Io's Thermal Regions and non-SO_2 spectral features. W. D. Smythe[1], L. A. Soderblom[2] and R M. C.Lopes[1],[1]Jet Propulsion Laboratory, M/S 183-601, 4800 Oak Grove Drive, Pasadena, CA 91109-8099, wsmythe@lively.jpl.nasa.gov, [2]USGS Flagstaff, 2255 N. Gemini Drive, Flagstaff, AZ 86001-1695, lsoderblom@USGS.GOV).

Introduction: Several absorptions have been identified in the Galileo NIMS spectra of Io that are not related to SO_2. [1,2]. These absorptions have band centers at 2.97, 3.15, 3.85, and 3.91 microns. There are also broad absorptions in the regions 1-1.3 and 3-3.4 microns. "Patterning" noise in wavelength registration, arising from the pushbroom imaging and grating motion of the NIMS instrument have previously inhibited reliable mapping of weak absorptions. Recent improvements in techniques to remove the coherent pattern noise from the NIMS dataset have been made by Soderblom. This greatly improves the signal to noise ratio and enables mapping of weak spectral signatures such as the 3.15 micron absorption on Io.

The 3.15μ feature: The 3.15μ feature is a very weak band having an apparent band depth of less than 4% of the continuum – in contrast to many of the SO_2 features, which have apparent band depths ranging from 15-70%. The 3.15μ feature is reasonably ubiquitous on the surface of Io so it was seen in global average spectra obtained early in the Galileo mission [2]. The feature has not been identified but has been attributed variously to H_2S, H_2O, or OH stretch [2,3]. A map of this feature shows a variety of correlations. The feature is strongly present at lower latitudes, which suggests that it may be associated with a material less volatile than SO_2. However the absorption does appear above 30 degrees (north and south), suggesting its presence in not strictly a thermal issue. It is interesting that the absorption moves north of the equator above Pele apparently avoiding Pele's large plume deposit, is not present at Culann, yet covers Prometheus com-

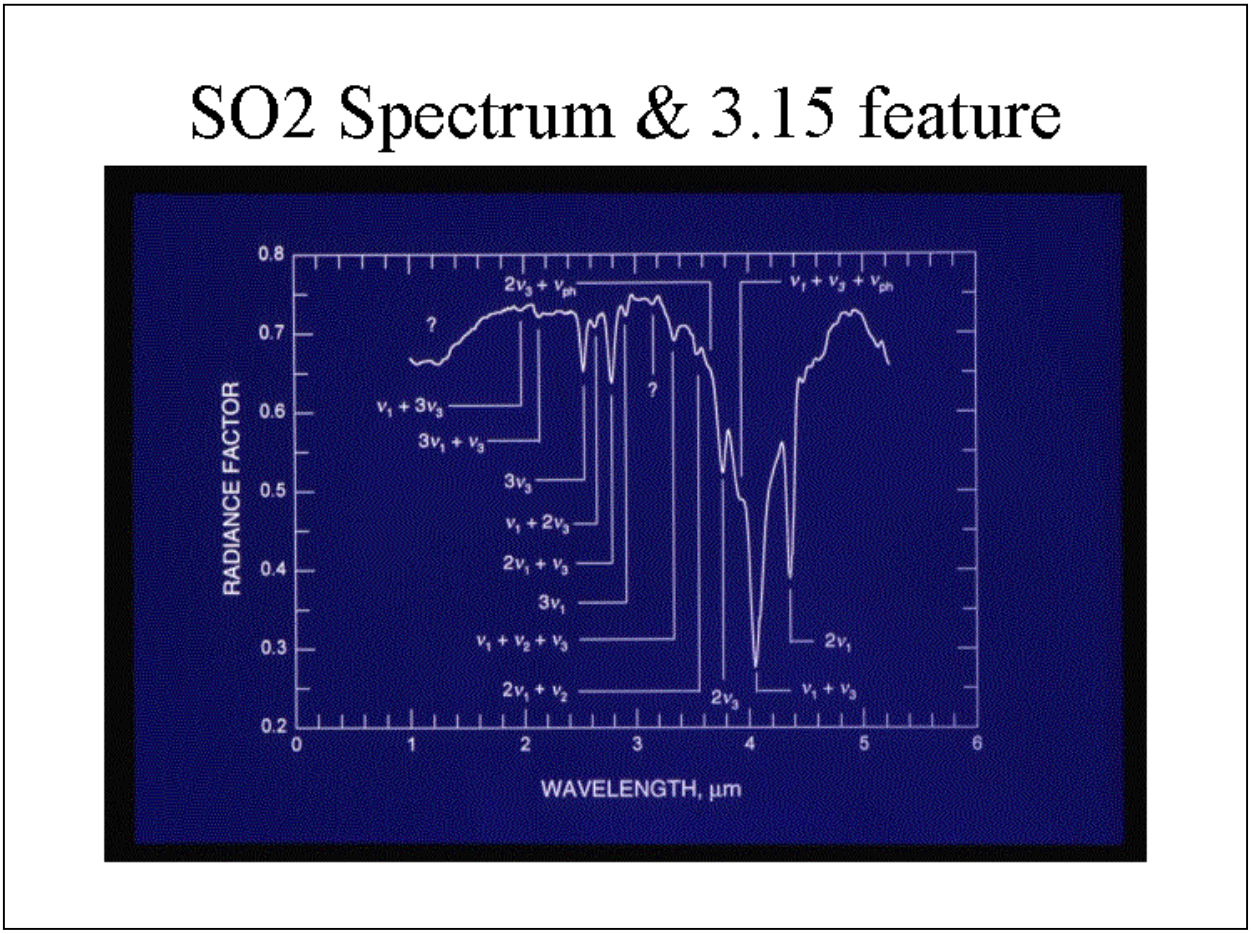

Figure 1. The 3.15 micron absorption (at the question mark) is much weaker than neighboring SO2 absorptions [2]

