ALLENDE 3509 HC-2: A COMPACT TYPE A - 'F' INCLUSION WITH A SNAKE-LIKE MORPHOLOGY.

H. C. Connolly Jr.[1,2,3], J. R. Beckett[4], G. R. Huss[5], K. Nagashima[5], E. D. Young[6], K. Ziegler[6], C. Ma[4], G. R. Rossman[4]. [1]Dept. Physical Sci., Kingsborough Community College of CUNY, Brooklyn NY 11235 & Dept. Earth & Envir. Sci., The Graduate Center of CUNY, New York, NY 10016, USA; [2]Dept. Earth & Planet. Sci., AMNH, New York, NY 10024, USA; [3]LPL, Univ. of Arizona, Tucson, AZ 85721, USA; [4]Div. of Geol. & Planet. Sci., Caltech, Pasadena, CA 91125, USA. [5]Hawai'i Institute of Geophysics & Planetology, Univ. of Hawai'i at Manoa, Honolulu, HI 96822, USA; [6]Dept. of Earth & Space Sci., UCLA, Los Angeles, CA 90095, USA; chondrule@haroldconnolly.com

Introduction: Calcium-, aluminum-rich inclusions (CAIs) are the first rocks to form in the Solar System. Some inclusions are igneous and a very few of these (called F inclusions) experienced significant mass dependant fractionation in oxygen [1], and in some cases, other isotopic systems (FUN inclusions). Increasing the number and types of F inclusions will provide additional constraints on CAI formation and their formation enviroments. We report here on a Compact Type A (CTA) inclusion from Allende with an overall snake-like morphology, is an F inclusion, and initial $^{26}Al/^{27}Al$ that was canonical.

Analytical methods: The entire inclusion, HC-2, was recovered from a slab of Allende 3509 (USNM). Major and minor element abundances were determined with the Cameca SX-50 at the LPL UAz. Oxygen isotopes and Al-Mg isotopic systematics were analyzed for on the Cameca 1280 ion microprobe at the Univ. of Hawai'i, Manoa [2]. Si isotopes were analyzed by LA-MC-ICPMS at UCLA.

Results: HC-2 has an overall morphology that is snake-like, wrapping throughout a 1.5 cm thick (total width is ~ 0.75 cm) section of the meteorite, inspiring it to be nicknamed The Snake. It has a Wark-Lovering rim on both sides, although the rim is thicker on one side. The inclusion has experienced some brittle deformation. HC-2 is dominated by spinel (Ti = 0.14-0.37; V = 0.44-0.64; Cr = 0.08-0.14; all wt%) and melilite (Ak = ~4 to ~50). Perovskites are numerous, ranging in size from sub-micron to ~ 0.5 mm. There appear to be two smaller (~400 μm) CAIs that are mineralogically layered included.

SIMS analysis on spinel and melilite yield an isochron with an initial $^{26}Al/^{27}Al$ of (4.9±0.2) x 10^{-5}. $\Delta^{25}Mg$ (variations from the standard in stable Mg isotope) range from ~ 5 to 13‰. *Oxygen isotopes:* Melilites have $\delta^{18}O$- $\delta^{17}O$- values that span approximately 10‰ and plot on the CCAM line near the TF line. Two perovskite grains are isotopically different with $\delta^{18}O$, $\delta^{17}O$ of (in ‰) ~ -28, -31 in one and -40, -44 in the other. Overall, the spinels are ^{16}O-rich and show a clear mass fractionation of 4‰/amu, ($\delta^{18}O$ = -34 to -42‰; $\delta^{17}O$ = -41 to - 45‰) with the overall trend to the right of the CCAM line.

Conclusion: HC-2 is clearly igneous. The reason for its unusal shape is not clear, but it must have formed while plastic. Based on the stable isotope data, HC-2 experienced considerable mass-dependent isotopic fractionation, most likely while molten and while ^{26}Al was present. We will compare our data to other 'F' inclusions to place new constraints on CAI formation and the environment in which they formed.

References: [1] Bullock E. S. et al., 2011. 42nd *Lunar. Planet. Sci. Conf.* abst. # 2312. [2] Kentaro et al., 2009. *GCA.* [3] Shahara and Young, 2009. *EPSL.*