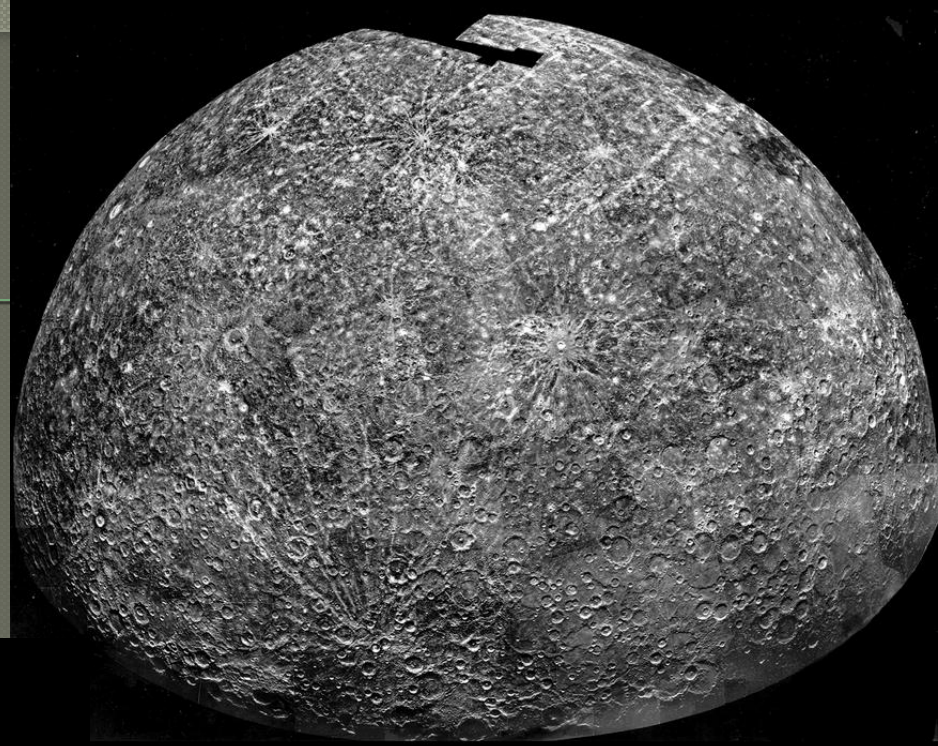


Constraining The Mineralogy of Mercury Using Gamma Ray and Infrared Spectroscopy

Maggie McAdam
Terps Conference
December 5, 2012

Mercury – A brief summary

- ◉ Small and difficult to observe with Space telescopes
- ◉ Difficult to get to with spacecraft
- ◉ Highly interesting scientifically
 - Highest uncompressed density in Solar System
 - Heterogeneous surface materials
 - Evidence for volcanic activity on surface
 - Thermal extremes on surface
 - Massive core and magneto sphere



Observations of Mercury

◉ Infrared Spectroscopy

- Mineralogy of surface
- Grain size
- Thermal effects (longer wavelengths)
- Maturation of surface

◉ Gamma ray spectroscopy

- Tells us what specific elements populate a surface
- Probes top ~10 cm of surface

