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Tracing Martian volcanic activity using crater obliteration rate

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Impact craters are often used to date planetary surfaces, the density of crater increasing with the exposure age of the surface. However, some geologic event, such as lava flows, do not totally “reset” the crater clock. Indeed, larger craters, rather than being totally recovered by the lava flow will be only partially filled.

In that case, the crater size frequency distribution differs from cratering models. In order to better describe crater populations, additional parameters can be included. To this purpose we build crater size and depth frequency distributions that offers a snapshot of the current degradation state of the population.

We used cratering models to interpret crater size and depth frequency distributions in terms of crater infilling rates. Using both global crater database and more local high resolution crater maps, we estimated crater obliteration rates on various Martian volcanic provinces.

Our method proven efficient to track activity of the main Martian volcanic provinces. Resurfacing rates reach several thousands of m/Gy. Pic activity differs from provinces. Syrtis and Hesperia are the oldest with the highest and oldest observed rates around 3.7 Gy. The activity of those provinces quickly decreases reaching few hundreds of m/Gy around 3.4 Gy. During Hesperian, Tharsis is the most active surface of Mars with high resurfacing until 3.3 Gy. Finally, our result shows an increase of resurfacing, reaching few hundreds of m/Gy in Amazonis planitia from 2 Gy to present.