EPSC Abstracts
Vol. 8, EPSC2013-1006, 2013
European Planetary Science Congress 2013

SMART-1 studies of impact processes: all scales from South Pole-Aitken basin to the SMART-1 bouncing site

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Abstract

We highlight some ESA SMART-1 results on impact processes. We discuss impact basins, the morphology of craters, the properties of central peaks, and the study of specific impact craters of interest to ILEWG community. We also give an update on the results from SMART-1 impact campaign and the search for SMART-1 bouncing site and debris using latest LRO data.

1. Introduction

ESA SMART-1 mission demonstrated Solar Electric Propulsion for deep space, tested new technologies for spacecraft and instruments miniaturisation, and provided an opportunity for science [1-24] until impact on 3 September 2006. To date, 75 refereed papers and more than 325 conference or technical papers have been published based on SMART-1 (see ADS or SMART-1 scitech website sci.esa.int/smart-1). The SMART-1 data are accessible on the ESA Planetary Science Archive PSA [13] http://www.rssd.esa.int/psa

2. Studies of impact basins/craters

The South Pole-Aitken Basin was mapped and studied combining data from Clementine, SMART-1, and other missions [24]. Large basins and the relation between impacts, tectonics and volcanism have been studied. The tectonic structure differ in simple impact basins (such as Humorum,) compared to Oceanus Procellarum, suggesting the latter has a different origin. Impact craters in the lunar North and South polar illumination have been mapped [16, 17]. SMART-1 SIR data were used to study the mineral composition of the central peak of craters [22]. SMART-1 could study a large range of impact crater sizes and morphologies, and sites of interest to the international lunar community (ILEWG).

3. SMART-1 artificial impact

The SMART-1 mission finished in a grazing bouncing impact. The impact flash was observed from Earth, as well as a debris cloud downrange of 50 kms. The SMART-1 impact was modelled using laboratory experiments predicting the size of asymmetric crater and ejecta [23]. We report the analysis of SMART-1 impact campaign and subsequent data from LRO to pinpoint the initial SMART-1 bouncing site and impact debris.

4. References

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