I27 orbit for the REGION01 observation. It has a spatial resolution of 11.7 kilometers per pixel.

Figure 2 is a spectral plot of green material near Chaac. In order to better understand this plot let us remember the Io spectra collected by NIMS during the nominal Galileo mission with the full 408 channel spectral resolution. There are spectral features around 4 micrometers and between 2.6 and 2.9 micrometers. These absorption features are due to sulfur dioxide (Carlson et al., 1997 [2]). There is also another absorption center around 1.2 micrometers that could be due to a silicate absorption. All of this features are present in the “Green” spectrum from Chaac.

**Dark Spots:** Let us now examine the dark spectral units as identified by Geissler et al., 1999 [1] and illustrated in figure 3. These

are regions which have absorptions around 0.9 micrometers and have been found near the volcanic constructs of Prometheus and Amirani.

Figure 4 shows that the I27REGION01 spectral response of the Prometheus region “dark” area is dominated by thermal emission. The 4.01 micron NIMS image of the same region shows the Prometheus dark area is glowing.

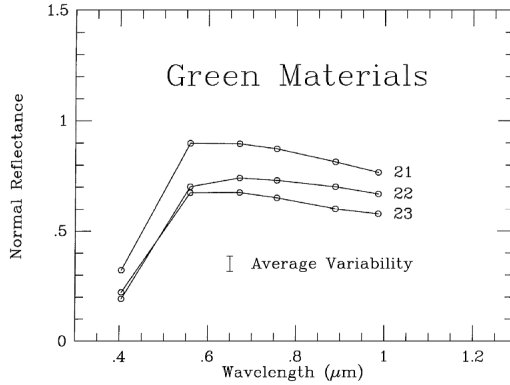
Let us now examine the Amirani Volcano. The NIMS AMRANI01 observation collected data of this region at a resolution of 5.7 km/pixel. The Amirani “Dark” spectrum (figure 5) does not preclude the presence of an orthopyroxene as the data point near 2.0  $\mu$  was not collected. There is a dip in the general vicinity of where a 2.0  $\mu$  feature would be if it were present. This spectrum also has a thermal component. The thermal component is more easily seen in the spectral sample (figure 6) that is closer to the active portion of the volcano than of figure 5.

**Conclusions:** (1) For the NIMS “green” spectrum collected, it appears that it does not correspond to any indicative infrared features that differ it from the surrounding regions. (2) For the both of the “dark” spectral units measured, they appeared to be dominated by thermally active volcanoes. (3) Infrared reflectance of the “dark” spectral units do not rule out the presence of orthopyroxene or other magnesium rich silicates.

**References:** [1] Geissler et al. (1999) *Icarus* **140**, 265-282. [2] Carlson et al. (1997) *Geophys. Res. Lett.* **24**, 2479-2482.

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Figure 1: SSI "Green" Spectra



Plot from Geissler et al., 1999 [1]

Figure 2: A NIMS "Green" Spectrum

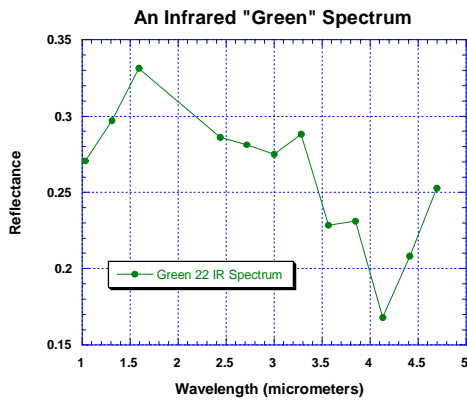
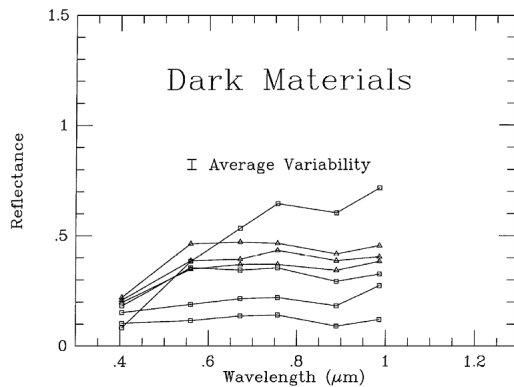


Figure 3: SSI "Dark" Spectra



Plot from Geissler et al., 1999 [1]

Figure 4.

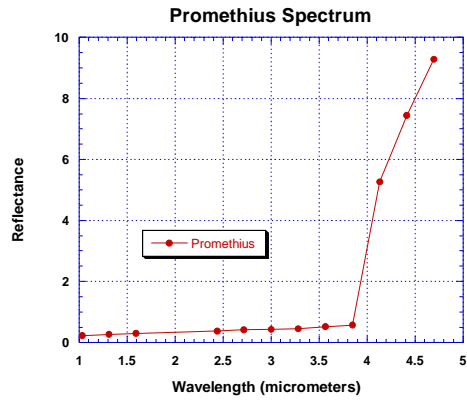


Figure 5.

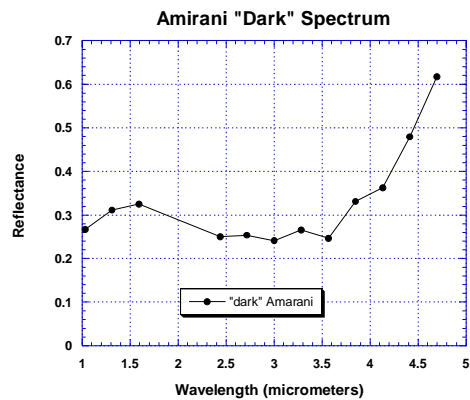


Figure 6.

