A Geospatial Comparison of Meteorites Recovered from the North and Middle Icefields of the Miller Range, Transantarctic Mountains, Antarctica. P. W. Scholar[1], R. P. Harvey[1], J.M. Karner[2], and J.S. Schutt[1], [1]EEPS, Case Western Reserve University, Cleveland, OH 44106 . [2]Geology & Geophysics, University of Utah, Salt Lake City UT 84112.

Introduction: The United States-based Antarctic Search for Meteorites program (ANSMET) has recovery nearly 22,000 meteorites from the Antarctic continent [1]. During the recovery process, high resolution GPS coordinates are recorded for each location. Combining this data with high resolution WorldView 2-3 imagery and the 8m resolution Reference Elevation Model of Antarctica (REMA) digital elevation models recently made available, we have begun a high resolution geospatial analysis for meteorite stranding surfaces.

The meteorite-bearing blue ice areas adjacent to the Miller Range in the Transantarctic Mountains at the edge of the polar plateau have been nearly completely searched and have yielded a total of 3200 MIL meteorite recoveries so far. Three major icefields (MIL North, Middle and South) represent the majority of the recoveries, with many smaller distinct icefields represent the remaining recoveries. With the exception of parts of the southernmost icefield (MIL South), the vast majority of these meteorites have been systematically classified and their physical characteristics recorded. The relative completeness of this data set makes it is possible to compare the Miller Range meteorite population both within its separate individual stranding surfaces and among other similar groups of stranding surfaces. Here we compare the northernmost Miller Range icefield (MIL North) to the central stranding surface (MIL Middle) both geographically and statistically. The work presented here is a subset of a larger ongoing study comparing the meteorite concentrations from throughout the Miller Range to those recovered from icefields within and around the Walcott Névé Basin (the MAC, LEW and QUE meteorites).

Methods: ArcGIS software was used to produce an array a both raster and vector-based data products and their associated statistical data. The MIL North icefield covers around 48 km^2, and 366 meteorites have been recovered from the site; all but 17 of these meteorites have been formally classified. The MIL Middle icefield (with ~45 km^2 of bare ice) is nearly identical in size but has produced 1435 meteorite recoveries (1408 have been formally classified). Geographically these icefields adjacent to another and occupy similar settings on the northern and eastern margins of a local dome in the ice sheet. Local wind and ice-flow directions are similar.

Results: The mean and mode of the masses of the meteorites, nearest neighbors distances, and even the meteorite class distributions differ for the MIL North (Figure 1). Size-frequencies for both of the icefields shows MIL North as having a distinctly larger mode class (32-64g) than MIL Middle (4-8g) and far fewer meteorites on the smaller end of the histogram in general. Meteorite locations from the MIL Middle icefield show a pattern of meteorites accumulating towards the northern, downwind side of the icefield. This is especially noticeable for meteorites within the smaller mass ranges. MIL North shows a similar trend but to a lesser degree, with fewer smaller meteorites at the downwind ice edge. As seen in the maps of meteorite clustering, distinct hot spots of meteorite recoveries exist across both icefields, but the MIL Middle icefield hotspots are

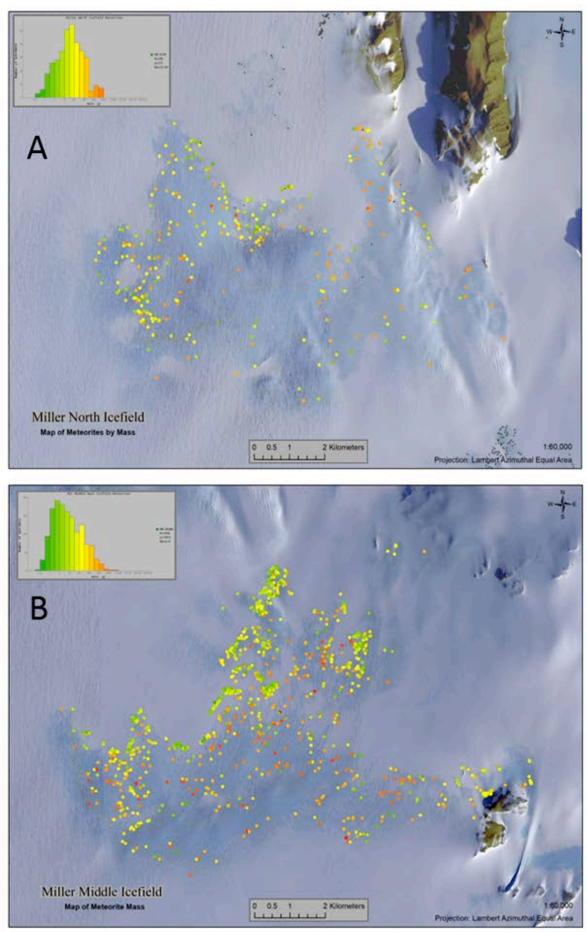

Figure 1. Size distribution and location of meteorites recovered from the MIL North (A) and MIL Middle (B) icefields. Colors of find locations correspond to mass as shown in the size-frequency histogram for each map.