Gamma Ray Spectroscopy

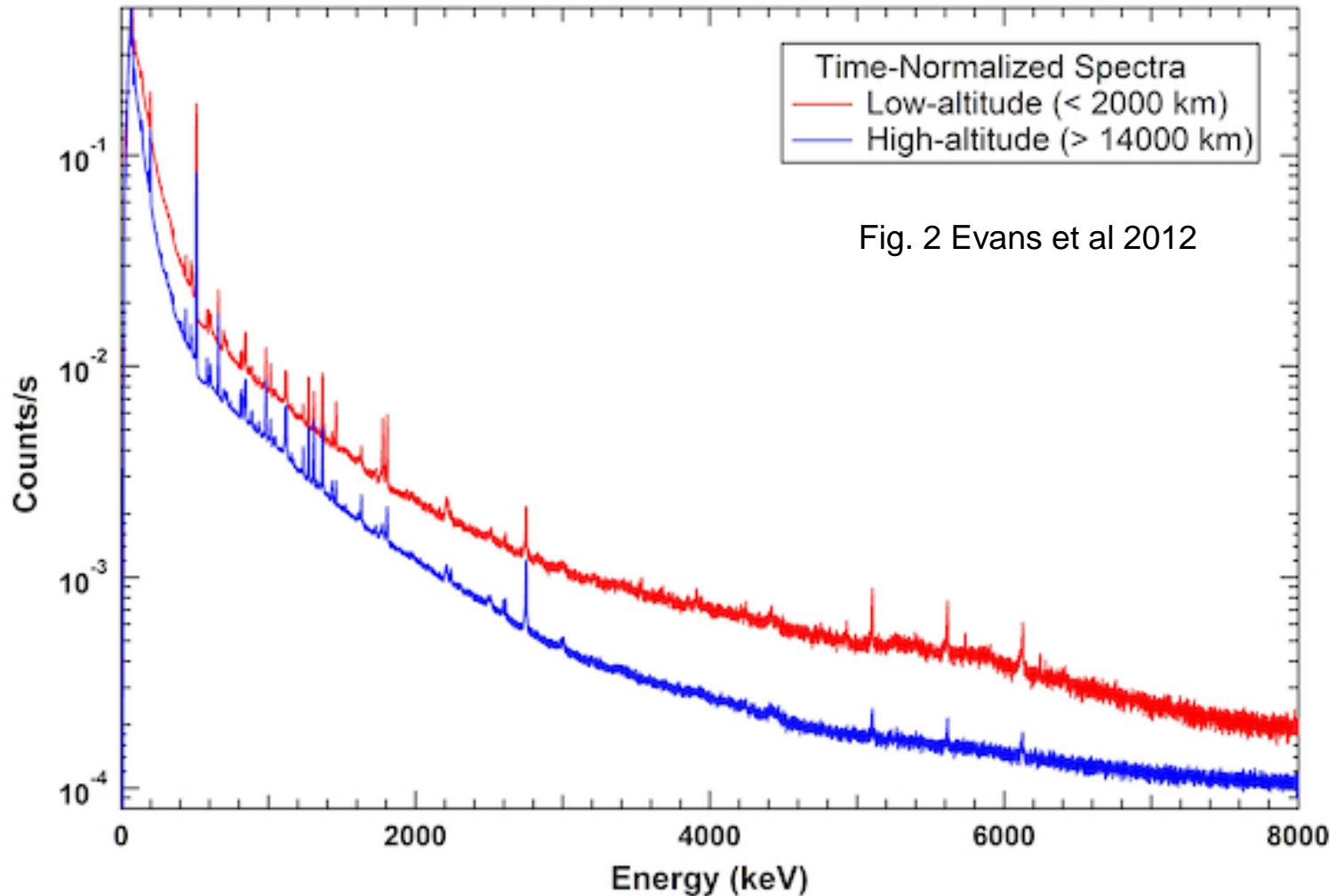
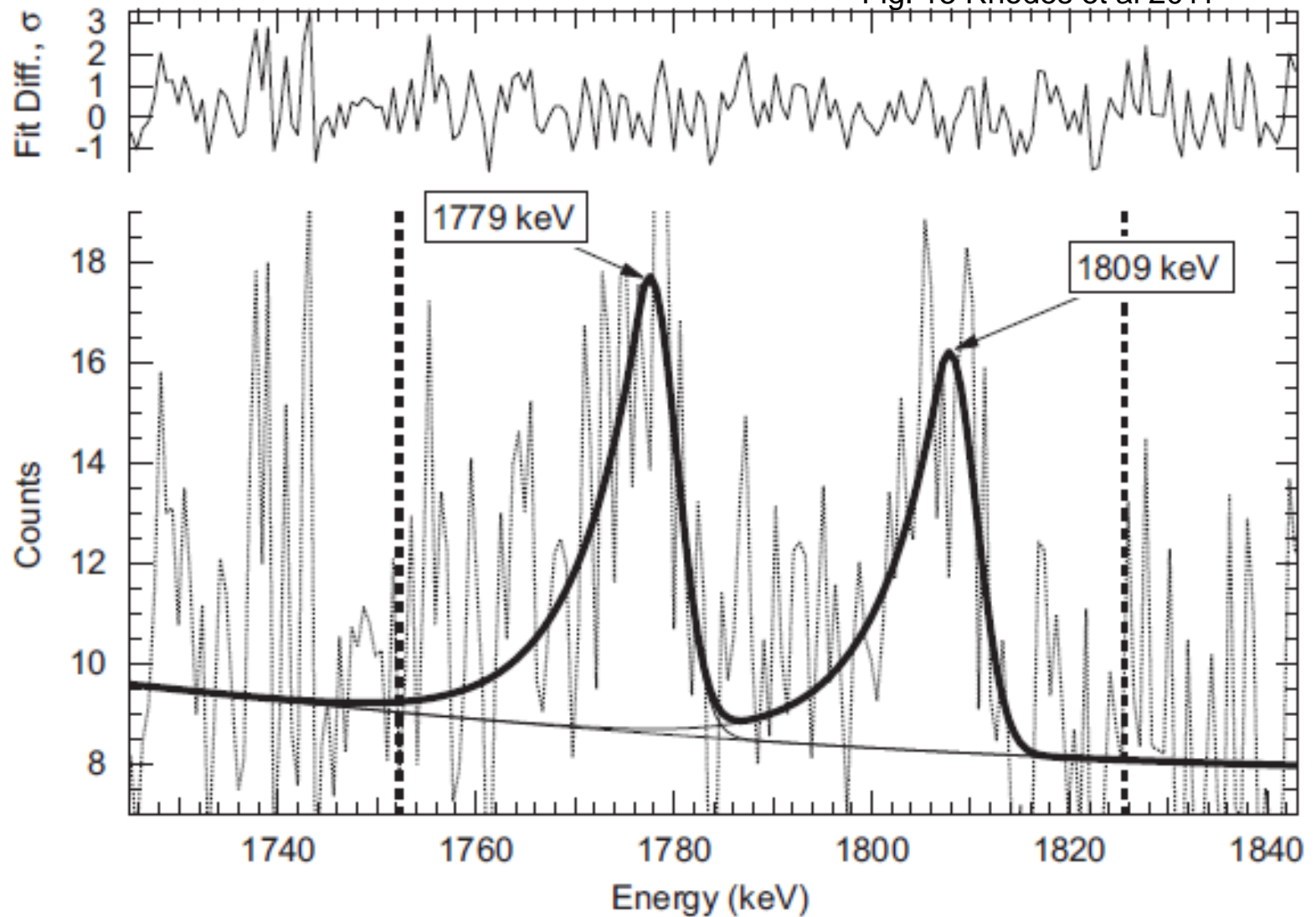


