



# COSMIC DUST COURIER



Compiled and issued by:  
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## COSMIC DUST CATALOG 10 BEING PUBLISHED

*Cosmic Dust Catalog 10* is being published. This catalog describes 147 particles from collection surface W7074, which sampled the stratosphere over the North American continent during several missions in 1988. This collector surface was flown on a NASA WB-57 aircraft which is stationed at Ellington Air Field. We have recently begun to utilize this aircraft in addition to the U-2 craft at Moffet Field. Collector W7074 is a new surface, and its contents should reflect the recent particulate composition of the stratosphere. According to Zolensky et al. (Journal of Geophysical Research, in press), the dominant source of particulates in the stratosphere is currently ablating material from Earth's man-made debris belt. Thus,

one would expect to find this material well-represented among the particles in Catalog 10.

Many new chondritic particles appear in Catalog 10. In addition, a particular effort was made to characterize many spherical particles, in light of renewed interest in this morphological type. Finally, since particles in Catalog 10 are arranged by particle type, and thus do not appear in strict numerical order, a particle index has been included in this catalog for the user's reading pleasure. A similar table for particles listed in *Cosmic Dust Catalogs 6 & 7*, as well as previous *Cosmic Dust Couriers*, was provided in *Cosmic Dust Courier 7*.

## NO CONTAMINATION IN THE COSMIC DUST LABORATORY

Recently, certain investigators have raised the concern that unusual particle types found on stratospheric collection surfaces could actually have originated as solid particle contamination from the Cosmic Dust Laboratory at JSC. We have, in the past, conducted surveys of the nature of all materials which could contaminate stratospheric particles in our laboratory. These materials include silicon oil, lexan plastic (the collector plate material -organics, minor silicon and sulfur), teflon (organics, minor silicon and aluminum), stainless steel, aluminum metal and glass (silicate). In the past we have used a glue on occasion (organics, silicon, sulfur and chlorine). There are no painted surfaces upwind of the particle manipulation areas in our laboratory. We perform periodic cleaning of all equipment in the

laboratory, and continuously monitor the particulate content of the air. Based upon our experience we do not believe that we introduce significant contamination to the stratospheric particles in our laboratory, with one exception. We do believe that the use of silicon oil to capture particles in the stratosphere can cause the apparent silicon concentration of particles to be increased (due to incomplete oil removal). However, recent work by K. Thomas and co-workers at JSC has demonstrated that this is a minor effect. Unfortunately, the hexane and freon rinses used to remove the silicon oil from particles probably also removes indigenous organics as well. We have recently been experimenting with techniques for the dry collection of particles in the stratosphere, thus far without success.

## **LARGE AREA COLLECTORS: CURRENT STATUS AND PLANS FOR THE FUTURE III**

The past year has finally seen the flight testing of the long-awaited next generation of Cosmic Dust collector, the Large Area Collector (LAC). This collector will feature a collection impaction surfaces with approximately an order of magnitude larger surface area than conventional collectors. The LAC should thus permit the collection of an order of magnitude more particles per collection period than the conventional collection apparatus, with more large grains being harvested. The availability of larger Cosmic Dust samples will permit new analytical techniques to be employed in their characterization, and allow more consortium studies to take place.

Integration of the LAC onto U-2 and ER-2 aircraft and testing were performed during the summer and fall of 1988. In the 1989 fiscal year we anticipate 40 hours of accumulated collecting time on each of four LAC collector plates. At an early stage in the LAC testing process we removed two of the collectors and verified that they were indeed collecting large (>25  $\mu$ m diameter) chondritic particles.

Experience in our laboratory has shown that we cannot perform preliminary analyses of large chondritic particles as we routinely do for the smaller particles featured in our Catalogs. We cannot rely on static charges to securely hold large uncoated particles to the graphite mounts upon which we typically analyze and store particles. We are therefore considering alternate ways to curate and allocate large particles from the LACs. In those cases where we can easily break a small section off of a large particle for analysis, this problem will not be important. However, we may be forced to allocate most large particles individually in oil droplets, without the benefit of a preliminary chemical analyses. Under these circumstances an investigator would have to request a certain number of "particles", and perform all analyses on the particles himself (or herself). This would obviously introduce a certain new degree of uncertainty into the allocation process, however we feel that ultimately the allure of larger particles will always outweigh these new difficulties.



