SEPARATE CAI RESERVOIRS FOR ALLENDE (CV3) AND MURCHISON (CM2) D. S. Ebel[1,2], and K. V. Fendrich[1] Department of Earth and Planetary Sciences, American Museum of Natural History, [2]Earth and Environmental Sci., CUNY Graduate Center. debel@amnh.org

Introduction: The Allende (CV3) and Murchison (CM2) carbonaceous chondrites fell in large abundance in 1969. Each has been the focus of a plethora of studies of all kinds [1, 2]. We recently reported 57% matrix in Allende and 72% in Murchison, the balance consisting of a broad range of inclusions: chondrules, chondrule fragments, isolated Mg-silicates, Ca-, Al-rich inclusions (CAIs) and amoeboid olivine aggregates (AOAs) with sizes and relative abundances also reported [3].

Methods: Samples were AMNH thick sections 4948-t2-ps5a and -ps9a (Allende, **A**) and 4377-t1-ps8a (Murchison, **M**) all from CT'd pieces. Methods closely follow [4] and [5]. Quantitative data for the two Allende sections were combined. Electron microprobe X-ray intensity maps (15kV, 40nA, 15ms dwell, 3µm/pxl, **M**; 15kV, 20nA, 20ms, 5µm/px, **A**) were processed to yield element counts per pixel for each of 1001 (**A**) and 1928 (**M**) inclusions, over total areas of 6.526 (163.16 mm^2, **A**) and 4.460 (40.14 mm^2, **M**) million pixels.

Results: We found area% 3.9 CAI, 2.0 AOA (**A**)and 1.2 CAI, 0.6 AOA (**M**), and apparent mean diameter (of equivalent circles to pixel areas) in micrometers (µm) of 93 CAI, 306 AOA (**A**) and 36 CAI, 72 AOA (**M**). For this work, both A and M counts/pixel for each inclusion were mapped to wt% using a conversion factor calculated by equating the total for all measured pixels of each sample, subtracting holes and cracks, to the bulk composition reported by [6]. Results for low-mobility (relative to Ca, Fe) Mg and Si are graphed in Figure 1. The average for each component type was calculated as the total X-ray counts among all pixels in that category, divided by pixels in that category, converted to wt%.

Discussion: Our results are broadly consistent with a commensurate and reliable subset of previous reports [3]. Mean "true" chondrule diameters [3] are 716 µm (**A**) and 184µm (**M**). Characteristic size differences were cited by [7], along with textural types, O isotopic compositions and petrographic properties of chondrules from different chondrite groups, to argue that each chondrite group sampled a unique chondrule reservoir. It was concluded by [7] that this constraint requires multiple (spatially and/or temporally) separate chondrule reservoirs, maintained for long time periods prior to local accretion into distinctly different chondrite parent bodies. This is consistent with the hypothesis of matrix-chondrule "complementarity" [8].

The size, compositional and textural differences between the CAIs and AOAs in Allende and Murchison tell a similar story to the chondrules of [7]. CAIs in **A** and **M** have previously been directly compared by [9], who concluded that CAIs in **M** experienced higher degrees of heating than those in **A**. Sizes are much smaller in **M**. Figure 1 illustrates that AOAs in **M** are more Mg and Si rich than those in **A**. One interpretation would be that the core CAIs, rimmed by forsteritic olivine (Fo), are much smaller relative to Fo rim thickness in **M** than in **A**. We are not aware of any study of the relative areas of these AOA parts. The Mg/Si ratios in CAIs also differ considerably between **A** and **M**. Both fall below the bulk Mg/Si ratio, but CAIs in **A** are much richer in Si than those in **M**. **A** contains more and larger Si-rich melted CAIs, containing melilite, anorthite and Ca-pyroxene, equilibrated with vapor at lower T than those in **M**. The ratio of the fraction of total Al in CAIs to the fraction of Si in CAIs is 3.03 in **A**, but 5.91 in **M**. Thus, the CAI populations are quite different between the CV (**A**) and CM (**M**) meteorites.

Chondrules incorporated CAIs and AOAs as precursors [10]. Extant CAIs and AOAs are then the "survivors" of chondrule formation. Different signatures in "survivor" CAIs implies different initial mixtures of chondrule precursors and/or different degrees of processing between the isolated reservoirs that accreted to form the CV and CM parent bodies.