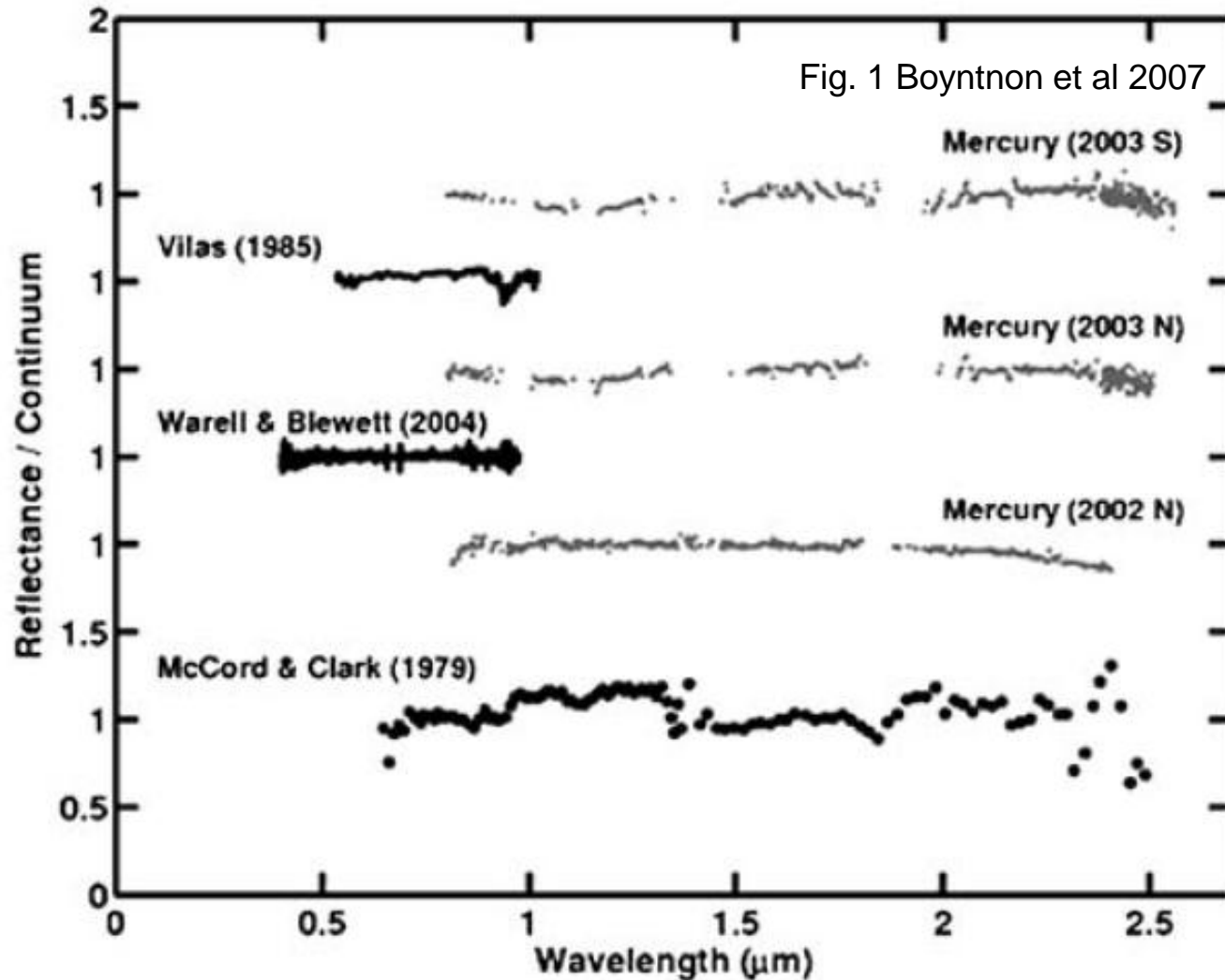
Fig. 2 Evans et al 2012

Si and Mg from Flybys

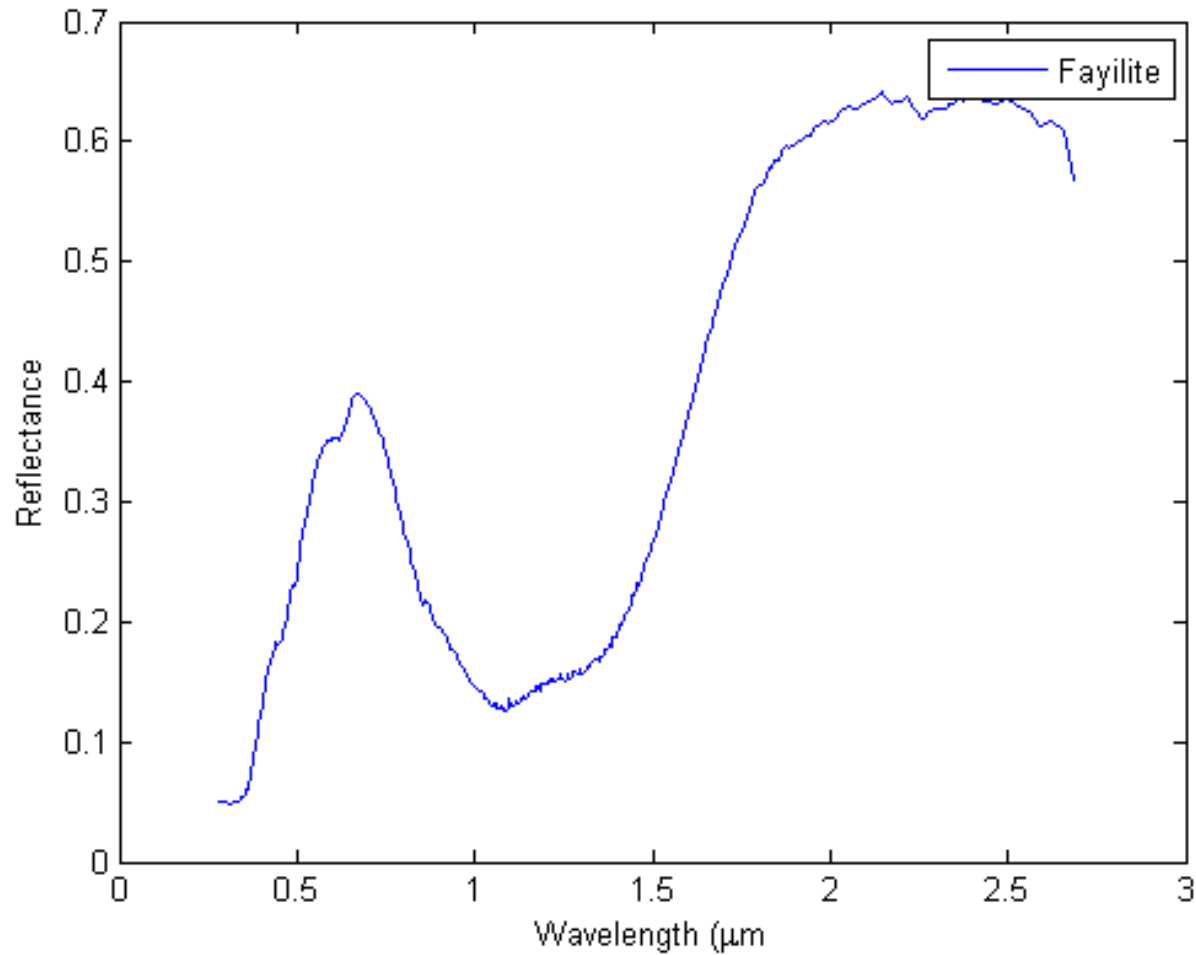
Fig. 15 Rhodes et al 2011



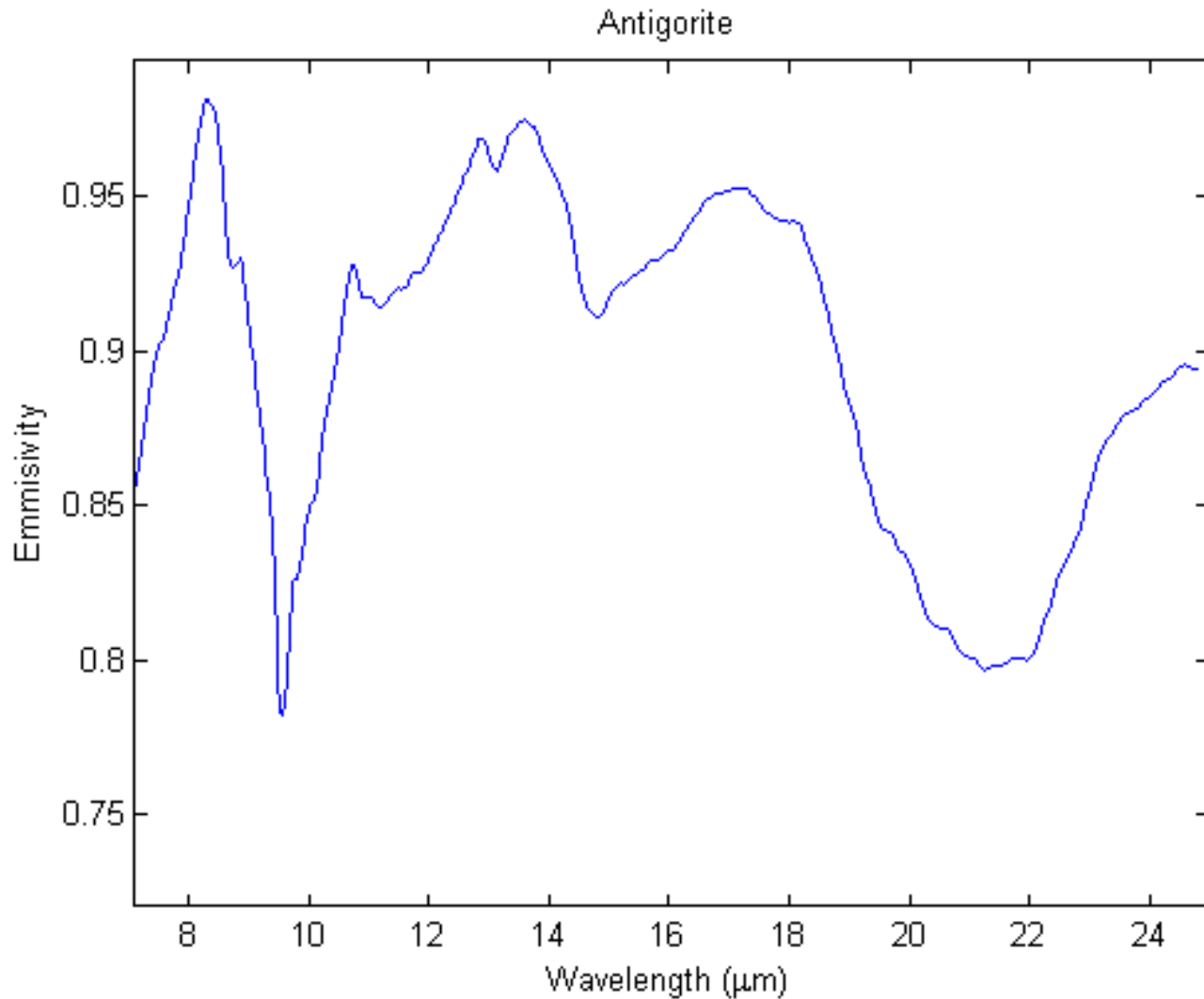
Reflectance Spectra of Mercury



