A TESTBED FOR ADVANCED COLD CURATION OF ASTROMATERIALS. L. A. Fletcher[1], R. Bastien[2] and C.C. Allen[1]. [1]ARES, Mail Code KT, NASA Johnson Space Center, Houston, TX 77058. lisa.a.fletcher@nasa.gov [2]Jacobs Technologies, 2224 Bay Area Blvd, Houston, TX 77058.

Introduction: The NASA Astromaterials Curation Facility at the Johnson Space Center is responsible for the curation of all astromaterial sample return collections and includes state-of-the-art processing of these samples for allocation to the scientific community. Unique challenges to traditional curation practices are being raised with planned missions to return cold samples from the Moon, Mars, comet nuclei and other icy bodies. These missions will require performing curation processes in a clean, controlled thermal environment. In anticipation of these types of unique samples, we have installed a new advanced curation laboratory to explore the feasibility of curating samples under cold, clean conditions [1]. The primary motive for this effort is to understand the potential challenges associated with processing samples cold while quantifying and minimizing organic and inorganic contamination levels.

Results and Discussion: The laboratory consists of a controlled-atmosphere, custom-designed stainless steel glovebox equipped with a -35°C freezer and -35°C cold plate for sample storage and manipulation at cold temperatures [1]. Our initial experiments have focused on measuring the thermal profile surrounding the cold plate working surface and determining sublimation rates from ice samples into the dry nitrogen purged environment of the glovebox. With the current configuration, there is a strong thermal gradient around the cold plate such that the working temperature decreases to 0°C less than 1 cm above the cold plate surface. Measured sublimation rates from ultrapure water ice samples are on the order of 1% mass lost each successive 24 hour period.

The cold plate is a potential source of organic contamination of samples because it may act as a "getter" for volatile organic compounds in the glovebox environment. To quantify the level of organic contamination, we are analyzing organic-free silicon witness plates exposed to the nitrogen glovebox environment using thermal desorption-gas chromatography-mass spectrometry (TD-GC-MS). These results are compared with baseline data obtained from previous organic analyses conducted inside curation gloveboxes within the Lunar, Meteorite and Genesis Curation Laboratories. We are particularly interested in the comparison of the types and abundances of organic species that adhere to the clean silicon surface when placed on the cold plate verses the warmer overall box environment. In addition to organic analyses, we are also investigating the trace metals in various locations within the glovebox environment using inductively coupled plasma-mass spectrometry (ICP-MS) of witness plates.

A series of additional experiments with simulants and astromaterial samples are planned. Now that contamination levels are better understood, efforts to reduce these levels are underway so that cold curation may be offered as a service to the community in the near future.

References: [1] Fletcher, L. A. et al. (2008) LPSC XXXIX, Abstr. # 2202.