pletely. The distribution at Prometheus suggests that the material leading to the 3.15μ absorption may be associated with the Prometheus SO_2 reservoir – but it is difficult to reconcile that with the behavior of the absorption about Pele and Culann. There is a reasonably good correlation with visibly white material, but the absorption is also present where the white material is absent.

Conclusion: The 3.15 micron absorption appears to be associated with the equatorial region and with white surface features, though there are exceptions in both cases. The absorption, which is not present at Pele or Culann and appears to cover Prometheus, is probably not a direct result of plume activity.

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References: [1] Shirley J. H. (2001) *BAAS* **33**, #3, p1063 [2], Carlson R W *et al* (1997) *GRL* **24**, p2479-2482, [3]Salama, F. *et al.*, (1990) *Icarus* **83** p66-82

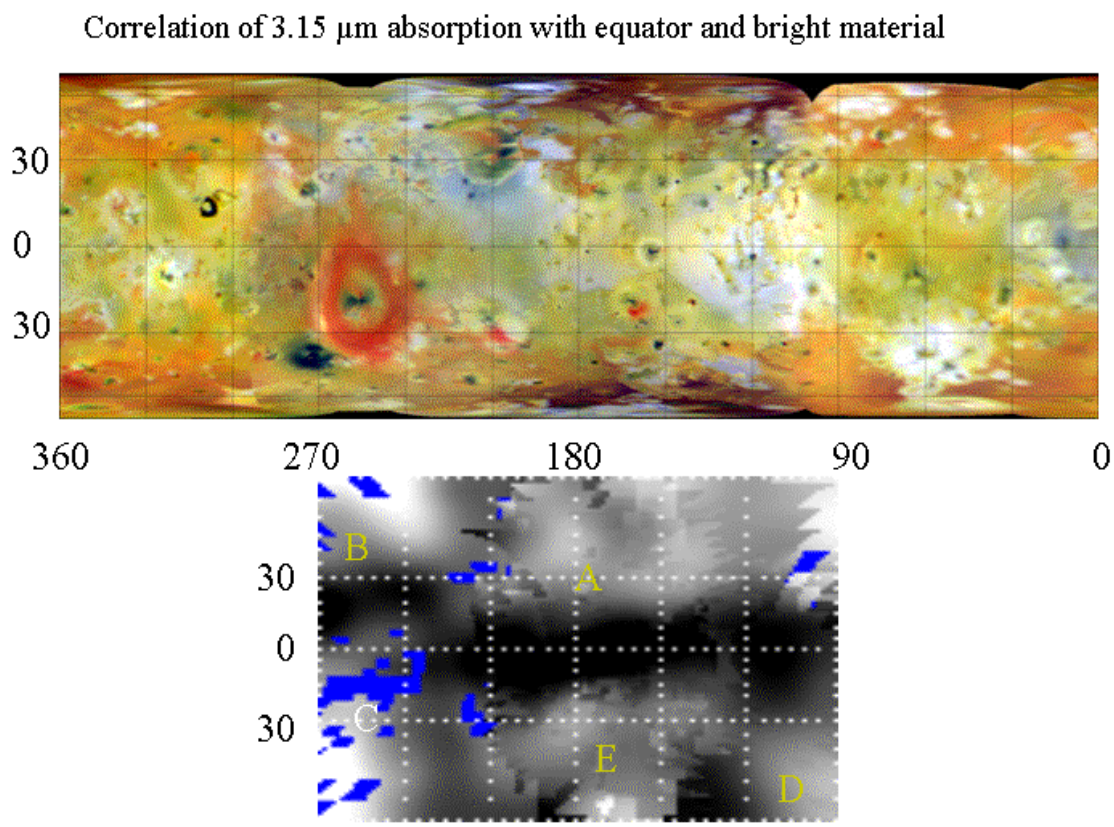

Figure 2. Correlation of 3.15μ absorption. The (lower) map 3.15μ is compared to a Galileo SSI cylindrical map of Io. **A**) The 3.15μ absorption appears to be associated with the equator, suggesting thermal control (less volatile than SO2) or that material is visible through large SO2 crystals. Note that the absorption completely covers Prometheus (about 155 W.) but avoids Pele (about 250 W). **B**) The 3.15μ absorption follows bright material to 30 N. **C**) The 3.15μ feature is weaker at equator near Pele). **D**) The absorption appears below 30 S. **E**) The absorption spans Prometheus (~5S) but not Culann (~20S).