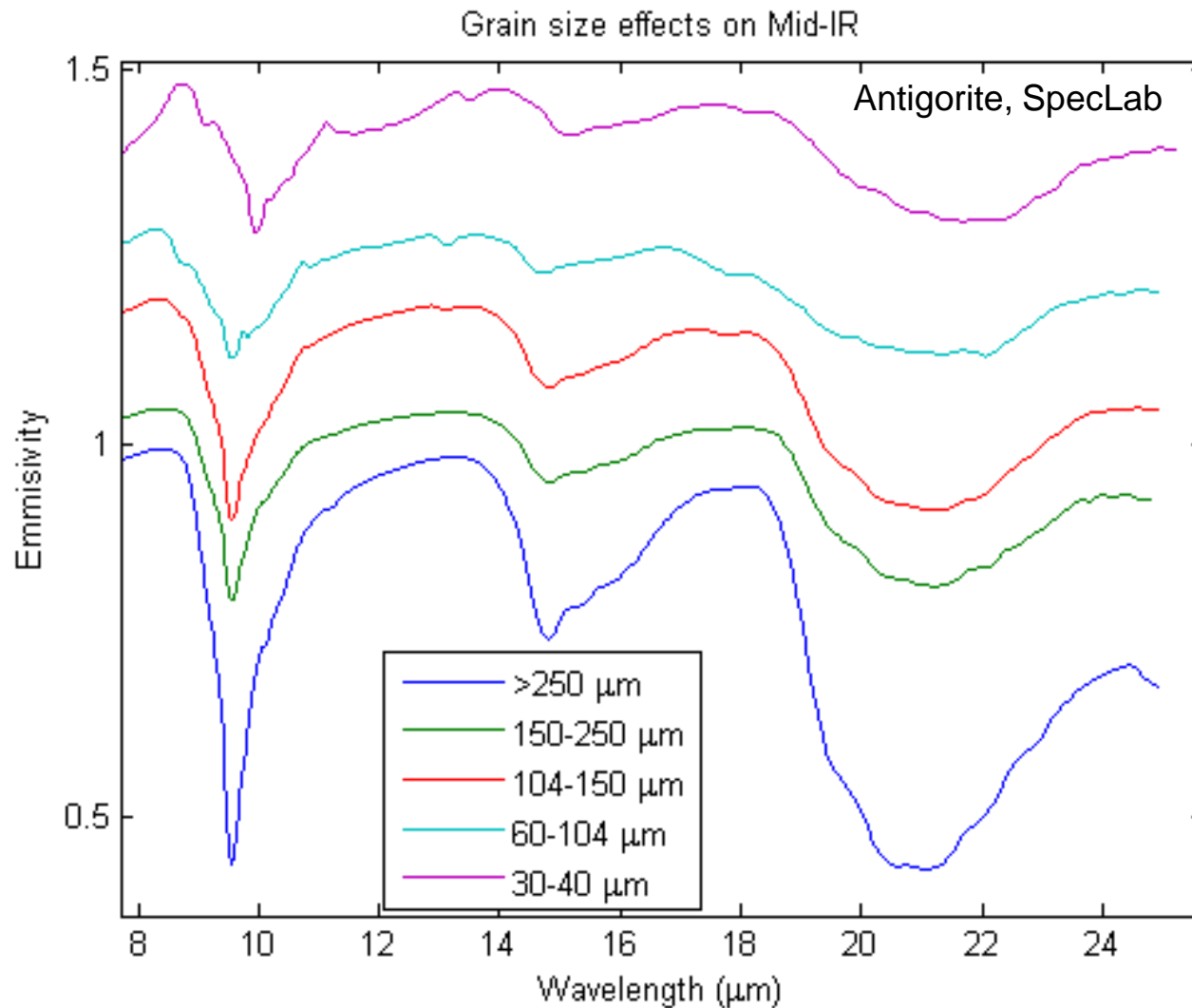
Fayilitic Olivine



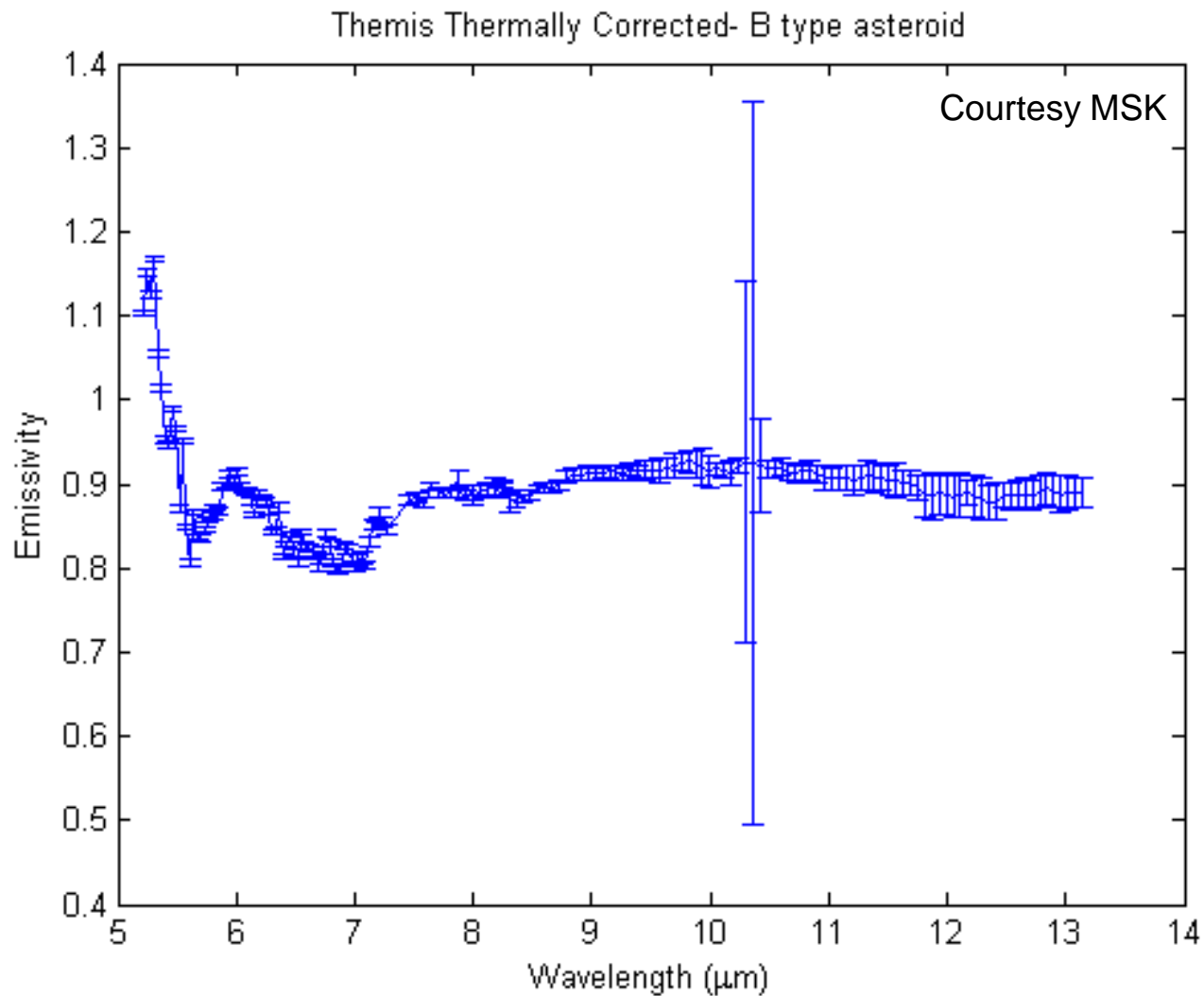
Infrared Spectroscopy



Mid-Infrared Observations

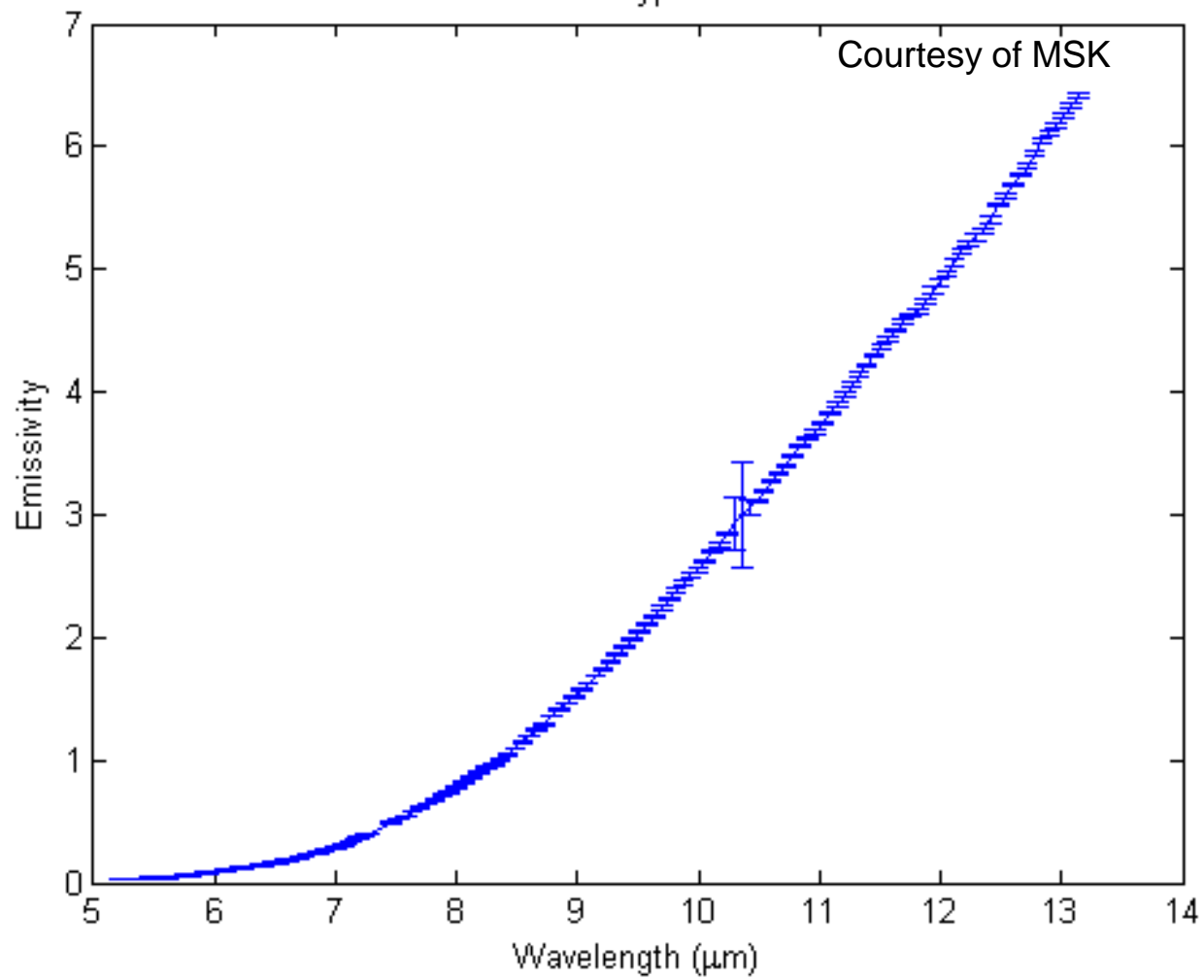


