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Spectroscopic Analysis of Flooded Craters from Oceanus Procellarum

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The last major phases of lunar volcanism produced compositionally unique, high-titanium basalts that are not observed elsewhere on the Moon's surface or earlier in its history. These volcanic deposits include some of the Moon's most extensive flows and age estimates suggest that these basalts are among the youngest. These flows are concentrated in Oceanus Procellarum, a very large volcanic province on the lunar near side. Investigations using the Moon Mineralogy Mapper (M3) data have shown that these basalts exhibit strong mineralogical variations, with compositions strongly dominated by either high -Ca pyroxene, or low-Ca pyroxene, or olivine, and even a combination of these minerals. Following the surprising high olivine content of the crater Marius, we examine other flooded craters of the large Oceanus Procellarum (O.P.) province to characterize the uniquess, or not, of Marius. If a large number of flooded craters within O.P. exhibits similar high-olivine content, this will help us to constrain the magmatic history of the last major phases of lunar volcanism. The Moon Mineralogy Mapper (M3) onboard the Indian Space Research Organization's (ISRO) Chandrayaan-1 Spacecraft is an imaging spectrometer that imaged the Moon in 85 spectral channels with a combination of high spectral and spatial mapping, enabling spectra to be placed in a geological context. M3 data have a spectral range from 460 to 3000 nm, and a spectral resolution of 20 to 40 nm. This range allows detailed investigations of the 1 and 2 μm absorption bands characteristic of mafic minerals on the lunar surface. A selection of flooded craters has been performed to investigate their spectral properties. Craters with unbreached walls have been selected as much as possible in order to better constrain the origin of the volcanic flows. Preliminary results show that few craters share the high-olivine content properties of Marius. Compositionally, crater Billy seems to be the closest one, and to a certain extent the craters Plato, Hansteen and Flamsteed G (although the later one is clearly connected to the surroundings lava flows through its breached walls). More detailed analysis will be performed to highlights the similarities and differences of these flooded craters from a spectral point of view.