THE LORTON, VIRGINIA, USA, METEORITE FALL. C. M. Corrigan[1] M. D. Fries[2], L. C. Welzenbach[1], T. J. McCoy[1], and J. Fries[3]. [1]Dept. of Mineral Sciences, National Museum of Natural History, Smithsonian Institution, Washington DC, USA. [2]Planetary Science Institute, 1700 East Fort Lowell St, Suite 106, Tucson, Arizona, USA, [3]U. S. Air Force Weather Agency, 1[st] Weather Group, Offutt AFB, Omaha, NE, 68113, USA. E-mail: *corriganc@si.edu*.

Introduction: On Monday, January 18, 2010, a large fireball was reported by viewers in the greater Washington, DC, USA, area. Viewers from as far away as West Virginia have described seeing a large, single fireball at 5:45 PM, near dusk that evening, with some reporting having heard a large detonation. One stone has been recovered to date, that having fallen through the roof/ceiling of the Williamsburg Square Family Practice in Lorton, VA. The doctors, who were in the office at the time the meteorite fell, found the meteorite embedded into the concrete floor (under the carpet). It had broken into three large pieces, along with a few smaller fragments upon impact with the floor. The doctors describe hearing a sound akin to bookshelves crashing to the ground as the meteorite fell through the ceiling. This meteorite fall, the first fall on record in the DC area (nearest being Richmond, VA, 1828; St. Mary's County, MD, 1919; and Sharps, VA, 1921 [1]), and who's fireball was seen by many people on their evening commute, garnered an enormous amount of public/media interest.

The Meteorite: The meteorite in question (Figure 1) was brought to the Smithsonian Institution on Wednesday, January 20, 2010, for identification/classification purposes. The meteorite is approximately 8 cm x 5 cm x 5 cm, and is roughly rectangular, with a dark, matte, fusion crust. The meteorite contains a few small clasts visible on the broken surfaces. The interior is, not surprisingly, exceptionally fresh, with no evidence of oxidation of the metal grains. The metal grains are very small and evenly distributed throughout the rock. A few small (2 mm) relict chondrules are visible with the naked eye. The total mass recovered is 329.7 grams.

Petrography and Mineral Chemistry: This new meteorite is an L6 chondrite. Olivine composition is Fa: 24.7 ±0.3 (n=23). Pyroxene composition is Fs: 20.9 ± 0.3, Wo 1.6 ±0.2 (n=16). Feldspar composition is An: 10.3 ± 0.3, Or 6.4 ±2.8 (n=14). This meteorite shows irregular fractures, but no undulose extinction in the olivine grains, and is, therefore, shock stage S1. No shock veins are present. Chondrules are rare, but when present, show diffuse outlines and some degree of recrystallization, with many crystals exhibiting 120-degree triple junctions. Metal and sulfide occur mostly as separate, blocky, grains found throughout the meteorite.

Lorton: This meteorite has been approved by the meteorite Nomenclature Committee with the name of Lorton. The meteorite has been acquired by the Smithsonian Institution in its entirety. The intent is to display a portion of the meteorite, and to make material available for research purposes.

Figure 1: The Lorton meteorite, as received by the Smithsonian Institution, January 20, 2010.

Doppler Weather Radar: The Lorton fall appears in NEXRAD radar data collected by the KLWX radar at Dulles Int'l Airport, as seen in four separate radar sweeps. [2, 3, 4] First appearance of falling debris occurs at 2246:26 UTC and 3357m above local ground level. Three additional radar returns occur between 2529 m down to 466 m above local ground level, with the last and furthest east appearance seen at 2249:00 UTC. Radar signatures of the fall are also seen in Terminal Doppler Weather Radar (TDWR) imagery. TDWR radars are short range, high spatial resolution, 5-cm wavelength radars installed near airports for hazard avoidance purposes. This is the first reported instance of a meteorite fall in TDWR data. Apparent signatures of the Lorton event appear in data from TDWR radars serving Andrews AFB, Dulles, Reagan National, and Baltimore-Washington International airports (TADW, TIAD, TDCA and TBWI radars, respectively). TDWR radar data is publicly available and is distributed through the same Internet portal as NEXRAD data.

Many eyewitness reports are available for the Lorton event, but most of those were made on local news and weather blogs. These reports suffer considerably from the lack of a common reporting format and most lack information such as the observed direction, travel direction, time, location of the observer and other critical items. Due to conflicting reports, there is ambiguity as to the direction traveled by the fireball although a pair of digital photos of the fireball's dust trail taken from NE Washington, DC, shows an apparent angle of ~80° below horizontal from that vantage point.