Thermal Effects

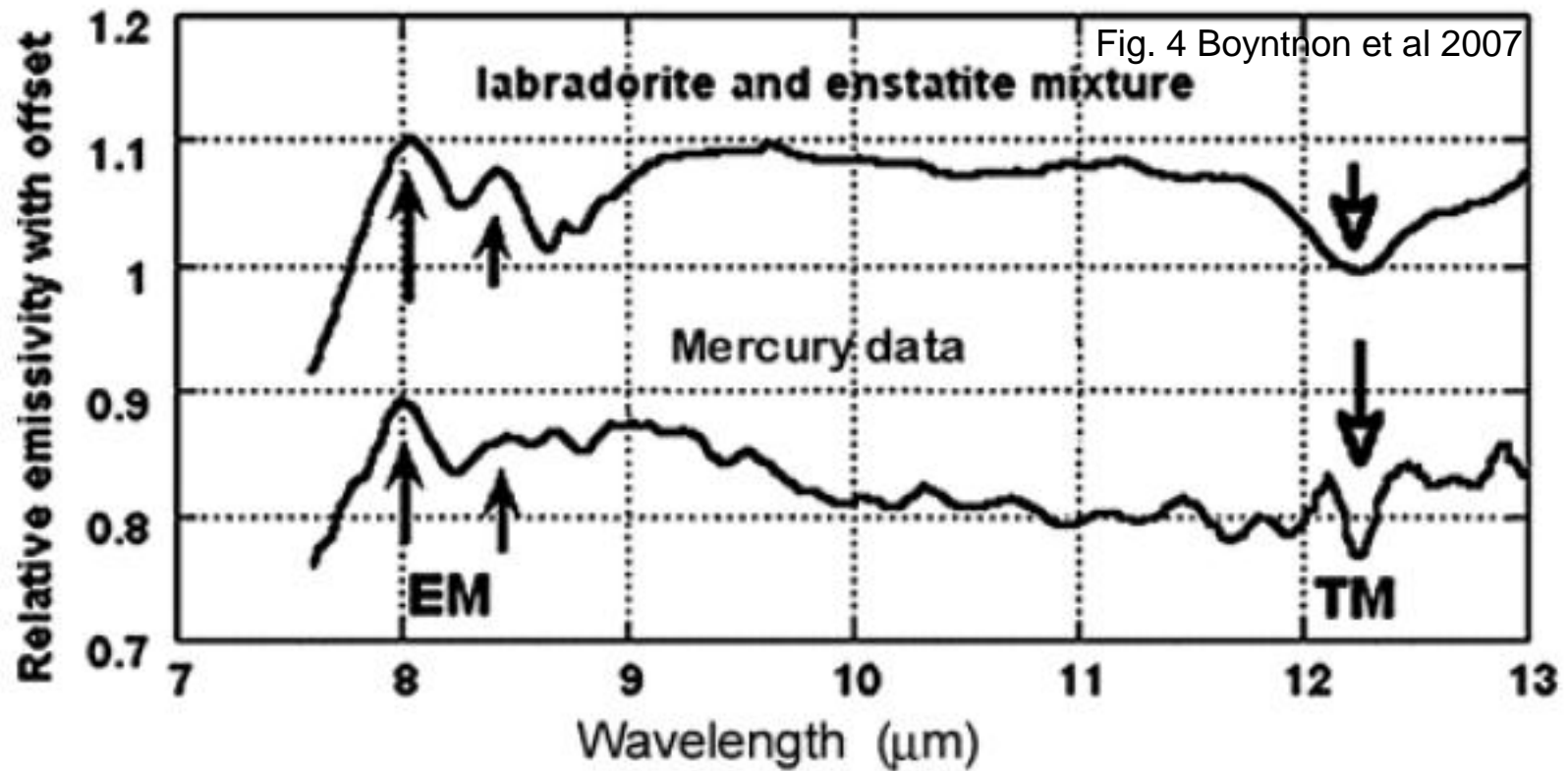


Themis - B type asteroid

Courtesy of MSK



Spectral Modeling



Current GRS Conclusions

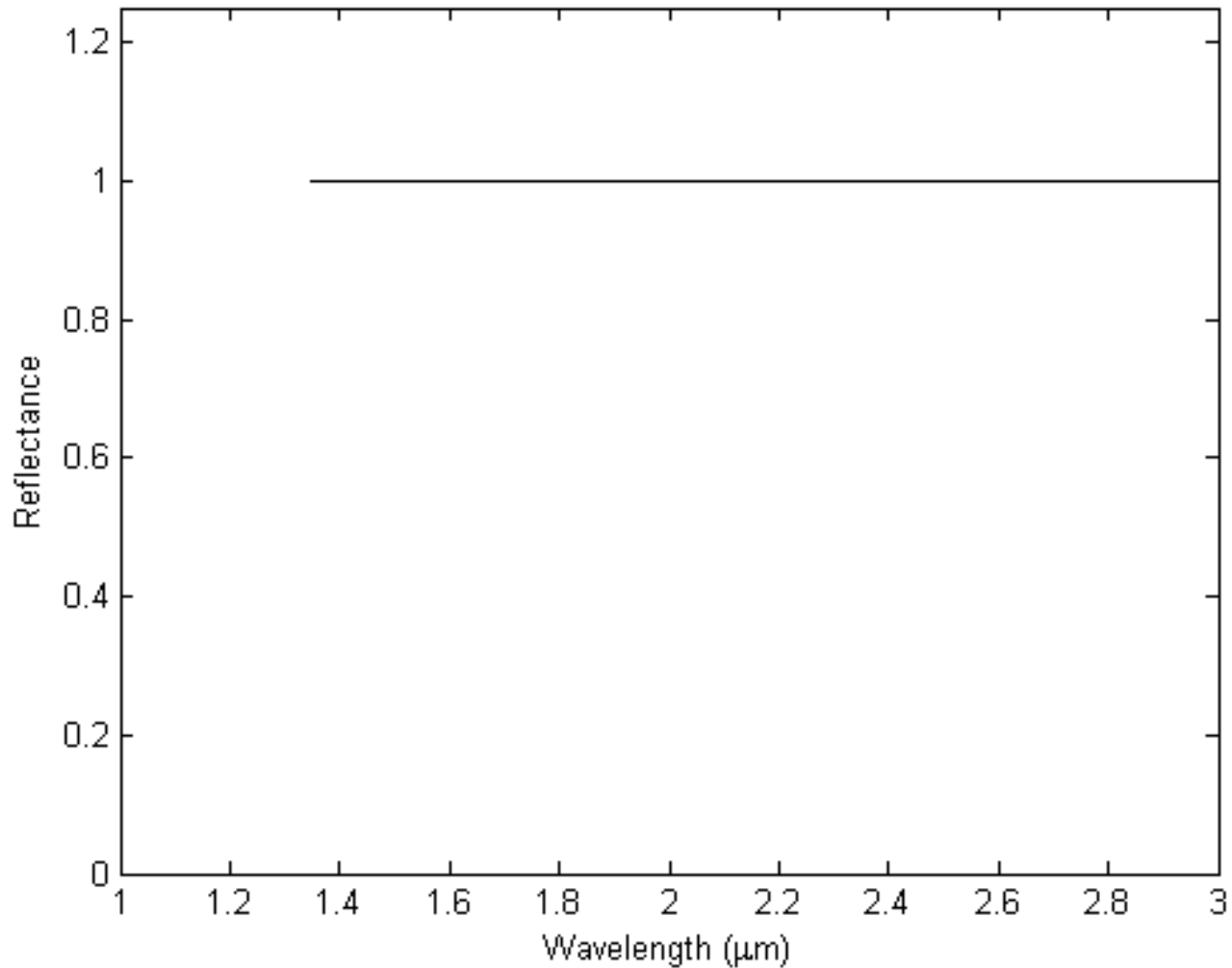
- Confirmed abundances of Al, Ca, S and Fe
- Comparisons with XRS and NS indicate vertical homogeneity on 10's of cm scales
- Confirmation of low global Fe
- Mineralogy constrained to albite, Na-rich plagioclase and Mg end member of pyroxene, enstatite.

