Boulder Halo (Crater)

Joseph Levy* and Henrik Hargitaib

aInstitute for Geophysics, University of Texas, Austin, TX, USA
bPlanetary Science Research Group, Eötvös Loránd University, Institute of Geography and Earth Sciences, Budapest, Hungary

Definition

Boulders in concentric pattern associated with circular fractures or depression in a thick mantling layer observed on Mars.

Synonyms

Arranged boulders; Crater-oriented boulder halos

Subtypes

Boulder halos (Figs. 1, 2, 3, and 4) have been observed on flat surface, along concentric fractures and bordering depressions (Levy et al. 2010: Fig. 11).

Formation

The boulders were ejected by an impact into ice-rich mantling units. The boulders were part of the coarse proximal ejecta. They may have been excavated out of and deposited onto a surface that has lowered the boulders to their present configuration (e.g., by sublimation of ground ice) or may have been raised from their original stratigraphic level (e.g., craters were filled with latitude-dependent mantle and the boulders were floated to their current location via kinetic sieving). Boulders may have been fallen into concentric fractures, around which uncovered material was preferentially removed by sublimation, resulting in relief inversion. Observations suggest that the boulders moved to their present position by slumping, rolling, or sliding (Levy et al. 2008, 2010).

Distribution

Vastitas Borealis Formation terrains, 65–70°N latitudes, Mars.

*Email: joe.levy@utexas.edu
Fig. 1  Boulder halo on patterned ground in Acidalia Planitia. Image 1 km across. HiRISE ESP_016526_2415 (NASA/JPL/University of Arizona)

Fig. 2  Detail of Fig. 1. Image 170 m across (NASA/JPL/University of Arizona)

Fig. 3  Boulders along concentric fracture, on patterned ground. Image 650 m across. HiRISE PSP_001413_2495 (NASA/JPL/University of Arizona)
Significance

Barata et al. (2012) used this feature to define “palimpsest craters” (▶ Softened Crater): “craters that are only perceptible by annular clusters of meter sized boulders on an otherwise almost featureless plane surface.”

Terrestrial Analog

Upland Stable Zone of the Antarctic Dry Valleys, Mullins, and Beacon valleys.

See Also

▶ Boulder Field
▶ Ghost Craters

References