HYDROGEN AND NITROGEN IMAGING OF ULTRA-CARBONACEOUS ANTARCTIC MICROMETEORITE TT54B397. C. Floss[1], T. Noguchi[2], and T. Yada[3]. [1]Washington University, St. Louis, MO 63130, USA. [2]Ibaraki University, Mito, Ibaraki 310-8512, Japan. [3]Japan Aerospace Exploration Agency, Sagamihara, Kanagawa 252-5210, Japan. (contact email: floss@wustl.edu).

Introduction: Ultra-carbonaceous Antarctic micrometeorites (UCAMMs) are fine-grained fluffy particles dominated by carbonaceous matter [1]. Hydrogen isotopic analysis of two UCAMMs shows that they contain extreme D excesses [2], suggesting links to other primitive extraterrestrial materials with H isotopic anomalies [e.g., 3, 4]. TT54B397 is a UCAMM that consists of more than 90 vol.% carbonaceous matter and has a high abundance of O-rich presolar grains (~135 ppm; [5]). However, C and N imaging in 8000 μm^2 of ultra-microtome slices of this UCAMM showed no N isotopic anomalies [5], despite the fact that such anomalies are common in highly disordered carbonaceous matter like that in TT54B397 [6]. Here we present the results of H isotope imaging carried out on the potted butt of this sample, along with additional N isotope data.

Experimental Methods: NanoSIMS C and N imaging was carried out according to standard procedures [e.g., 7]. Hydrogen isotope mapping followed a similar procedure, but was done at a higher beam current (~7 pA vs. ~0.5 pA), in order to obtain increased signal from D. We measured ~1500 μm^2 of area for H isotopes, followed by C and N imaging of the same areas. The data were normalized to a terrestrial kerogen standard [8].

Results and Discussion: The average C and N isotopic compositions are normal (i.e., terrestrial) in all of the areas measured on the potted butt, consistent with our previous results. However, we did find one probable mainstream SiC grain ($^{12}C/^{13}C = 42 \pm 2$), several ^{15}N-rich hotspots ($\delta^{15}N$ = ~180–630 ‰), and one area depleted in ^{15}N ($\delta^{15}N = -210 \pm 20$ ‰). The sample shows an average D enrichment of ~150 ‰ and contains several localized D-rich hotspots (δD = ~710–1270 ‰). These D excesses are far below the enrichments observed in the UCAMMs studied by [2], but are consistent with the ranges of H isotopic compositions found in anhydrous IDPs [e.g., 3, 8].

High presolar grain abundances are often associated with N isotopic anomalies [e.g., 8, 9]. However, the carbonaceous matter in TT54B397 does not show a bulk enrichment in ^{15}N, like many IDPs and CR chondrites do [8, 10], although it does contain some ^{15}N-rich hotspots and has anomalous H isotopic compositions. In this respect it is similar to the so-called 'isotopically normal' subgroup of IDPs studied by [8], although these do not contain presolar grains. TT54B397 also contains GEMS and enstatite whiskers [11], components characteristic of anhydrous IDPs. The high presolar grain abundances of TT54B397 and its primitive nature suggest that secondary processing is probably not responsible for its lack of a bulk ^{15}N enrichment [5], implying that multiple isotopically distinct sources may be required for the carbonaceous matter found in extraterrestrial materials.

References: [1] Nakamura et al. (2005) *MAPS* 40, A110. [2] Duprat et al. (2010) *Science* 328, 742. [3] Messenger et al. (2003) *SSR* 106, 155. [4] Busemann et al. (2006) *Science* 312, 727. [5] Floss et al. (2012) *LPSC XLIII*, #2247. [6] Dobrica et al. (2011) *MAPS* 46, 1363. [7] Floss and Stadermann (2009) *ApJ* 697, 1242. [8] Floss et al. (2006) *GCA* 70, 2371. [9] Floss et al. (2010) *MAPS* 45, 1889. [10] Alexander et al. (2007) *GCA* 71, 4380. [11] Noguchi et al. (2008) *MAPS* 43, A117.