## STATUS OF COSMIC DUST COLLECTION SURFACES (FLAGS)

The table below indicates the current status of all Cosmic Dust collection surfaces which have been flown to date and received into the Curatorial Office.

**TABLE 1**  
**NASA/JSC COSMIC DUST PROGRAM: STATUS OF FLAGS**  
**Effective Date: February, 1989**

FLAG #	LOCATION	COMMENTS
U2001	AT JSC	PICKED
U2002	AT JSC	RESERVED
U2003	AT JSC	VOLCANIC ASH
U2004	AT JSC	VOLCANIC ASH/RESERVED
U2005	AT JSC	GROUND CONTAMINATION/IN PETRI DISH
U2006	AT JSC	GROUND CONTAMINATION/IN PETRI DISH
U2007	AT JSC	VOLCANIC ASH/IN PETRI DISH
U2008	AT JSC	VOLCANIC ASH/RESERVED
U2009	AT JSC	GROUND CONTAMINATION
U2010	AT JSC	GROUND CONTAMINATION
U2011	AT JSC	PICKED
U2012	AT JSC	RESERVED
U2013	AT JSC	PICKED
U2014	WALKER,RM	
U2015	AT JSC	PICKED
U2016	AT JSC	GROUND CONTAMINATION?
U2017	AT JSC	PICKED
U2018	AT JSC	PICKED
U2019	AT JSC	GROUND CONTAMINATION
U2020	AT JSC	GROUND CONTAMINATION
U2021	AT JSC	GROUND CONTAMINATION
U2022	AT JSC	PICKED
U2023	AT JSC	VOLCANIC AEROSOL?/RESERVED
U2024	MCKAY,DS	
U2025	AT JSC	RESERVED
U2026	AT JSC	CONTAMINATION/BROKEN HELICOIL/RESERVED
U2027	DISPOSED	BY JSC GROUND CONTAMINATION /DISCARDED
U2028	DISPOSED	BY JSC GROUND CONTAMINATION /DISCARDED
U2029	AT JSC	IN PLEX COFFIN/RESERVED
U2030	DISPOSED	BY JSC GROUND CONTAMINATION /DISCARDED
U2031	DISPOSED	BY JSC GROUND CONTAMINATION /DISCARDED
U2032	DISPOSED	BY JSC GROUND CONTAMINATION /DISCARDED
U2033	WALKER,RM	IN PLEX COFFIN
U2034	AT JSC	IN PLEX COFFIN
U2035	AT JSC	IN PLEX COFFIN
U2036	AT JSC	IN PLEX COFFIN
U2037	AT JSC	IN PLEX COFFIN
U2038	AT JSC	IN PLEX COFFIN
U2039	AT JSC	IN PLEX COFFIN
U2040	AT JSC	IN PLEX COFFIN
U2041	AT JSC	IN PLEX COFFIN

TABLE 1 (Continued)

FLAG #	LOCATION	COMMENTS
U2042	AT JSC	IN PLEX COFFIN
U2043	AT JSC	IN PLEX COFFIN
U2044	AT JSC	
U2045	AT JSC	
U2046	AT JSC	
U2047	AT JSC	
W7001	AT JSC	GROUND CONTAMINATION /PICKED
W7002	AT JSC	GROUND CONTAMINATION /IN PETRI DISH
W7003	AT JSC	GROUND CONTAMINATION /IN PETRI DISH
W7004	AT JSC	GROUND CONTAMINATION /IN PETRI DISH
W7005	AT JSC	GROUND CONTAMINATION /IN PETRI DISH
W7006	AT JSC	GROUND CONTAMINATION /IN PETRI DISH
W7007	AT JSC	GROUND CONTAMINATION /IN PETRI DISH
W7008	AT JSC	GROUND CONTAMINATION /IN PETRI DISH
W7009	AT JSC	
W7010	AT JSC	PICKED
W7011	AT JSC	RESERVED
W7012	BROWNLEE,DE	
W7013	AT JSC	PICKED
W7014	AT JSC	
W7015	AT JSC	
W7016	AT JSC	RESERVED
W7017	AT JSC	PICKED
W7018	WALKER,RM	
W7019	AT JSC	
W7020	AT JSC	RESERVED
W7021	WALKER,RM	WALKER,RM
W7022	WALKER,RM	
W7023	AT JSC	RESERVED
W7024	WALKER,RM	
W7025	AT JSC	RESERVED
W7026	AT JSC	PICKED
W7027	AT JSC	PICKED/PREVIOUSLY ALLOCATED TO BROWNLEE
W7028	AT JSC	PICKED
W7029	AT JSC	PICKED
W7030	AT JSC	RESERVED
W7031	AT JSC	PICKED/PREVIOUSLY ALLOCATED TO BROWNLEE
W7032	AT JSC	PICKED
W7033	AT JSC	VOLCANIC ASH/COMPLETELY RINSED ONTO NUCLEOPORE FILTER
W7034	AT JSC	VOLCANIC ASH/COMPLETELY RINSED ONTO NUCLEOPORE FILTER
W7035	AT JSC	VOLCANIC ASH/RESERVED
W7036	AT JSC	VOLCANIC ASH/PICKED
W7037	ZOLLER,WH	VOLCANIC ASH/COMPLETELY RINSED ONTO NUCLEOPORE FILTER
W7038	AT JSC	VOLCANIC ASH/COMPLETELY RINSED ONTO NUCLEOPORE FILTER
W7039	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7040	AT JSC	VOLCANIC ASH/RESERVED
W7041	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7042	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7043	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7044	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7045	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7046	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE



