RAPID RECOVERY OF A NEW CHONDRITE METEORITE NEAR NATCHEZ, MISSISSPPI

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Introduction: On April 27, 2022 at 8:03 a.m. CDT (1303 GMT) multiple eyewitnesses from Arkansas, Louisiana and Mississippi reported a bolide and sonic booms (AMS Event 2022-2591)[1]. NASA- Marshall Space Flight Center's Meteoroid Enviroment Office Lead Scientist Bill Cooke shared the event at 4:51p.m. on the NASA Meteor Watch Facebook Page. Cooke reported that the bolide was produced by a 40 kg object of approximately 0.3 meters in diameter, moving at approximately 56,327 kph. Observations show that the object broke apart roughly 34 miles above the ground. Late on the 28th, citizen scientist Eric Rasmussen contacted NASA- Johnson Space Center (NASA-JSC) scientist Marc Fries suggesting that there were very strong Doppler radar reflections near the time of the reported fireball. Fries posted his Doppler radar and dark flight model results on 29 April on the NASA-ARES website. On April 30, 2022 at 2:44 p.m., the first two meteorites were recovered 16.9km east of Natchez, MS on the shoulder (31°33'06.1"N 91°11'36.6"W) and median (31°33'08.9"N 91°11'25.9"W) of U.S. Hwy 84E. When officially confirmed, this meteorite will represent the fifth officially approved meteorite from Mississippi. It is the first recovered in MS since *Tupelo* (EL6 find) in 2012, and also the first fall in MS in 100 years, since the *Baldwyn* L6 chondrite fell in 1922.

Figure 1: Top shows radar returns overlaying the dark flight model showing predicted masses 10g or less in yellow, 10-100g in orange and greater than 100g orange to red. Bottom: As of this writing at least 10 identified masses (many broken) have been collected.

Strewnfield Model: *Doppler radar returns.* Weather radars (Fig. 1 top) in the NOAA NEXRAD network detected signatures of falling meteorites in eleven radar sweeps by four separate radars [2]. The first detection occurred 73 s after bolide terminus at an altitude of 11,257 m above sea level (ASL). The last detection occurred 358 s after terminus with detections occurring between 2,115 and 13,704 m ASL.

Early strewnfield map. A strewnfield map was calculated using the Jörmungandr dark flight model (Fig. 1 top). Average mass in each radar sweep was estimated using change in altitude and time from the terminus. Masses range from 1.3 to 251g, with the caveat that larger masses commonly evade radar detection. The calculated strewn field estimates where meteorites of a given mass may lie, with the simpifying assumption that all meteorites originate from a common point at the terminus. The estimated strewn field and calculated landing sites for the radar signatures agree very well (Fig. 1 bottom).

Preliminary Type Classification: The two stones, N1 (41.31g) (Fig. 2) and N2 (37.64g) (Fig. 3), were collected 30 April prior to 1 May rain, cleanly, using baked-out aluminium foil and bagged in Teflon for transport. The samples were weighed two days later at NASA-JSC, photographed and then measured for their magnetic susceptibility. The Log X value for N1 is 5.06 and for N2 is 5.08, suggesting that the stones fall in the range of values expected for L chondrites [3]. N2 is a broken stone revealing a matrix with clasts ranging from millimeters to centimeters in size. Clasts are poorly defined at margins, irregularly shaped and include a variety of textures suggesting that the meteorite represents a polymict breccia. Chondrules, when visible, are better preserved within clasts. The surrounding darker mottled matrix shows a wide range of millimeter-sized lighter colored irregularly shaped grains and chondrule fragments. Imagery of other stone fragments are also of mixed color and texture. XCT will be employed to characterize the range and degree of brecciation. Microprobe analyses are underway to confirm chemistry and petrology for a complete classification and subsequent submission to the Meteoritical Society Nomenclature committee.

Figure 2: N1 insitu on the shoulder along U.S. Hwy 84E.

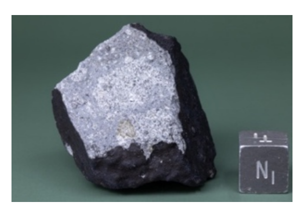

Figure 3: N2 interior exhibiting brecciated texture.

References: [1] Hankey M. F. et al. 1997. *American Meteor Society* Event 2022-2591.[2] Fries, M. and Fries, J., 2010. *Meteoritics & Planetary Science*, 45(9),1476-1487. [3] Rochette P. et al. 2003. *Meteoritics & Planetary Science* 38:2, 251–268.