**Heterogeneous Distribution of Supernova Silicate and Oxide Grains in the Solar System?** P. Haenecour[1], C. Floss[1], and T. Yada[2]. [1]Laboratory for Space Sciences and the Physics Department, Washington University in St. Louis, 1 Brookings Dr., St. Louis, MO 63130, USA. (haenecour@wustl.edu). [2]Japan Aerospace Exploration Agency, Institute of Space and Astronautical Science, Sagamihara, Kanagawa 252-5210, Japan.

**Introduction:** Group 4 presolar silicate/oxide grains are characterized by large enrichments in $^{18}O$ relative to solar. While their possible origin(s) remained enigmatic for many years, they are now thought to have a supernova origin [1]. Previous studies [e.g., 2] have noted a higher abundance of Group 4 grains in Antarctic micrometeorites (AMMs, ~37%) and interplanetary dust particles (IDPs, ~33%) than in meteorites (~11%). This observation was interpreted to possibly reflect a heterogeneous distribution of presolar grains in the solar nebula. However, previous data on AMMs were limited. Here we report new data from AMMs that support this initial suggestion.

**Methods and Results:** We carried out NanoSIMS raster ion imaging of C and O isotopes in eight fine-grained AMMs. A focused $Cs^+$ primary beam of ~1 pA (~100 nm in diameter) was rastered over surface areas of 10×10 $\mu m^2$ ($256^2$ pixels) and the $^{12,13}C^-$ and $^{16,17,18}O^-$ secondary ions, as well as secondary electrons were collected in multi-collection mode. The total area mapped was 38,900 $\mu m^2$. We identified 65 O-anomalous presolar grains. Based on the classification proposed by [3], 45 of the 65 O-anomalous grains are Group 1 grains with enrichments in $^{17}O$ relative to solar and close to solar $^{18}O/^{16}O$ ratios. Sixteen grains are $^{18}O$-rich and belong to Group 4 and four are Group 3 grains with depletions in $^{18}O$ and (sub)solar $^{17}O/^{16}O$ ratios.

**Discussion:** Based on the 65 O-anomalous grains identified in our study, we estimated an abundance of Group 4 grains of 25%, similar to the initial estimate for AMMs [2]. Considering all the presolar silicate/oxide grains reported in this study and the presolar grain database [4], the average abundances of Group 4 grains are 27%, 31%, and 10%, respectively, for AMMs, IDPs and meteorites. This estimate, based on a large number of silicate/oxide grains, suggests a heterogenous distribution of supernova presolar grains in extraterrestrial materials. Supernova mixing calculations [1] show that the O isotopic compositions of many Group 4 grains fall along a single mixing line, suggesting that they may have originated from a single supernova source that injected material into the early solar nebula [e.g., 5, 6]. This differs from carbonaceous grains of supernova origin, which do not show evidence for a single dominant source [1]. This model has also been invoked to account for the presence of short-lived radionuclides, such as $^{26}Al$ and $^{60}Fe$, in early solar system materials [e.g., 5, 7]. A nearby supernova could also have triggered the collapse of the molecular cloud, leading to the formation of the solar system [7]. If the Group 4 grains did indeed form in a single nearby supernova, the heterogeneity in their distribution in AMMs, IDPs, and meteorites would reflect formation of these materials in different parts of the solar nebula with different abundances of Group 4 grains, or at different times during solar system formation [2, 8].

**References:** [1] Nittler L. R. et al. 2008. *ApJ* **682**: 1450-1478. [2] Yada T. et al. 2008. *MAPS* **43**: 1287-1298. [3] Nittler L.R. et al. 1997. *ApJ* **483**: 475-495. [4] Hynes, K.M. and Gyngard, F. 2009. *LPSC XL*, #1198. [5] Huss G.R. et al. 2009. *GCA* **79**: 4922-4945. [6] Ouellette N. et al. 2010. *ApJ* **711**: 597-612. [7] Ouellette N. et al. 2009. *GCA* **73**: 4946-4962. [8] Floss C. and Stadermann (2012). *MAPS* in press.