TABLE 1 (Continued)

FLAG #	LOCATION	COMMENTS
W7047	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7048	AT JSC	DEPLOYMENT FAILED/RESERVED
W7049	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7050	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7051	AT JSC	VOLCANIC ASH/RESERVED
W7052	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7053	AT JSC	VOLCANIC ASH/RESERVED
W7054	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7055	AT JSC	VOLCANIC ASH/COMPLETELY RINSED INTO FREON-113 BOTTLE
W7056	AT JSC	VOLCANIC ASH/COLLECTOR INVERTED/RESERVED
W7057	AT JSC	VOLCANIC AEROSOL/BROKEN FLAG/RESERVED
W7058	AT JSC	VOLCANIC AEROSOL
W7059	AT JSC	VOLCANIC AEROSOL
W7060	AT JSC	VOLCANIC AEROSOL
W7061	AT JSC	VOLCANIC AEROSOL
W7062	AT JSC	VOLCANIC AEROSOL
W7063	AT JSC	VOLCANIC AEROSOL
W7064	AT JSC	VOLCANIC AEROSOL
W7065	AT JSC	VOLCANIC AEROSOL
W7066	AT JSC	PICKED
W7067	AT JSC	RESERVED
W7068	AT JSC	PICKED
W7069	AT JSC	PICKED
W7070	AT JSC	RESERVED
W7071	AT JSC	PICKED
W7072	AT JSC	WALKER,RM
W7073	AT JSC	PICKED
W7074	AT JSC	PICKED

## TABLE OF RENUMBERED CHONDRITIC COSMIC DUST PARTICLES

Occasionally, in the course of detailed chondritic Cosmic Dust particle characterization, it is found that several grains originated from the same large chondritic cluster particle. Chondritic particles are particularly prone to disaggregating during the collection process in the stratosphere, as well as during particle picking from the collection surface. When this is recognized, and in order to explicitly recognize this relationship, the particle is renumbered. The new, renumbered name contains a \*. For example, W7028 A4 and W7028 D1 were recognized as originating from the same large chondritic particle. This larger particle was posthumously named W7028 \*C, and W7028 A4 and W7028 D1 were renumbered W7028 \*C1 and W7028 \*C2, respectively. The following table lists all particles which have to date been so renumbered.

TABLE 2  
NASA/JSC COSMIC DUST PROGRAM:  
RENUMBERED CLUSTER PARTICLES  
Effective Date: February 1989

OLD PARTICLE NUMBER			NEW PARTICLE CLUSTER NUMBER		
U2011	A	2	U2011	*A	1
U2011	A	4	U2011	*A	2
U2011	A	5	U2011	*B	1
U2015	A	1	U2015	*A	1
U2015	A	2	U2015	*A	2
U2015	A	3	U2015	*A	3
U2015	A	8	U2015	*B	1
W7010	A	8	W7010	*A	1
W7010	C	1	W7010	*A	3
W7010	C	2	W7010	*A	4
W7010	C	4	W7010	*A	5
W7026	A	1	W7026	*A	1
W7028	A	4	W7028	*C	1
W7028	D	1	W7028	*C	2
W7029	B	13	W7029	*B	1
W7029	C	1	W7029	*A	1
W7029	K	1	W7029	*A	27
W7029	K	2	W7029	*B	8
W7031	A	1	W7031	*A	1
W7031	A	2	W7031	*B	1
W7031	A	5	W7031	*C	1
W7031	A	9	W7031	*D	1
W7031	E	1	W7031	*A	3
W7031	E	2	W7031	*C	2
W7031	E	3	W7031	*B	2
W7031	E	4	W7031	*B	3
W7066	A	1	W7066	*A	1
W7066	A	5	W7066	*A	2
W7066	B	1	W7066	*A	3
W7066	B	2	W7066	*A	4



