Abstract These files supplement Jenniskens et al. (2012), a comprehensive description of the April 22, 2012 fall and the petrology of the Sutter's Mill CM2 chondrite breccia. Here, we present 3-dimensional scans of individual stones of this meteorite. A "Methods" document in this repository records particulars of CT (see Ebel and Rivers 2007).

In the Science paper, we note that "samples SM3 and SM9 appear to contain a dominant lithology characterized by abundant 200 to 400 µm diameter clasts (chondrules or CAIs), and 0.05 - 0.15 µm metal oxide or sulfide grains. A second lithology, with higher average atomic mass (Z) matrix and more abundant clasts, appears as irregular, angular lithic fragments many mm in size. At least one metal grain ~250 µm across, was observed, surrounded by a halo ~750 µm wide, of oxidized or sulfidized metal. It is unlikely that such a grain would be sampled by random cutting. Several clasts larger than 1 mm include a low-Z spherical object that appears to be concentrically zoned, and a similar object with zoned high-Z (metal) and low-Z (silicate) layers. While the samples are fractured, and metal grains appear to be altered, no high-Z veins (e.g., FeO-rich) are observed." And, "the meteorites studied so far exhibit a dominant, primary lithology that is the host for multiple types of exotic lithic clasts." This lithology is evident in most of SM3. In SM3_13A, at ~30/45 sec running time, more lithic clasts appear, and a large metal-cored grain rimmed by metal sulfide or oxide, appears briefly.

The oriented sample SM51 illustrates the asymmetry of fusion crust, thick on the trailing side, very thin on the leading side (top of movie), and thickest at the 'lip' between these surfaces (image right). A slightly brighter clast (higher average Z) that intersects the leading side fusion crust at ~60/100 sec illustrates a small effect of its composition on crust thickness and composition. A clast-poor lithology is prevalent through the first half of the stack. A large metal grain is present at ~57/100. Two large chondrules appear in SM51 at ~72/100 sec, and the lithology between there and the end is rich in low Z (forsterite-rich?) spherical clasts.

In SM54S, fusion crust is very prominent, sweeping left to right in the first few seconds. Several lithologies are present, perhaps four at ~11/83 sec. This sample has some low-Z terrestrial contamination, a reddish clay, that thinly fills small depressions in the sample at the bottom of the images.

References

Ebel, D. S. and M. L. Rivers. 2007. Meteorite 3-dimensional synchrotron micro-tomography: Methods and applications. Meteoritics and Planetary Science 42: 1627-1646.

Jenniskens, P. and 69 coauthors. 2012. Radar enabled recovery of the Sutter's Mill meteorite, a carbonaceous chondrite regolith breccia. Science 338: 1583-1587. DOI: 10.1126/science.1227163; Online Supplement: www.sciencemag.org/cgi/content/full/338/6114/1583/DC1