FIVE THINGS LEARNED FROM THE ANTARCTIC SEARCH FOR METEORITES. J. M. Karner[1], R. P. Harvey[2], J. S. Schutt[2], and B. Rougeux[3]. [1]University of Utah, Geology and Geophysics, Salt Lake City, UT, [3]Case Western Reserve University, Cleveland, OH.

Introduction: Fifty years ago, in 1969, the Japanese Antarctic Research Expedition (JARE-10) recovered nine meteorites from bare ice that was upstream from the Yamato Mountains [1]. The discovery spurred Bill Cassidy at the University of Pittsburgh to propose a US led search for meteorites, and in 1976-77 his team recovered nine meteorites from the huge expanses of bare (blue) ice in the Allan Hills area of Antarctica [2]. At present, Cassidy's legacy, the Antarctic Search for Meteorites (ANSMET) program, is half way through its 43rd field season. In those 43 seasons, ANSMET has recovered more than 23,000 meteorites from approximately 65 separate locations (which often include multiple icefields) in East Antarctica. Here are several things we've learned about meteorite recovery in Antarctica and what it means to planetary science.

1) Meteorites are found on slow-moving blue ice that is being ablated away: Our basic understanding of the genesis of meteorite concentration sites (i.e., icefields) is that meteorites have been raining down on the East Antarctic Plateau for several millions of years, they are then buried by snow, and then they are eventually incorporated into glaciers flowing down through the TransAntarctic Mts. (TAMS) that eventually empty into the Ross Sea [3]. With general ice sheet thinning over the Pleistocene [4], previously unobstructed and rapidly flowing glaciers became redirected, trapped, and stranded by exposed and subsurface barriers (i.e., the TAMS) [5, 6]. Simply put, flowing ice has been pinched off, slowed, and ablated- allowing for meteorites trapped in the ice to be exhumed at the surface and accumulate like a lag deposit [3, 5, 6]. An example of slow-moving ice that is being ablated away is the Miller Range icefields. Fig. 1a. shows that ice at Miller is moving slow, less than ~1 m per year, while Fig. 1b. shows ablation rates of 1.3 to 5.6 cm per year at Miller [7]. This combination of slow ice and ablation has led to the exposure and recovery of 3000 meteorites from the Miller Range icefields.

2) Check the moraines: Historically, ANSMET teams mainly searched for meteorites on the bare, blue ice areas of icefields- but after forty plus years of searching it is apparent that the moraines accompanying icefields (lateral, terminal, medial, etc.) hold significant concentrations of meteorites as well. For example, in its last two field seasons at Davis Nunataks-Mt. Ward (DW), ANSMET recovered ~760 meteorites from the moraines that surround the icefields. That number amounts to almost 50% of the meteorites found in the area over those two seasons. Moraine searching amongst thousands of terrestrial rocks is decidedly more challenging than spotting meteorites on blue ice, but the potential payoff in extraterrestrial samples makes it worth the effort (Fig. 2).

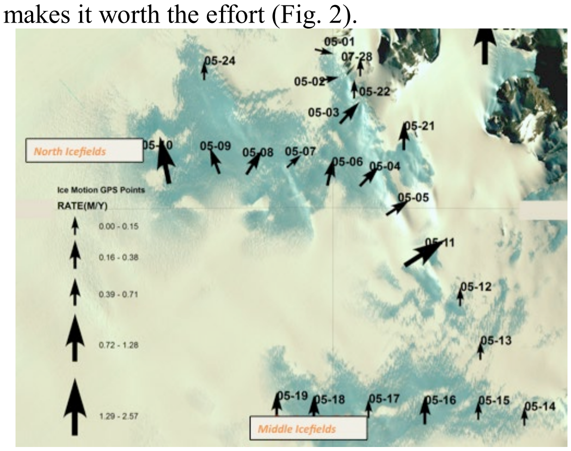

Figure 1a. Ice velocity at the Miller Range icefields.

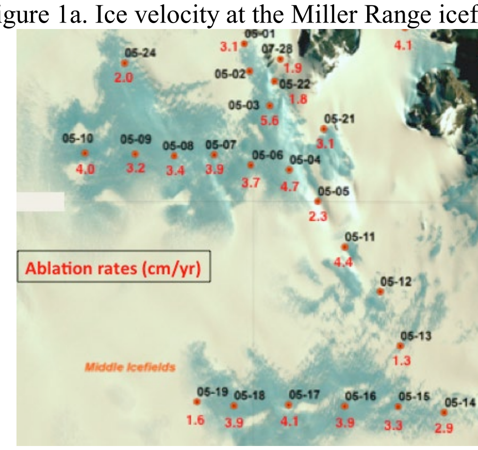

Figure 1b. Ablation at Miller Range icefields.

Figure 2. A lunar meteorite in a moraine at DW. The sample is ~4 cm in its longest dimension.

3) Check the downwind ice edge: The downwind border of an icefield is often characterized by blue ice that gives way to a compact snow called firn. The strong katabatic winds in Antarctica are capable of moving rocks of up to 100 g [8], and firn has proved to be an excellent trap for wind-blown rocks and meteorites (Fig. 3). Furthermore, the downwind ice edge can be used to gauge whether or not a specific icefield contains a meteorite concentration- abundant small meteorites, probably a concentration upwind; few small meteorites, probably no concentration upwind.

Figure 3. The downwind ice edge at DW with flags marking meteorites fetched up on firn.

4) Check areas that have been previously searched. For icefields showing a meteorite concentration, ANSMET strives to systematically search all blue ice areas, relevant moraines and ice edges in order to recover the most meteorites possible. On occasion we have time to revisit areas searched in previous seasons- and we almost always find more meteorites, sometimes a lot more meteorites (Fig. 4)! Most additional finds are undoubtedly due to human error, we simply missed them the first time around. Other additional finds are the result of wind and/or glaciotectonic redistribution. Still others may be an actual recharge, where continuous ablation, over time, results in "new" meteorites being exposed at the ice surface. Whatever the reason, it is worth having another look in areas where meteorites have been found previously.

5) ANSMET is important to the planetary science community, and vice versa. The meteorites recovered by ANSMET are vitally important to planetary research. Since 1978 there have been over 3600 requests for samples, and over 1800 peer-reviewed journal articles published using ANSMET meteorites as their major source of data. Current rates of publication predict about 60 peer reviewed publications and nearly 200 abstracts per year on ANSMET meteorites. ANSMET meteorites are in particular demand because the continuous supply of new extraterrestrial materials is made available rapidly and free of charge to the world's planetary science community.

Lastly, the planetary science community is vitally important to ANSMET. In a typical season ANSMET-funded personnel (PIs, mountaineers) rely on four to five volunteers to fill out the field team. These volunteers willingly give up two months of their time to live in tents in sub-zero temperatures and tirelessly search for extraterrestrial rocks on skidoo and foot. As of this season ANSMET has had ~195 (volunteer) participants in our field seasons, and nearly three dozen of those volunteers have served on multiple ANSMET teams. Certainly the success and longevity of ANSMET would not be possible without the outstanding support of the planetary science community.

Figure 4. The Beach at DW showing additional finds in the exact same location as a previous season.

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