[EJ] Eveningポスター発表 | セッション記号 P (宇宙惑星科学) | P-PS 惑星科学

[P-PS05] 月の科学と探査

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2018年5月23日(水) 17:15 〜 18:30 ポスター会場 (幕張メッセ国際展示場 7ホール)

月周回衛星「かぐや（SELENE）」によりもたらされた月の物理・化学・地質データは月科学における基準データとなり、現在もそれらのデータ解析により月に関する新たな知見が次々と報告されている。またLRO、GRAIL、LADEEやChang’e3といった海外ミッションも新たな成果を生み出している。それと並行して、現在日本を含め世界各国では、着陸探査を含めた次期月探査計画の検討が精力的に進められている。本セッションでは新しい月科学の構築に向けて、月探査データを用いた研究成果の報告、SLIM計画を含む将来の月探査計画に関する議論、今後の探査データの解析に向けた提案、関連する理論や実験，試料分析の結果、搭載機器開発など、月科学に関する発表を広く受け入れる。

[PPS05-P04]Integrating Crystal Chemistry with Laboratory Analysis to Model Bound and Adsorbed OH^- and H_2O

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キーワード：Moon, Asteroids, Water, Hydroxyl

Investigating the specific characteristics of the H_2O/OH^- absorption bands near 3 microns is critical for understanding how these molecules are adhered to a remotely observed surface and for assessing their abundance. Current methods for analyzing the form and amount of water in or on rocks range from precise laboratory measurements of oriented single crystals and glasses in transmission, where individual absorptions can be modeled and examined, through more generalized band-depth analysis where a 3-micron band, observed in reflectance spectra of powdered samples in the lab or remote measurements, is treated as a single integrated absorption and compared to empirically calibrated water abundances. Understanding the relationship between the component band strengths and shapes and the bonding to the mineral also has the potential to provide a method to mathematically model terrestrial adsorbed water out of spectral measurements that were not obtained under vacuum conditions, increasing the number of laboratory spectra available for spectral analysis dramatically.

As part of the VORTICES SSERVI team, we are working to spectrally and mathematically characterize the distribution of energies for absorption bands caused by bound and adsorbed hydroxyl and water. To increase the amount of information that can be derived from spectra of hydrated terrains throughout the solar system, we are working to combine both transmission and reflectance spectra of a series of samples to develop a methodology for reliably separating out the specific component absorptions in the 3 micron region of reflectance spectra. For a suite of nominally anhydrous minerals, we are currently obtaining combined transmission measurements of thin sections and powdered rock measurements in ambient air and in ultra-high vacuum. Samples are dehydrated in vacuum, resulting in a suite of spectra with a decreasing amount of adsorbed water. Transmission measurements, which are dominated by internal water/hydroxyl absorptions, are used to characterize absorption bands of any internal water present. The thin sections are then also dehydrated enabling the baseline absorption to be characterized. We will present new modeling results for analog and meteorite materials.

For our preliminary analysis, we have selected two ordinary chondrites (H and LL) as well as 8 Stillwater complex samples as analogs of lunar material. Stillwater samples include harzburgite, norite, anorthite,

gabbro and orthopyroxenite. Each sample is being prepared as a double polished thin section for transmission analysis of internal water, powdered for UHV measurements, and characterized in a Hitachi Desktop SEM with a Bruker EDS attachment. Terrestrial samples have been prepared first to test our methods and to ensure that the chondrites can be handled in a way that uses the minimum amount of sample.

Spectra of each sample are being measured in transmission to characterize the shapes and relative strengths of internal water bands. Powdered samples, with water adsorbed from the atmosphere at ambient temperature and pressure, are then measured, taken to UHV and measured again before being heated to drive the adsorbed water off. Samples are measured at progressively warmer temperatures to monitor the shapes and strengths of the absorption bands at each step. Spectra are then modeled using Gaussian curves in energy space. The current objective is not to explicitly quantify the amount of water through modeling, but to determine whether the positions and shapes of bands resulting from adsorbed water are distinct enough from the water and/or hydroxyl bands in each mineral or rock type to be spectrally distinguished.