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Effects of thermal gradients on mid- IR emission spectra of planetary surfaces.

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Thermal infrared emission from a planetary surface originates from a very thin layer of the upper section of the surface regolith; the thickness of such layer depends on the radiation wavelength and varies considerably with the composition, and the physical nature of the surface materials, but its average value is of a few hundred microns in the mid-infrared. On planets with little or no atmosphere, like Mercury and the Moon, near surface radiative cooling can create a significant thermal gradient in the uppermost layer where the escaping radiation is generated[1]. When a thermal gradient is present, the surface brightness temperature is affected not only by the surface emissivity, but also by its spectral opacity. The few measurements of spectral emissivity of minerals and rocks in a simulated space environment show that thermal gradients significantly increase the spectral contrast, compared to that measured for isothermal samples. In this work we have tried to induce significant thermal gradients in the uppermost layer of samples, by heating them from below and allowing them to radiate to colder background. We have investigated the effects of near surface thermal gradients measuring emission spectra of granulated quartz, of different grain size, heated at different temperatures. Our results show that near surface thermal gradients affect the measured energy flux and the magnitude of such effect, for particulate materials, depends on the grain size.

[1] **Henderson**, B.G., and B.M Jakosky, Near-surface thermal gradients and their effects on mid-infrared emission spectra of planetary surfaces, *J. Geophys. Res.*, 1994, 99, 19,063-19,073.