SCIENTIFIC BOUNTY AMONG METEORITES RECOVERED FROM THE DOMINION RANGE, TRANSANTARCTIC MOUNTAINS. C. Satterwhite[2], K. Righter[1], R. Funk[2], R. Harrington[2], K. Pando[2], C. Calva[3,] [1]Mailcode XI2, NASA Johnson Space Center, Houston, TX 77058; [2]Jacobs JETS, NASA Johnson Space Center, Houston, TX 77058; [3]Barrios Technology – Jacobs JETS Contract, NASA Johnson Space Center, Houston, TX 77058.

Introduction: The US Antarctic Meteorite Program has visited the Dominion Range in the Transantarctic Mountains during several different seasons, including 1985, 2003, 2008, 2010, 2014 and 2018. Total recovered meteorites from this region is close to 3000 [1]. The 1985 (11 samples), 2003 (141 samples), 2008 (521 samples), 2010 (901 samples), 2014 (562 samples) seasons have been fully classified, and 2018 (865 samples) are in the process of being classified and characterized. Given that close to 2200 samples have been classified so far, with more expected in 2020, now is a good time to summarize the state of the collection. Here we describe the significant samples documented from this area, as well as a large meteorite shower that dominates the statistics of the region.

Significant samples: The Dominion Range has yielded some very important and interesting samples, including: (a) a large group of low grade CO3 chondrites that includes DOM 08006 and DOM 08004 which have provided interesting results on organic compounds [2,3], pre-solar grains [4], and refractory inclusions [5]; (b) DOM 14021 a large EH3 chondrite; (c) DOM 10077 and paired CR2 chondrites; (d) DOM 08001, a large brecciated eucrite (Figure 1), DOM 10100, a large howardite that contains clasts of dacitic material as well as harzburgitic mantle material illustrating the lithologic diversity that is possible in HEDs [6,7]; (e) DOM 03183 and paired masses that are CM2 material with unique inventories of volatiles [8,9,10]; (f) the small and rare CM1 chondrite DOM 14239, recording highly aqueously altered lithologies [11]; (g) DOM 14170, a spectacularly oriented ungrouped iron meteorite specimen (Figure 2); (h) DOM 10848, DOM 10302, and DOM 08002 - H, L and LL chondritic impact melts, respectively; (i) DOM 10490, an LL3.2 chondrite; (j) DOM 10122, a metal-rich mesosiderite; (k) DOM 10662 - a rare highly shocked (mosaicised olivine and pyroxene) ureilite; (l) the very recent recovery of DOM 18262 and 4 other paired masses of lunar polymict breccias that are dominated by basaltic materials [12]. This great diversity of samples suggests more interesting samples will come from the Dominion Range. These have contributed to understanding differentiated bodies, volatile-rich asteroids, and complicated impact histories of ordinary chondrites.

Presence of a large L chondrite shower: During characterization of the larger 2008 and 2010 season sample suites it became clear that a large shower dominates the DOM dense collection area (DCA). Although initially this was identified as an LL shower, additional samples and analysis revealed that it is in fact an L chondrite shower with the olivine content predominantly $Fa_{25\text{-}26}$ [13]. This shower comprises ~60% of all samples recovered in those two seasons. Nearly 1500 equilibrated ordinary chondrites (EOC) from the Dominion Range have been measured for magnetic susceptibility (Figure 3) using the pocket contact probe SM30 (ZH Instruments). Many of these were also classified by SEM and/or electron microprobe.

Figure 1: The DOM 08001 brecciated eucrite – a 1.3 kg meteorite.

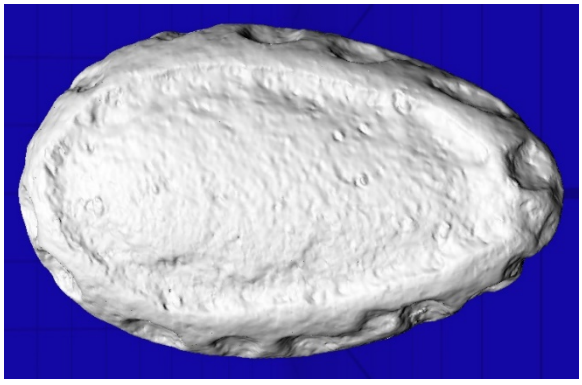

Figure 2: Laser 3D image of DOM 14170, a flight oriented iron meteorite; length of sample is approximately 7 cm.

