SPATIAL VARIATION OF PRESOLAR SILICATE ABUNDANCES IN CO3 CHONDRITES: CORRELATION WITH AQUEOUS ALTERATION? P. Haenecour[1,2], C. Floss[1,3] and T. J. Zega[4]. [1]Laboratory for Space Sciences, [2]Department of Earth and Planetary Sciences, [3]Department of Physics, Washington University, One Brookings Drive, St. Louis, MO 63130, USA (haenecour@wustl.edu). [4]Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721, USA.

Introduction: Because of their higher susceptibility to heating and alteration processes than other types of circumstellar grains, presolar silicates can be a useful tool for understanding secondary processes (e.g., thermal metamorphism, aqueous alteration) acting in the early solar system history [1].

Using a multi-technique approach, we are studying the effect of aqueous alteration on the abundances and elemental compositions of presolar silicates in distinct fine-grained areas in CO3.0 chondrites. These meteorites have experienced only minimal secondary processing [2, 3] and, thus, provide direct information on the processes affecting fine-grained material in the early solar system.

Experimental methods: We have carried out additional NanoSIMS raster ion imaging of $^{12,13}C$ and $^{16,17,18}O$ in multicollection mode in LAP 031117 and DOM 08006 to identify presolar grains. We mapped a total of 12,800 μm^2 in LAP 031117 and 14,900 μm^2 in DOM 08006 (each image = 10×10 μm^2). We will use the Auger Nanoprobe to determine the elemental composition of the presolar grains identified. We will also carry out FIB-TEM analysis as described in [4] to characterize the mineralogy and degree of alteration of several fine-grained areas.

Results and discussion: We identified a total of 51 O-anomalous grains and six C-anomalous grains in the matrix of DOM 08006, corresponding to abundances of 216 ± 30 ppm and 31 ± 13 ppm, respectively. Our estimate is consistent with a previous estimate by [5] (240 ± 25 ppm) but significantly higher than the abundance in a fine-grained chondrule rim (FGCR, 45 ± 23 ppm) in this meteorite. We previously reported the observation of systematic differences in the O-anomalous grain abundances between the matrix and FGCRs in CO3.0 chondrites (LAP 031117, ALHA77307 and DOM 08006) [6]. Further comparison of the presolar grain abundances between distinct matrix areas in LAP 031117 shows that there are also large variations of the O-anomalous grain abundances (up to ~200 ppm) between distinct matrix areas. We carried out initial FIB-TEM analysis of two areas to try to understand the reason for those variations. Our initial TEM analysis of a matrix area and a FGCR in LAP 031117 indicated that, while the matrix area is mostly composed of anhydrous amorphous material, the FGCR shows clear evidence of aqueous alteration, with the presence of phyllosilicates. Those results provide a good explanation for the variations in presolar grain abundances, with a higher abundance in the more pristine matrix area (291 ± 54 ppm) than in the aqueously altered FGCR (98 ± 25 ppm). These observations suggest that the spatial variation of presolar grain abundances in LAP 031117 might reflect various degrees of aqueous alteration. We will acquire FIB-TEM data in additional areas to confirm this initial observation.

References. [1] Floss & Stadermann (2012) MAPS 47, 992–1009. [2] Brearley A.J. (1993) *GCA* 57, 1521–1550. [3] Davidson et al. (2014) LPSC XLV, #1384. [4] Zega et al. (2014) LPSC XLV, #2256. [5] Nittler et al. (2013) LPSC XLIV, #2367. [6] Haenecour et al. (2013) LPSC XLV, #1316.