METEORITE FALLS OBSERVED IN U.S. WEATHER RADAR DATA IN 2015 AND 2016 (TO DATE)

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Introduction: To date, over twenty meteorite falls have been located in the weather radar imagery of the National Oceanic and Atmospheric Administration (NOAA)'s NEXRAD radar network [1-4]. We present here the most prominent events recorded since the last Meteoritical Society meeting, covering most of 2015 and early 2016.

Meteorite Falls: The following events produced evidence of falling meteorites in radar imagery and resulted in meteorites recovered at the fall site.

Creston, CA (24 Oct 2015 0531 UTC): This event generated 218 eyewitness reports submitted to the American Meteor Society (AMS) and is recorded as event #2635 for 2015 on the AMS website. Witnesses reported a bright fireball with fragmentation terminating near the city of Creston, CA, north of Los Angeles. Sonic booms and electrophonic noise were reported in the vicinity of the event. Weather radar imagery records signatures consistent with falling meteorites in data from the KMUX, KVTX, KHNX and KVBX. The Meteoritical Society records the Creston fall as an L6 meteorite with a total recovered mass of 688g.

Osceola, FL (24 Jan 2016 1527 UTC): This daytime fireball generated 134 eyewitness reports on AMS report number 266 for 2016, with one credible sonic boom report. The fireball traveled roughly NE to SW with a terminus location north of Lake City, FL in sparsely populated, forested countryside. Radar imagery shows distinct and prominent evidence of a significant meteorite fall with radar signatures seen in data from the KJAX and KVAX radars. Searchers at the fall site found that recoveries were restricted to road sites by the difficult terrain, and yet several meteorites were recovered. Evidence indicates that this was a relatively large meteorite fall where most of the meteorites are unrecoverable due to terrain. Osceola is an L6 meteorite with 991 g total mass recovered to date.

Mount Blanco, TX (18 Feb 2016 0343 UTC): This event produced only 39 eyewitness reports and is recorded as AMS event #635 for 2016. No reports of sonic booms or electrophonic noise are recorded in the AMS eyewitness reports, but videos of the event show a relatively long-lasting fireball with fragmentation. Evidence of falling meteorites is seen in radar imagery from the KAMA and KLBB radars defining a roughly WNW to ESE trend with the dominant wind direction. This event featured favorable search ground composed mostly of farmland and ranchland and was extensively searched. Rather surprisingly, only a single L5 chondrite of 36.2g has been recovered to date.

Probable Meteorite Falls, Currently Unrecovered: The following events produced convincing evidence of a meteorite fall as seen in radar imagery, with no meteorites recovered to date for a variety of reasons.

Unnamed Event Near Locust Grove, GA (17 Dec 2015 2333 UTC): This event is recorded as AMS event #4047 for 2015, as a daytime fireball south and east of Atlanta. Radar imagery shows evidence of a small meteorite fall in terms of number of falling meteorites, seen in data from the KFFC radar. The timing of a signature seen in KFFC 2333 1.5 degree radar sweep indicate a mass in the multi-kg range reached the ground, and local eyewitnesses reported "crashing noises" in the woods at the calculated fall site. No meteorites have been recovered to date.

Unnamed Event Near Rainsburg, PA (30 Jan 2016 2317 UTC): This event is recorded as AMS event #340 for 2016, with an impressive 969 eyewitness reports and multiple videos. This fireball terminated over mountainous, wooded terrain. It appears in radar imagery from the KCCX, KLWX, and KPBZ radars for a total of seven radar sweeps. Calculations based on the timing of the radar data suggest masses as large as ~500g reached the ground.

Unnamed Event into the Atlantic Ocean off of Florida (06 Mar 2016 0107 UTC): This event is recorded as AMS event #901 for 2016 with 102 eyewitness accounts, to include reports of electrophonic sound and sonic booms from St. Augustine, FL. The fireball traveled S to N and terminated over the ocean east of Jacksonville, FL. Radar imagery from the 0107 UTC data set from the KJAX radar are consistent with a meteorite fall into the Atlantic Ocean. The authors note that this event occurred shortly after a certain NASA HQ official communicated a request to the authors to locate a "lunar meteorite fall", and respectfully request that he is more specific as to the location of said fall in the future. On the other hand, as far as anyone can tell we successfully fulfilled the request.

Unnamed Event near Black Earth, WI (03 Apr 2016 0015 UTC): This daytime fireball produced a relatively small number of eyewitnesses, only 19 on AMS event #1258 for 2016. The terminus calculated by the AMS site perfectly matches the appearance of radar signatures from the KGRB and KARX radars. The total radar reflectivity of these returns suggests that this is a small meteorite fall in terms of total mass and number of meteorites, and no meteorites have been recovered to date.

References: [1] Fries M. and Fries J., *MAPS* 45, 9 (2010) 1476-1487. [2] Jenniskens P. et al, *Science* 338, 6114 (2012) 1583-1587. [3] Brown P. et al *MAPS* 46, 3 (2011) 339-363. [4] Fries M., LeCorre L., Hankey M., Fries J., Matson R., Schaefer J., Reddy V. *MAPS* 49, 11 (2014) 1989-1996.