Preliminary Notes on the Presence and Distribution of "Condensation Products", in Drill Cuttings Collected from the Area Around Meteor Crater, AZ. J. P. Hughes, J. M. Boyce, Hawaii Institute of Geophysics and Planetology, University of Hawai, Honolulu, Hawaii; and M. G. Chapman, U.S. Geological Survey, Flagstaff, Arizona

Introduction: A number of investigators have looked for the presence of small meteoritic material in the ejecta blanket surrounding the Meteor Crater, Arizona [1, 2]. Nininger referred to these particles by the broad term "condensation products". Within that larger category, he identified a number of smaller subdivisions, which he referred to as spheroids, sluglets and impactite. Roddy describes the preliminary results of a program of air rotary drilling on the rim and area surrounding Meteor Crater, which took place in two phases, during the early 1970s [3]. The drill cuttings from this work have long been stored in several Sea Vans, at the US Geological Survey office, in Flagstaff, AZ. The goal of our current work, was three fold: first, locate and inventory the cuttings and field notes from the drilling program; secondly, take a preliminary look at a representative number of samples to see if any impact particles could be recovered from the cuttings; and thirdly, see if we could note any variations in vertical distribution of these particles in the cuttings.

Background: During the field work described by Roddy, a total of 161 drill holes were completed. The holes ranged in depth from a few meters to 50 m. Near the center extended through the overturned flap and underlying Moenkopi Formation, into the upper part of the Kaibab formation. Approximately 72% of those holes were drilled in the overturned ejecta flap, with the remaining 28% drilled beyond the flap (Figure 1). Altogether, over 2500 m of drill cuttings were collected. The cuttings were sampled on the average every 0.3m and placed in sandwich sized plastic baggies. The core boxes containing these samples are labeled: "MCRDH"

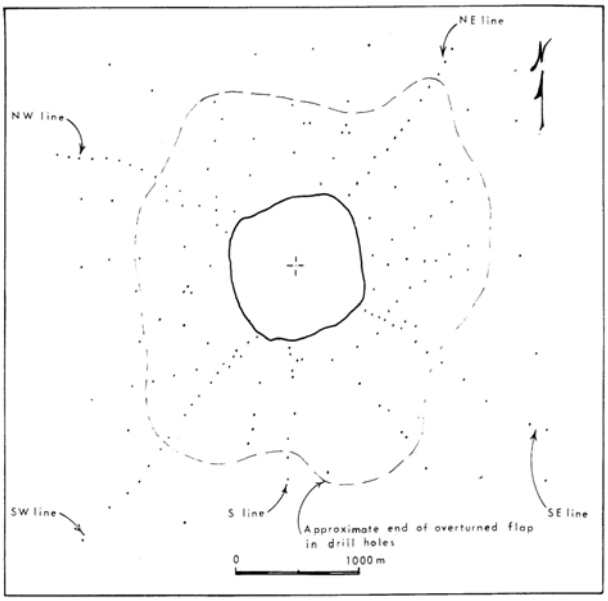

Figure 1. Meteor Crater rotary drill hole locations (after Roddy, et. al., 1975)

(Meteor Crater Rotary Drill Hole). These drill cuttings can be made available for study, by contacting Dr. Mary Chapman, at the US Geological Survey office in Flagstaff.

Results and Discussion: One of the purposes of this present work was to see if any of these condensation products had survived the drilling process, and whether they could readily be identified and separated from the drill cuttings. If so, it was hoped that a more through future study of both the horizontal and vertical distribution of the various categories of condensation products could be undertaken.

Toward that end, once the drill cuttings had been identified and inventoried, several drill locations were selected for this preliminary examination. Representative cuttings from a dozen or more holes were quickly

screened with a hand magnet (Figure 2). In a subset of these samples, a number of the condensation products were readily separated and identified with a strong hand lens. Subsequently, one hole each from just beyond the NE, SSE and S sides of the crater were chosen for a further cursory investigation. Samples from multiple depths in each of the holes were screened with the hand magnet and hand lens. Variations with depth were noted for both the number of particles and the variety of particles, in all three holes.

In his file notes related to this drilling project, the late Dr. Roddy indicated: "I consider this to be an extremely valuable sample collection that can be used to substantially further basic studies of ejection processes, formation of ejecta blankets, ground/base surge processes, and related phenomena at these types of craters. Systematic shock metamorphic studies should be completed on this set of samples (it will take a full research effort)."

We concur, and believe that a through study of the vertical distribution of the various "condensation products" would also yield important information. Given the current restrictions on sample collection at the site, it seems unlikely that a future field effort of this magnitude could be undertaken. The existing collection, therefore, represents an invaluable source of material, and clearly warrants further study.

References [1] Nininger, H.H. (1956), *Arizona's Meteorite Crater: Past, Present, and Future*, American Meteorite Laboratory, Denver, 232 pp.; [2] Kargel, J.S., et al. (1996), *Systematic Collection and Analysis of Meteoritic Materials from Meteor Crater, Arizona*, Lunar Planet. Sci. XXVII, Part 2, 645-646.; [3] Roddy, et al., (1975*). , Meteor crater, Arizona, rim drilling with thickness, structural uplift, diameter, depth, volume, and mass-balance calculations*, Proceedings of the Sixth Lunar Science Conference, Houston, 3, 2621-2644.

A

B

Figure 2. "Condensation Products" culled from the drill cuttings, by means of a small hand magnet. A) Drill cuttings from one of the sample baggies. A small hand magnet is wrapped in the white cloth, just to the right of the cuttings. B) The same magnet, after it has been rubbed through the pile of drill cuttings, with the "condensation products" that it has attracted.