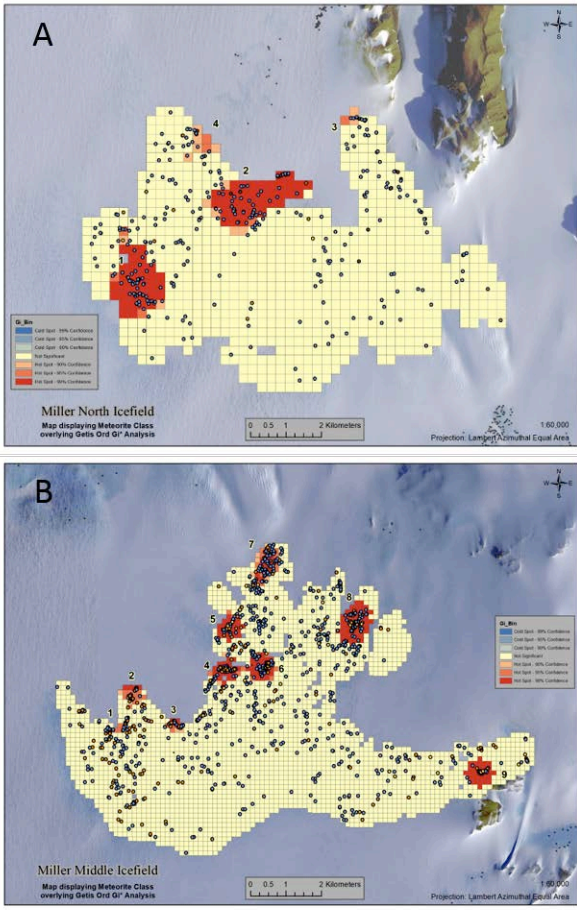

Figure 2. Grid analysis maps of MIL North (A) and MIL Middle (B) icefields. Statistical hotspot analysis based on Getis Or Gi* statistic.

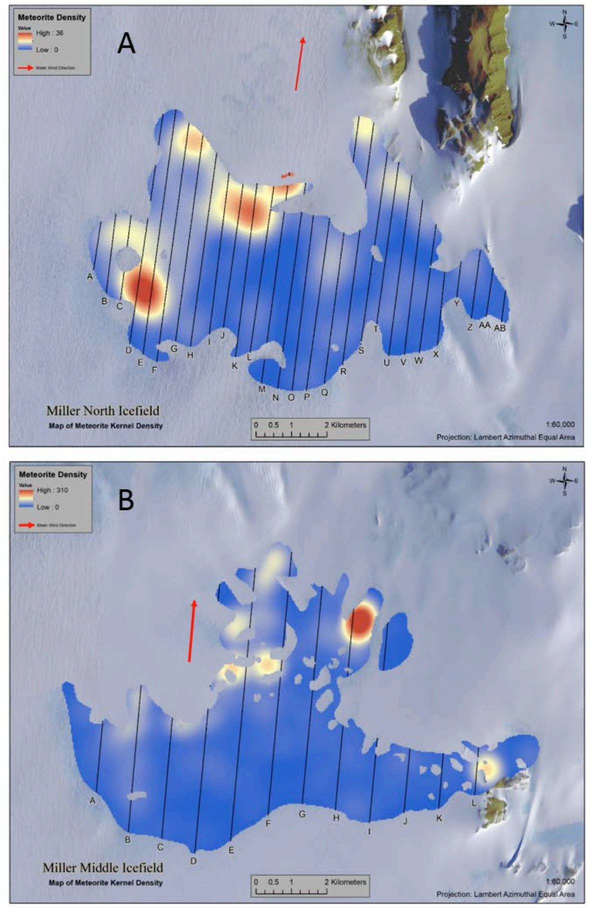

Figure 3. Meteorite kernel density maps for MIL North (A) and MIL Middle (B). Transects crosscut the icefields parallel to the mean wind direction.

more widely distributed along the downwind edge (Figure 2). Windrow analysis (Figure 3) shows a strong preference for hotspots at the downwind edge of the MIL Middle icefield with a much weaker effect for MIL North.

Discussion: The balance between meteorite accumulation mechanisms (conveyor-belt delivery, local deflation, direct infall, and wind movement) and loss mechanisms (sinking, weathering and search losses) strongly influence the meteorite concentrations that results [2]. This balance may be unique to the individual icefield due to localized climate and glacial history [2]. The MIL North and Middle icefields share nearly identical geographical settings suggesting that local glaciological and climatological factors should be of little influence. In spite of this, the two icefields show distinct size distributions, population sizes and patterns of meteorite distribution. The MIL North icefield has fewer but larger meteorites specimens and less transportation to the downwind edge of the icefield. MIL North also shows a prominent "hotspot" not associated with any obvious barrier to wind transport. The MIL Middle icefield has smaller, more abundant meteorite specimens as well as several distinct showerfalls (identified through multiple paired specimens of rare classifications). This suggests that MIL North is simply a younger meteorite stranding surface, accumulating fewer falls overall and experiencing less loss and transport of specimens. Ways to test this hypothesis are limited- meteorological data for these sites are virtually non-existent. Tests on meteorite movements across bare ice surfaces have occurred but were limited in scope [3,4]. Continued comparisons between icefields in similar settings will offer more insight into the processes that shape resulting meteorite accumulations.

References: [1] Harvey R.P. et al., (2014) in *Thirty-five Seasons of U.S. Antarctic Meteorites (Righter, Corrigan, McCoy and Harvey, eds.)*, 23-42. [2] Harvey R. P. (2003) *Chemie der Erde-Geochemistry,* 63, 94-147. [3] Schutt J.S. (1989) *Smithsonian Contr Earth Sci,* 28, 9-16. [4] Folco L. et al. (2002) *Meteoritics Plan Sci,* 37, 209-228.