Distribution and analysis of Pyroclastic Deposits on Mercury from Messenger data

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Observations of the MESSENGER spacecraft in orbit around Mercury have shown that volcanism is a very important process that has shaped the surface of the planet. [1] have identified 200 pyroclastic deposits candidates based on color ratio and morphology images. [2] used the visible portion of the MASCS spectrometer to do further analysis on the spectral nature of the deposits. The authors have shown that the deposits have specific UV properties probably caused by Oxygen-Metal charges transfer, and a correlation between the slope of the UV-downturn and the age of the surrounding terrains.

In this study, we use the full range of the MASCS spectrometer (300-1400nm) to characterize the spectral properties of the pyroclastic deposits. Moreover, additional observations have been obtained since the last publications, and this allows specific studies of previously non-imaged deposits. This study shows that the visible slope of the deposits is changing as a function of distance from the vent, as seen on the Moon for pyroclastic deposits and their mafic absorption bands [Besse et al, 2013]. This is consistent with a decrease of thickness of the deposits that are mixed with background material. Surprisingly, the UV-downturn parameter proposed by [2] does not change as the distance to the vent increase. Eventually, the near infrared portion does not appear to have absorption bands in the range 900nm-1200nm, consistent with the very low iron abundance of the surface of Mercury. This could also be due to the lower signal to noise ratio of the near infrared portion of the MASCS instrument, and further analysis are needed to confirm these results.

The use of visible images from the MDIS camera has revealed that some of the pyroclastic deposits candidates are certainly correlated with hollows.

References:

[1] Kerber et al, (2011) Planet & Spa. Sci, 59, 1895-1909, [2] Goudge et al., 2014, JGR, 119, 635-658. [3] Besse et al., 2011, JGR, 116.