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Fractured Craters in Southern Syrtis Major, Mars

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Abstract

Craters around the south-eastern edge of Syrtis Major are eroded and/or refilled. Additionally the crater floors are shaped by wind and fluvial activity generating highly weathered morphologies. Young basaltic deposits originating from nearby Syrtis Major predominately cover the floor of these impact craters. We investigated the correlation between basaltic crater deposits and Syrtis Major volcanic activities.

1. Introduction

High Resolution Stereo Camera (HRSC) and Mars Reconnaissance Context Camera (CTX) images revealed that the south-eastern region of Syrtis Major exhibits morphologies related to volcanism and erosion including lava flows, interior channels, erosion deposits and lava flow fronts. All these features are closely concentrated spatially and seem also to be correlated stratigraphically.

2. Geologic Overview

Syrtis Major is one of the large Hesperian-aged volcanic regions on Mars [1]. The basaltic shield volcano has a basal diameter of 1100km, a maximal height of 2300m [2, 3], and exhibits all volcanic landforms such as lava flows, calderas and wrinkle ridges. Erosional landforms indicate modification of the area [4]. The southern volcano region borders the oldest highlands on Mars covered with large and old impact craters. Craters at the southern flank of Syrtis Major ($-6°$N to $6°$N and $65°$E to $80°$E) are eroded by wind and fluvial activity. Some of these craters are filled with basaltic material, so that the crater floor is completely covered. In particular some craters exhibit a fractured floor. Our work focuses on this special crater type, because the filling of these craters is relatively young, as shown by the crater counting, and seems to record a late stage of Syrtis volcanic activity.

3. Refilled and Fractured Craters

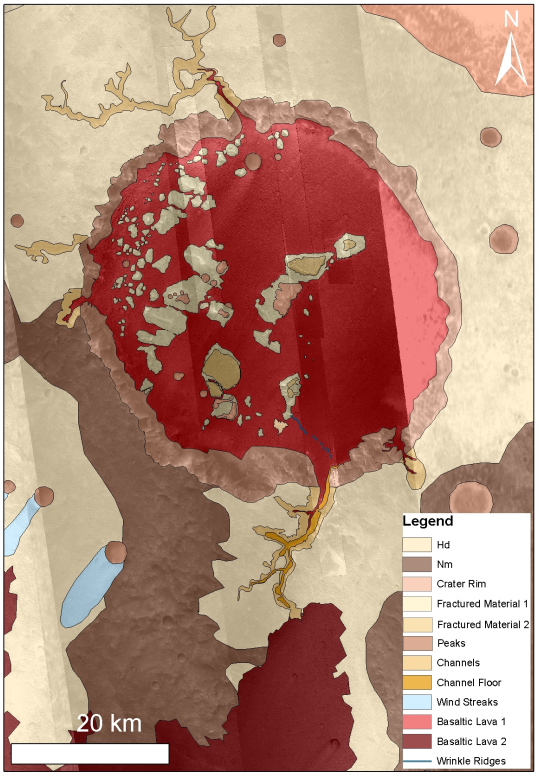

Abbildung 1: Geologic map of a crater at $-2.34°$N and $74.5°$E. Mapping based on database of CTX and THEMIS images (NASA/JPL).

There are four craters of special interest in the investigation area. Two of them are well preserved, exhibiting an uneroded crater rim, well separating the interior from the surrounding landscape. The third crater is located at $-2.34°$N and $74.5°$E and has a diameter of 50 km (Fig.1). The crater floor is covered with basaltic material. We found plates of also basaltic fractured remnants enclosed in basaltic filling. These plates are

scattered across the entire crater probably indicating various filling events. This crater also shows fluvial erosion in the form of channels which cut the crater rim in the north and south.

4. Crater Counting

The numbers of impact craters on planetary surfaces increase with time. The crater-size frequency distribution has been used to analyse the age of different layers (Fig.2). These information are essential to understand the order of material depositing and Syrtis volcanic activity.

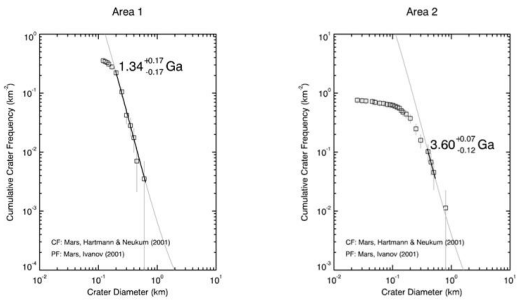

Abbildung 2: The crater-size frequency distribution shows the age of the young basaltic lava filling (Area 1) and the crater rim (Area 2).

5. Summary and Conclusions

Dating of basaltic material yields ages between 3.8 and 1.3 billion years, indicating Hesperian to Amazonian volcanic activities. Therefore lava flows vary in age, as shown by the crater-size frequency distribution. The interior structure of the four craters is diverse with respect to the fractured plates pointing out different emplacement processes of the lava.

Literatur

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