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METEORITES AND THE ANTARCTIC ICE SHEET; W. A. Cassidy, Department of Geology and Planetary Science, University of Pittsburgh, PA 15260.

The United States Antarctic Meteorite Program was begun in 1976, in collaboration with the Japan National Institute of Polar Research. It began as a direct outgrowth of the original Japanese discovery of nine meteorites on a small part of a large ice field near the Queen Fabiola (Yamato) Mountains (1,2). The first two specimens during that first field season were found by Keizo Yanai, on a small patch of ice between Mts. Baldr and Fleming, during our first 25 minutes in the field. For the next six weeks we worked steadily northward along the margin of the East Antarctica ice plateau, finding nothing until we reached a patch of exposed ice on the plateau side of the Allan Hills, where we found forty-three specimens during two brief helicopter-assisted searches (3). Over the succeeding eight field seasons the Allan Hills site has supplied the majority of specimens recovered in the U.S. program. Other major concentrations have been located, however, namely at Elephant Moraine and in the Thiel Mountains - Pecora Escarpment region (4).

Our ideas on the types of surface where meteorites occur have undergone a degree of evolution since 1976. Beginning with the idea that meteorites only can be stranded on ice surfaces that are completely stagnant due to the impoundment of ice behind an impassible barrier we later included ice surfaces located at sites where ice flow is not completely halted, but only slowed down. In addition, important concentrations of meteorites have been found in some moraines located downstream of rocky barriers; the significance of the morainal occurrences has not yet been evaluated.

The abstract of the original research proposal for the first year of the U.S. program read in part as follows: "Identification of areas where meteorites have been concentrated in Antarctica can provide new meteoritic material for study, may lead to collection of rarer meteorite types that are better preserved under Antarctic conditions, may permit better estimates of average meteorite composition, may lead to information on relative ages of Antarctic ice masses, and may result in discovery of previously unknown types of meteorites. They could also be areas where lunar ejecta have been concentrated." During the period of the U.S. program and the concurrent Japanese program it has been demonstrated that all the expected results involving the recovery of rare or previously unknown types of meteorites, and even recovery of lunar ejecta, have been realized. The relation between these remarkable concentrations of meteorites and the Antarctic ice sheet itself has been documented less well: ice flow vector studies have been made (5-11) and concentration models have been proposed (12-14), however in many cases we still do not understand why meteorites are found at one site and not at another. There is some evidence (15) suggesting that meteorites are held at concentration sites only for relatively short periods of time, of the order of the periods involved in climate changes, but this is somewhat speculative.

A useful term to describe a surface on which we find a concentration of meteorites is <u>stranding surface</u>. It is useful also to think of stranding surfaces in terms of their <u>degrees of maturity</u> because this may be quantifiable and, if so, would allow us to compare stranding surfaces in order to decide, for an individual surface, how representative of the meteorite flux in space will be the suite of specimens collected there. A mature concentration of meteorites is defined as a concentration whose numbers are large enough to reflect the true abundances of meteorites in space, as modified by atmospheric entry processes.

Earlier estimates of the abundances of meteorite types have been based on numbers of falls in the world's collections, with each fall being counted as one regardless of its relative mass. Although fundamentally flawed, this method has been useful because it does not require that the total fall, which may be an extensive shower, be recovered and weighed. In dealing with the problem of determining the relative abundances of different types of meteorites on a stranding surface it is more useful to think in terms of relative masses of the various types than in terms of relative numbers of individual specimens; this is because there are serious problems with pairing individuals at a given site. Reliance on total recovered masses of all meteorite types may in fact give a more reliable estimate of the meteorite flux in space because the Antarctic accumulations have been integrated over longer periods of time (16); more complete collections of shower individuals probably are possible in Antarctica because of the absence of surface clutter; and the fact that the smallest individuals, which are most likely to be overlooked even in Antarctica, contribute the least mass. Thus, data have been accumulating, and will accumulate during future field seasons, that will allow more reliable estimates of the source region of most meteorites.

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