Combining the new MS measurements on the 2003, 2008, and 2010 samples with the SEM and electron microprobe measurements on the 2010 and 2014 samples has led to re-classification of a significant portion of the equilibrated ordinary chondrites from the Dominion Range. Measurements on 2,043 samples reveal 72% L, 21% H, and 7 % LL chondrites from this DCA; nearly 800 samples from the 2018 season are awaiting classification and will add to this story. The EOC samples from DOM will thus allow more accurate and meaningful comparisons to be drawn between this pairing group and some other Antarctic EOC pairing groups such as from the Queen Alexandra Range (QUE), and Lewis Cliffs Ice Tongue (LEW) [14,15]. The QUE shower characterized by [14] consisted of ~ 2000 specimens with a total mass near 60-70 kg, <1% of the estimated pre-atmospheric size and mass of 150 cm and 50,000 kg respectively. The Dominion Range shower may be of comparable size – even the 15 samples studied in [13] comprise a total mass of ~ 15 kg. There are at least 1000 additional samples that have been collected of smaller size, but the total mass could easily approach the QUE shower.

Conclusions: The Dominion Range hosts a diversity of meteorite types that provide information about early solar system differentiation, volatile inventories, pre-solar processes, aqueous alteration, and regolith and impact breccia formation (chondrites and polymict HEDs). In addition, the large L chondrite shower may provide an opportunity to document the nature of a near Earth asteroid (NEA) impactor. Further characterization of this shower could yield insights into its pre-atmospheric size and mass and add to the number of large showers represented in the US Antarctic meteorite collection.

References: [1] Corrigan, C.M. et al. (2014) A Statistical look at the US Antarctic Meteorite Collection. *35 Seasons of US Antarctic Meteorites (1976-2010): A Pictorial Guide to the Collection*, 173-187; [2] Burton, A. S., et al. (2012) MaPS 47, 374-386; [3] Bonal, L. (2015) GCA 189, 312-337; [4] Davidson, J., et al. (2019) GCA 265, 259-278; [5] Simon, S. B. and Grossman, L. (2015) MaPS 50, 1032-1049; [6] Hahn, T. et al. (2017) MaPS 52, 1176-92; [7] Hahn, T. et al. (2018) MaPS 53, 514-546; [8] Alexander, C.M. O'D. (2007) GCA 71, 4380-4403; [9] Garenne, A. et al. (2016) Icarus, 264, 172-183; [10] Smith, K.E. (2014) GCA 136, 1-12; [11] Howard, K.T. (2011) GCA 75, 2735-2751; [12] Satterwhite, C.E. et al. (2019) AMN 42, no. 2; [13] Satterwhite, C.E. et al. (2017) LPSC abstract 2396; [14] Welten, K. et al. (1999) MaPS 34, 559-569; [15] Welten, K. et al. (2011); MaPS 46, 177-196.

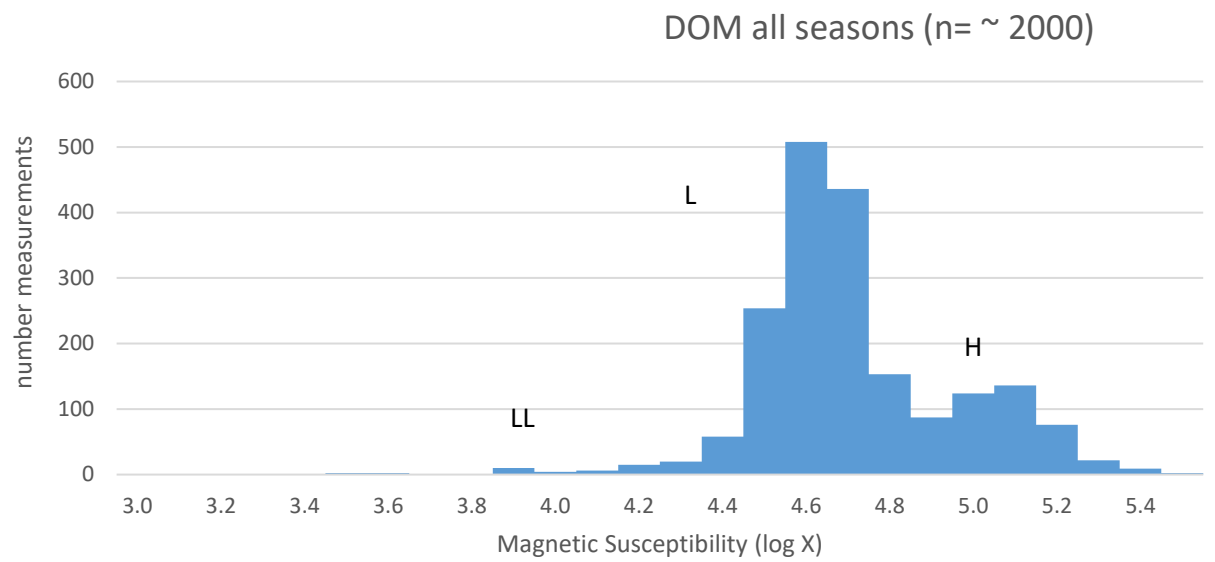

Figure 3: Histogram of log$X$ values for 2,043 equilibrated ordinary chondrites from the Dominion Range.