Local abundances?

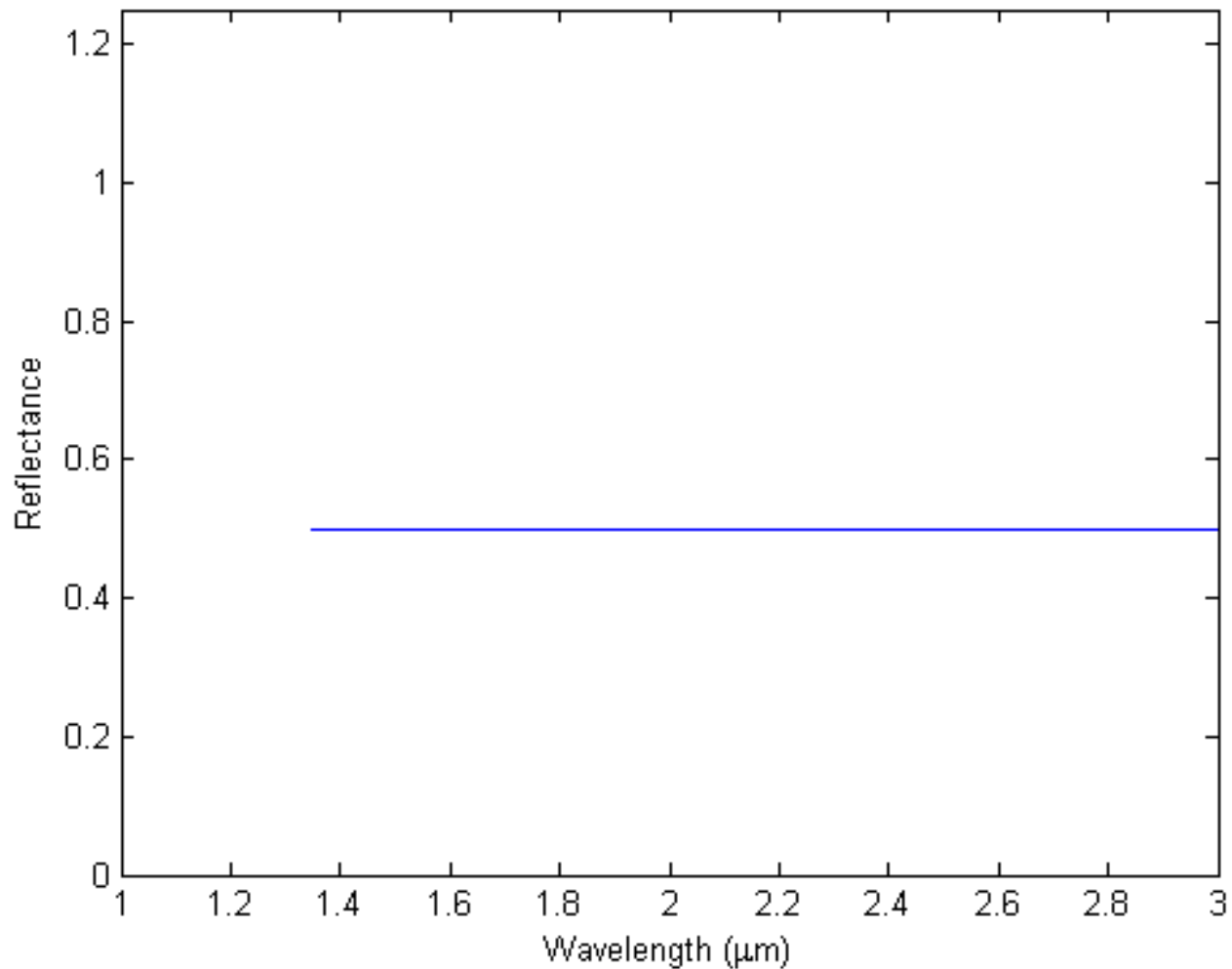
- ◉ GRS results for global counts
- ◉ MESSENGER Scientists working on mapping counts so that individual mineralogical units can be identified

Questions?

