

MURCHISON AND ALLENDE: CONTRASTS AND PERSISTENT PUZZLES.

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Introduction: Murchison (CM2) and Allende (CV3ox) falls are 2/3 of the 1969 "annus mirabilis" for sample-based planetary science. Murchison, a least-altered CM2 [1], is a breccia with planetary noble gas-rich accretionary dust rimming coarse components in primary accretionary rock, and solar noble gas and solar wind tracks in regolith-sourced clastic matrix portions [2,3]. Allende is a primitive accretionary rock affected by aqueous alteration [3, 4].

Methods: In [5] we describe methods of image analysis used to query every pixel in high resolution x-ray maps, such that the abundances of elements per pixel may be obtained for every inclusion, all matrix pixels, and for the entire mapped area (bulk). Samples of Murchison (6.56 mm², 3µm/pxl, 15ms, 40nA, primary accretionary portion [3]) and Allende (422.97 mm², 4-5µm/pxl, 20ms, 20nA) were mapped and analyzed. The figure shows outlined (in white) portions of each at the same scale, in Mg-Ca-Fe composite X-ray mosaics.

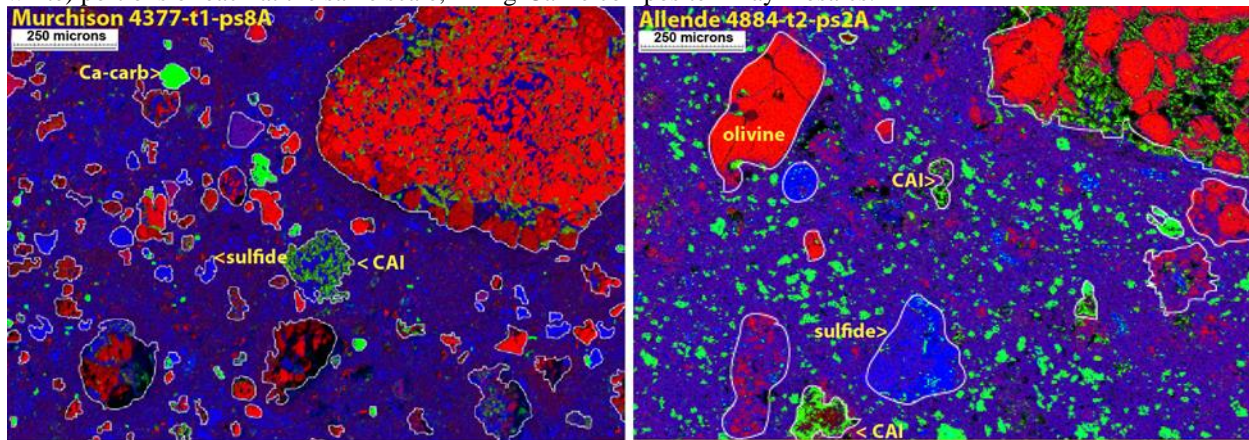


Fig. 1: Left: Murchison (partial), 3µm/pxl. **Mg-Ca-Fe = Red-Green-Blue** **Right:** Allende (partial), 4µm/pxl.

Results: Fig. 1 contrasts map portions at the same scale. Murchison has 23.3 vol% chondrules, 0.2 AOAs, 1.5 CAIs, 1.7 opaque phases, 2.1 isolated silicates and 71.3% matrix, compared to 35.5, 3.5, 4.3, 0.1 and 55.2% in Allende, respectively, based on our preliminary work. Murchison inclusions (Fig. 2) average 20% the size of Allende's.

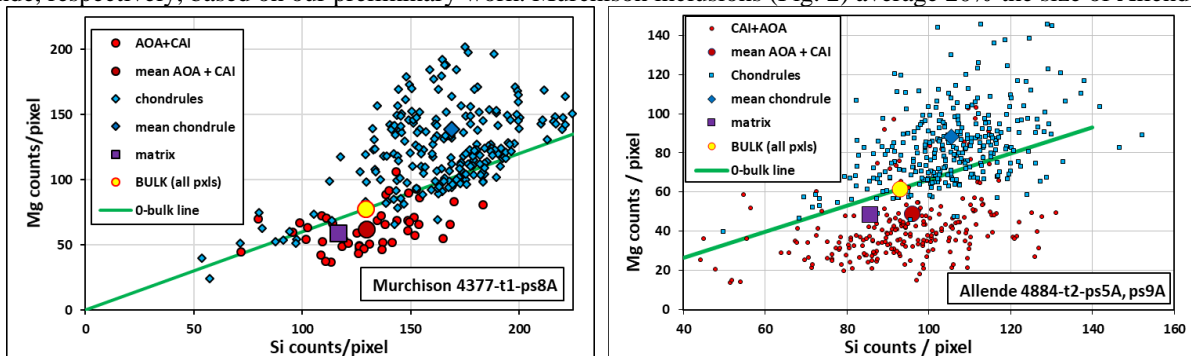


Fig 2: Mg-Si relationships as in [5]. Scales reflect different dwell time (ms) and current (nA). Matrix sums carbonate, opaques and isolated silicate. Both whole rock (bulk) Mg/Si are within a few % of the CI (solar) value.

Conclusion: Despite well-documented alteration, Murchison and Allende retain signals of chondrule and matrix origins in single reservoirs of precursors with ~solar Mg/Si. The role of CAIs and AOAs in Allende's 2.02 (± 0.11) and Murchison's 0.89 (± 0.03) mean (both flat) REE compositions (relative to Orgueil) remains mysterious [6].

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