CHARACTERIZING IMPACT EJECTA DEPOSITS AT BARRINGER (METEOR) CRATER, ARIZONA.
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Introduction: Herein, we present initial results of our investigation of physical distribution patterns and chemical composition of impact melts, metallic spherules, and meteoritic fragments at Meteor Crater, AZ. Our research used the USGS Meteor Crater sample collection of drill samples from the ejecta blanket [1]. Samples in this collection can be requested on the web at: http://astrogeology.usgs.gov/geology/Meteor-Crater-Sample-Collection.

Results: Our assessment of lateral and vertical distribution patterns of impact-related materials within the ejecta blanket reveals that, in the NE, SW, and SE transects, impact melts are concentrated within a zone ~270-300 m from the crater rim, at depths of 2-4 m. We find that impact melts are rare nearer to the rim and further out than ~300 m. Only trace amounts (<2%) of impact melts are present at depths of 0-2 m and deeper than ~4 m, although intact melt clasts may occur as deep as 10.5 m.

Impact melt fragments are compositionally heterogeneous and have a mafic groundmass with two variations: a homogenous Fe-rich glass from which pyroxene needles grew, and a Mg- and Ca-rich glass from which dendritic pyroxene crystals grew. The majority of these melt fragments contain angular, fractured quartz grains, which display apparent disequilibrium textures as well as metallic spherule inclusions.

We have identified carbonate lithic inclusions and carbonate glass spherules within several melt fragments, in contrast to the near-absence of carbonate inclusions noted in other studies [i.e., 2-6]. Abundant lechatelierite clasts within drill cuttings, and within impact melts, provide clues to the sequence of formation for these materials.

We discovered a unique suite of highly metallic impact melt fragments. SEM analyses of these fragments reveal textures and compositions distinct from Canyon Diablo projectile fragments [e.g., 7] and impact melts. These non-vesicular fragments have a Fe-rich (~90 wt%), compositionally banded groundmass, with varying proportions of Fe, Ni, and Si. These fragments also contain angular, shattered quartz grains as well as Ca- and Mg-rich lithic inclusions.

Conclusions: Drill cuttings from the Meteor Crater ejecta blanket are providing new data that confirm the results of previous studies while also revealing additional levels of complexity and/or mixing within the ejecta blanket that require further investigation.


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