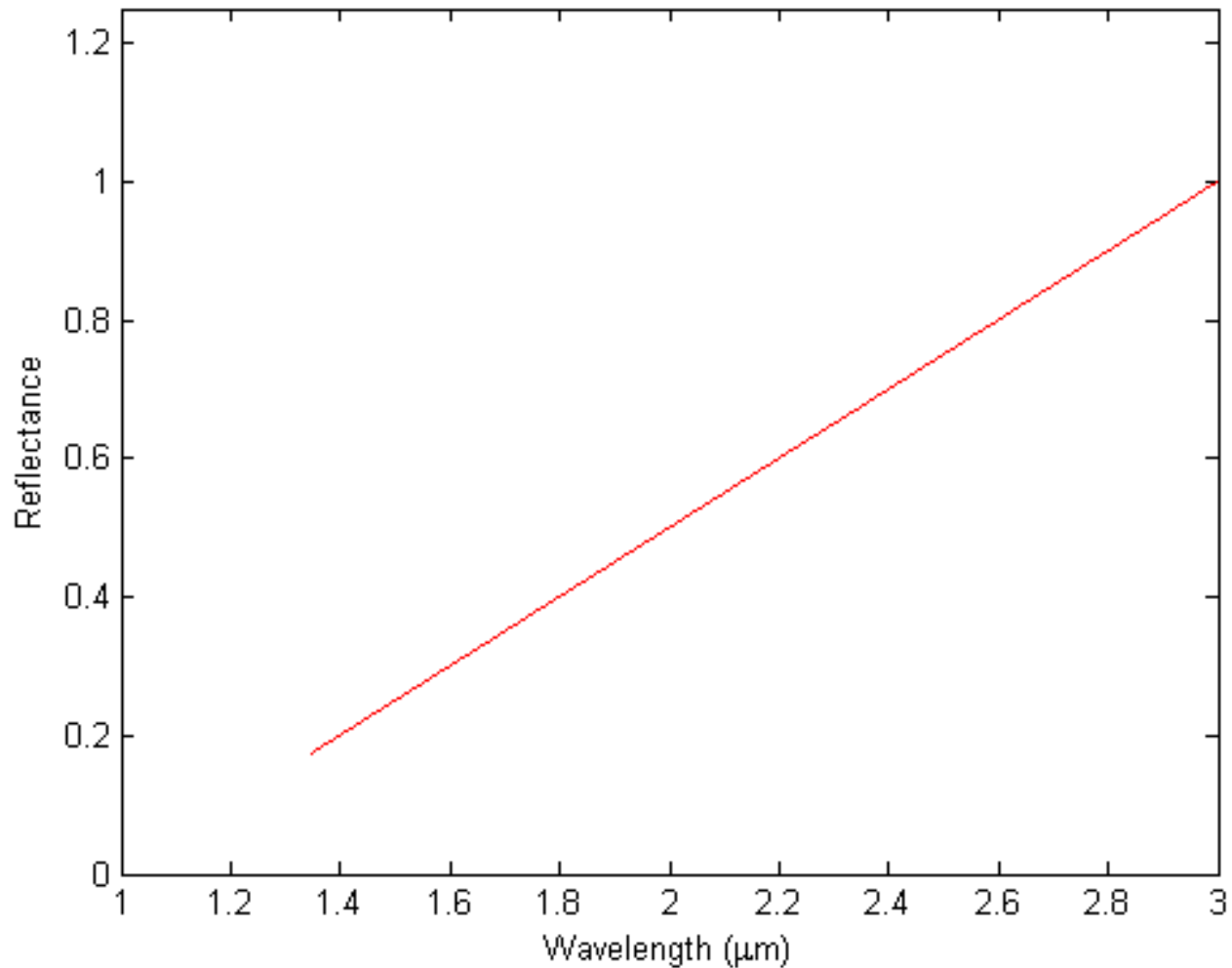
Surface Maturation

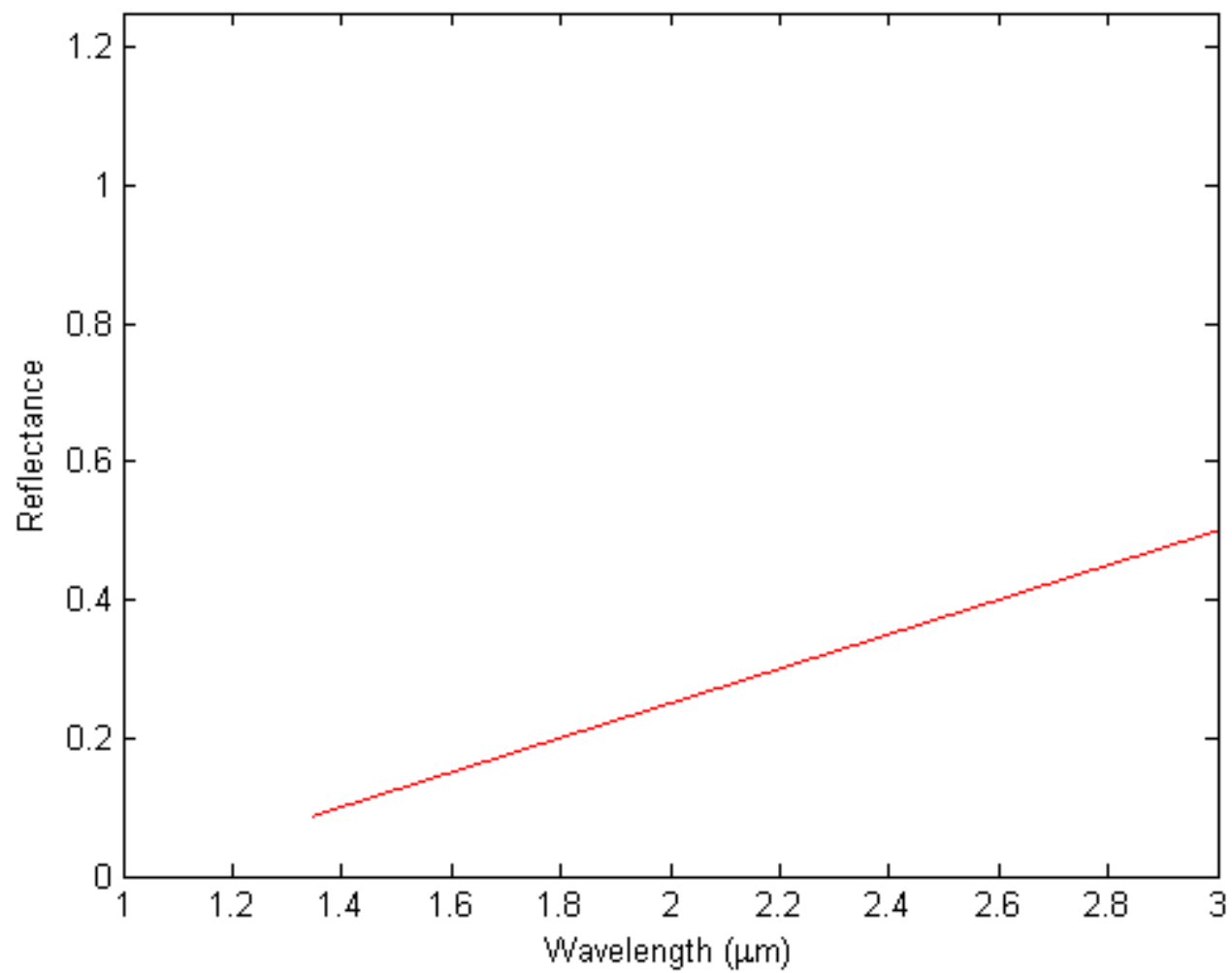


Surface Maturation



Surface Maturation





Mid-IR of Mercury

