Olivine-enriched regions as seen by Diviner

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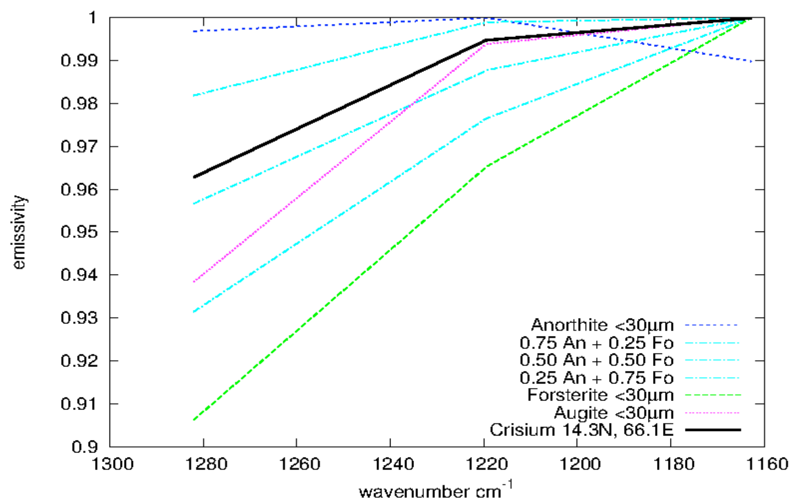
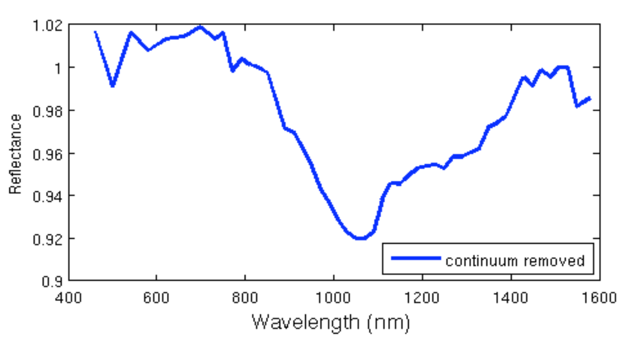
Abstract. We have made compositional estimates based on Diviner Lunar Radiometer Experiment (Diviner) data in locations where olivine has been detected by both Moon Mineralogy Mapper (M^3) and Kaguya Spectral Profiler (SP). Diviner data can be used to study the diversity in silicate mineralogy through three spectral channels (Ch 3, 4 and 5) centered near the wavelengths where the Christiansen feature (CF) occurs in common lunar minerals. While Diviner is capable of detecting pure olivine, it appears that a high abundance of olivine is necessary to produce CF position values that are distinguishable from pyroxene. We used laboratory data acquired in a simulated lunar environment to show how mixtures of plagioclase and olivine would vary in CF position and spectral shape, assuming linear mixing. These spectra were compared with Ch 3, 4 and 5 emissivity values derived from Diviner data. In addition to composition, the CF is also a function of particle size. For the majority of the lunar surface, a very fine particle size can be assumed, however for areas such as those containing blocky ejecta, this is not the case. We looked at Diviner Ch 7 night-time brightness temperature, which serves as proxy for thermal inertia to point out areas containing courser materials.



Diviner Ch 3,4,5 emissivity of an area within Mare Crisium compared with "mixtures" generated from data taken in a simulated lunar environment.



M^3 reflectance spectra of the same area, clearly showing the characteristic 1µm olivine absorption.