Conclusions: The distinctly different refractory inclusion populations in Allende and Murchison either 1) formed elsewhere (e.g., near the Sun, [11]), were transported to the CV and CM reservoirs and then selectively incorporated into chondrules, or 2) formed from the separate CV and CM reservoirs prior to chondrule formation in those same reservoirs. Hypothesis (2) echoes the conclusion of [12]: it "is more straightforward to form characteristic populations of CAIs and characteristic populations of chondrules together", but hits [7]'s "biggest conundrum" in understanding chondrites: maintaining reservoir separation for long disk times.

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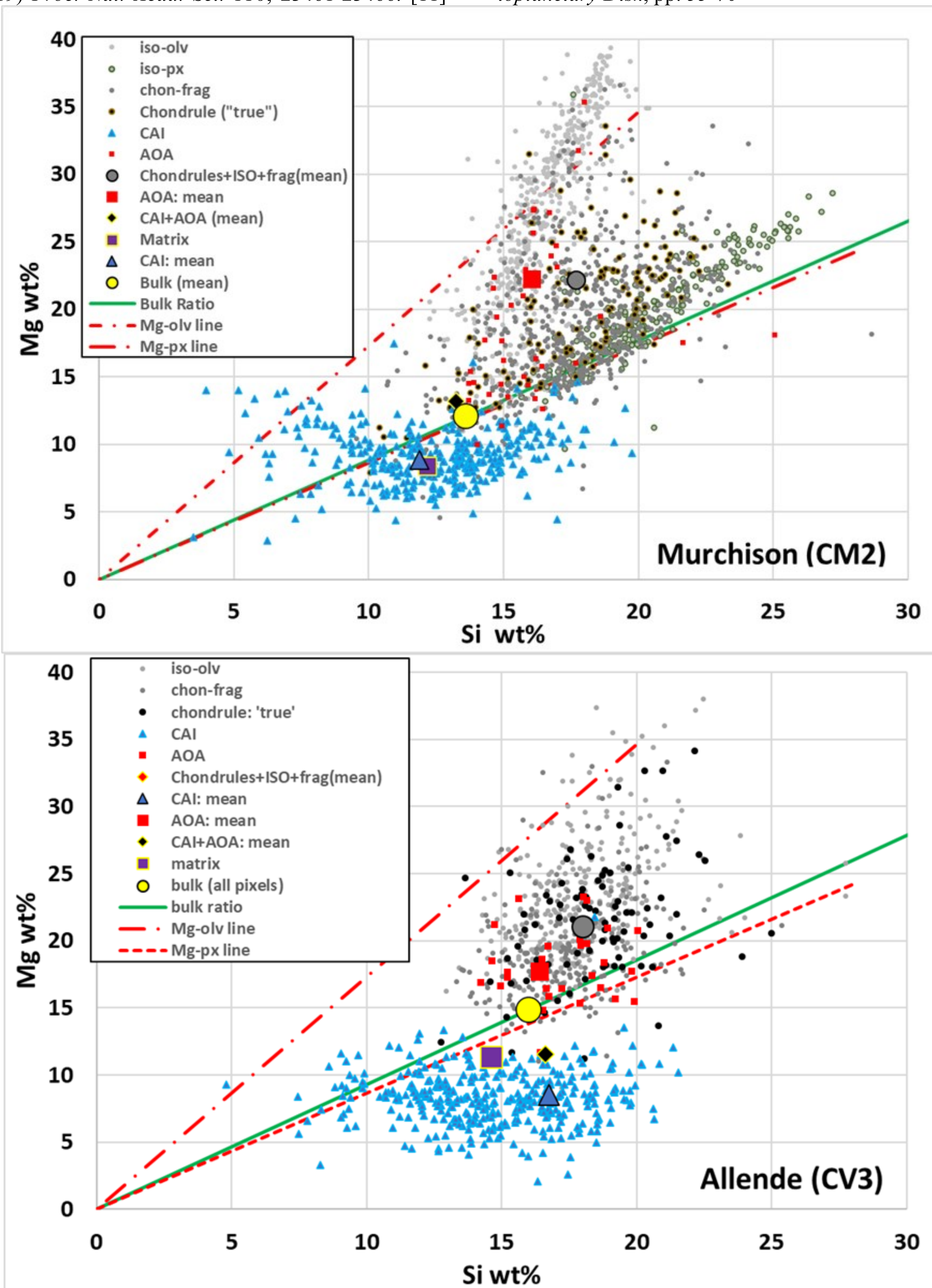

Figure 1: Mg/Si in inclusions, matrix and bulk, measured in Murchison and Allende [adapted from 3].