NEW INITIATIVES FOR THE NASA COSMIC DUST COLLECTIONS.

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Introduction: The NASA Cosmic Dust Collections (CDC) have steadily grown over its forty-one-year residence at Johnson Space Center. CDC features an active acquisition program which collects new material and accessions new collections within NASA's purview. An overview of current initiatives is described here.

Cosmic Dust: The CDC curates a collection of Aircraft Collected Particles (ACP) which have been collected using NASA high-altitude aircraft since 1981. A large number of particles are available for request, and new efforts have focused on collecting interplanetary dust particles (IDPs) associated with specific meteor showers. The scientific rationale for collecting material from a specific meteor shower is that such particles, if they can be conclusively shown as originating from a particular shower, thereby originate from a specific comet. This allows for sample return from specific cometary bodies. Since IDPs originate from both meteor showers and the sporadic interplanetary dust background, identifying material as originating from a shower is a non-trivial step. To facilitate this effort, CDC has:

Updated the CDC Database: The public-facing CDC database is now searchable WRT collectors, not just particles. Users may search the database for collectors exposed during a particular month, and information such as collector exposure date(s) is now visible. Also, each collector now has a figure showing its exposure period relative to the typical IDP flux over the course of a calendar year with individual meteor showers illustrated. An abstract was also presented at LPSC 2022 identifying collectors which correlate to showers either by design or accident (#2678).

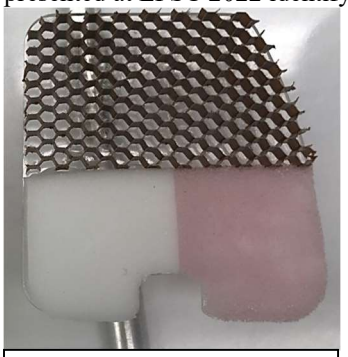

Figure 1: Technology demonstration collector (TDC) for flights in 2022. White material is a fluorinated polymer closed cell foam. Pink is polyurethane for degradation testing comparison to perfluorinated foam. Honeycomb structure will test this shape's ability to trap and retain CD particles.

Tech Demo Flights for 2022: CDC performs collection flights each year. The 2022 flights will focus on technology developments to improve oil-free, or "dry" collection of particles, with one standard oil-coated collector as a standard and one tech demo collector (TDC, Figure 1). The TDC contains three panels: one polyurethane foam collector, one fluorinated polymer foam collector, and a hexagonal open-cell collector with ~2mm cell width and 8mm-tall cells. The foam samples will test resilience of the perflourinated foam versus polyurethane, which displayed undesirable degradation behavior post-flight. The honeycomb will test its ability to trap particles from airflow and retain them in extended flight. For this flight an aramid fiber honeycomb is used (solely because of availability) but if the concept is proven, future flights will use an aluminum honeycomb in a design that can be disassembled post-flight for access to collected particles.

Interstellar CD Collection?: CDC is soliticing community input through the Extraterrestrial Materials Assessment Group (ExMAG) about the possibility of collecting CD of interstellar origin. Input is requested on how to collect this material and to identify and process it. Announcement of this activity to the community is currently pending.

Balloon-Borne CD Collection: CDC is in the third year of a development effort to fly small, "piggy-back" devices on NASA high-altitude balloons to collect cosmic dust. Advantages include longer flight times, higher altitude collection, and low particle impingement speed onto collectors. Recent testing at NASA Columbia Scientific Balloon Facility revealed the need for additional development of structure and electronics, which will occur this year. Initial flight tests are expected in calendar year 2023.

Timed Collection of 2020 Geminids Meteor Shower: CDC performed dedicated flights during the 2020 Geminids meteor shower. The parent body of the Geminids is 3200 Phaethon, which is the target of the JAXA Destiny+ mission which will launch in 2024. After a COVID-induced delay, particles have been removed and will be announced as available for request in a special catalog release this summer.

South Pole Air (SPA) IDP Collection: IDPs were collected at surface level using a series of large-area filters at the south pole. Once the SPWW collection accession is complete (see below), the SPA collection will be accessioned with ExMAG input and announced to the community.

Micrometeorites: *South Pole Water Well Micrometeorite (SPWW) Collection:* A collection of over 7,000 particles collected in 1998 and 2000 will be announced as available soon. This collection is the first astromaterials collection accessioned into CDC and will expand the breadth of the collections from IDPs to include micrometeorites as well.