A combination of NEXRAD and TDWR radar signatures appear in a sequence that generally moves from east to west, suggesting that the fireball was traveling roughly north to south as opposed to S-N (Figure 2). Since smaller masses have lower terminal velocities than larger masses, smaller meteorites will take longer to reach the interaction volume of the radars and thus appear later. Winds aloft were running as high as 50 m/s out of nearly due west, carrying falling meteorites towards the east. A N-S fireball path means that the largest meteorites in a strewn field (if it exists) will be found closest to the site of the single recovered stone, and smaller meteorites will have been carried further north and east. A "dark flight" model based on the physics of falling bodies shows that most of the radar returns in Figure 2 appear to lie in the 10s of g mass range.

Radar returns in the Lorton event appear lie along two lines extending towards the east, along with prevailing winds (white lines in Figure 2). The presence of these two distinct lines may be happenstance, or they may the product of two separate fragmentation events during the fireball's deceleration.

References: [1] Grady M., *Catalogue of Meteorites*, 2000, Cambridge. [2] Fries M. and Fries J., *Meteoritics and Planetary Science* **45**, 9 (2010) 1476-1487. [3] Fries M. and Fries J. *LPSC* 40, #1179. [4] Fries M., Fries J. and Schaefer J., *LPSC* 41 (this issue).

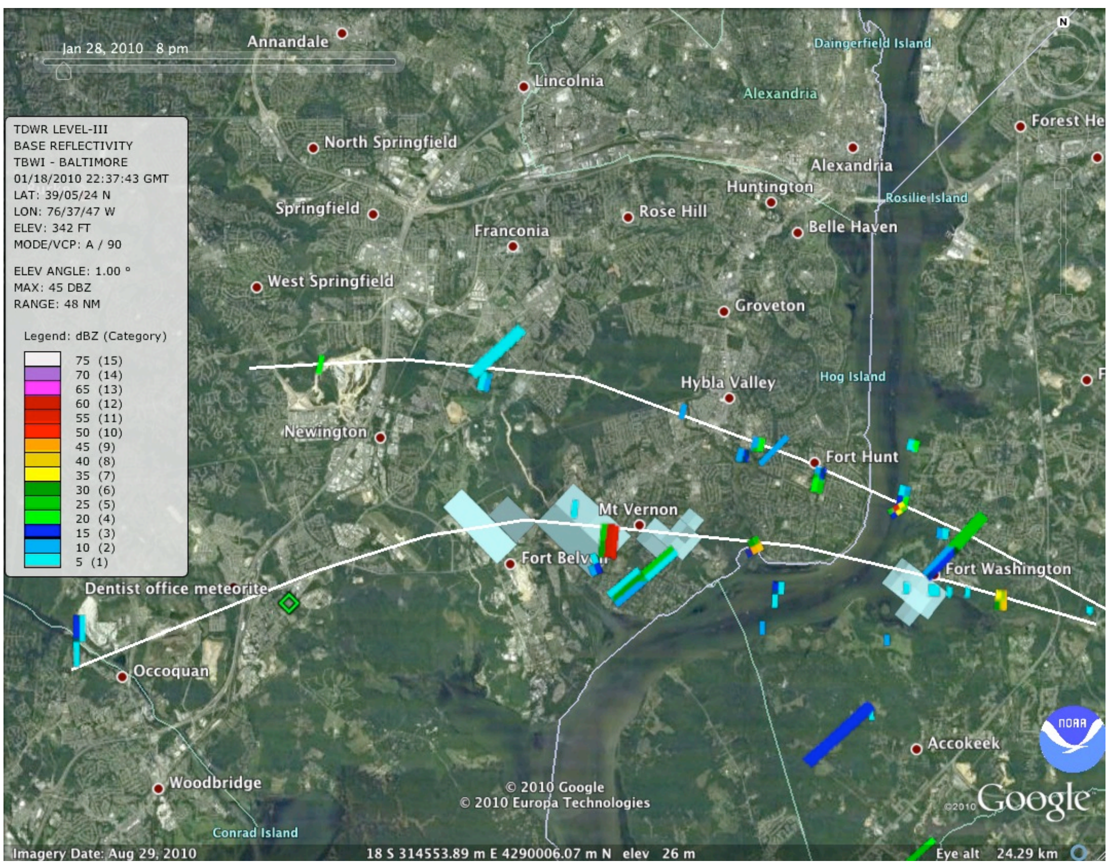

Figure 2, Radar synopsis of the Lorton event. The green diamond to lower left is the location of the single stone recovered to date. NEXRAD radar signatures are shown as large grey pixels and TDWR signatures are smaller, higher spatial resolution pixels colored according to the color scheme at left. Note how the radar returns appear to lie along two distinct paths (white lines), which may be the result of two major fragmentation events during the fireball's deceleration. To date only the single stone marked by the green diamond has been recovered.