**TABLE 2 (Continued)**

OLD PARTICLE NUMBER			NEW PARTICLE CLUSTER NUMBER		
W7069	A	1	W7069	*A	1
W7069	A	2	W7069	*B	2
W7069	B	1	W7069	*B	2
W7069	B	2	W7069	*A	2
W7069	B	3	W7069	*A	3
W7071	A	1	W7071	*A	2
W7071	A	2	W7071	*A	1

### ITEMIZED LISTING OF AVAILABLE SAMPLES

Prompt allocation of samples in response to approved sample requests serves the interests of the Cosmic Dust science community but also creates a minor problem in parallel efforts to publicize the current status of available samples. Unlike lunar and meteorite samples, Cosmic Dust samples, with the exception of relatively rare particles greater than 20 to 30 micrometer size, cannot be split or subdivided for allocation to more than one sample requestor. Therefore, once an individual dust particle has been approved for allocation to a given investigator, it immediately becomes unavailable for allocation to other investigators. As an aid to researchers planning future sample requests, the current availability of samples in inventory is summarized in the following table. This table has been simplified for this courier. In place of the usual complicated sample availability table we have instead provided a simplified listing of the samples which remain in our coffers. This table thus lists all cataloged Cosmic Dust samples which remain available for allocation as of February 1989.

**TABLE 3**  
**NASA/JSC COSMIC DUST PROGRAM: SAMPLE AVAILABILITY**  
**Effective Date: February, 1989**

MOUNT#	PARTICLES AVAILABLE FOR ALLOCATION
U2001 A	1 2 4 6 7 10 11 13 14 15 16 18 19 20
U2001 B	7 11 12 13 16
U2001 C	2 3 5 7 8 9 12 13 14 17
U2001 D	1 2 3 5 6 9 10 13 14 18 19
U2001 E	1 4 6 7 10 11 12 13 14 15 17 18 19 20
U2011 A	1 3 6 7 8 9 10 11
U2011 C	1 6 8 9
U2011 *A	1 2
U2013 A	1 2
U2015 A	1 2 3 4 5 6 7 8

TABLE 3 (Continued)

MOUNT#	PARTICLES AVAILABLE FOR ALLOCATION																										
W7031 *D	1																										
W7032 A	1	2	3	4	5	6	7																				
W7036 B	1	2	3	4	5	6																					
W7066 A	2	3	4	5																							
W7066 B	1	2	3	4																							
W7066 *A	1																										
W7068 A	1	2	3																								
W7069 A	1	2	3																								
W7069 *A	1	2	3																								
W7069 *B	1	2	3																								
W7071 *A	1	2																									
W7073 A	1																										
W7074 A	1	2	3	4	5	7	8	9	10	11	12	13	15	16	18	20	21	22	23	24	25	27					
W7074 B	1	2	3	4	6	7	8	9	12	13	14	15	16	17	18	19	20	21	22	23	24						
W7074 C	1	2	3	4	5	6	10	11	12	13	14	15	16	17	18	19	20	21	22	23							
W7074 D	1	2	3	5	6	8	9	10	11	12	13	14	19														
W7074 E	1	3	4	8	9	10	11	12	15	16	18																
W7074 F	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17											
W7074 G	1	2	4	5	6	7	8	9	11	12	13	14	15	16	17	19											
W7074 H	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15												
W7074 I	1	2	3	4	6	7	8	9	11	12	13	14	16														



## INVESTIGATORS WHO HAVE RECEIVED SAMPLES TO DATE

D. S. McKay (NASA/Johnson Space Center, Houston, TX, USA)

D. E. Brownlee (Univ. of Washington, Seattle, WA, USA)

R. M. Walker (Washington Univ., St. Louis, MO, USA)

P. R. Buseck (Arizona State Univ., Tempe, AZ, USA)

M. Maurette (Laboratoire Rene Bernas, Orsay, France)

G. L. Nord, Jr. (U. S. Geological Survey, Reston, VA, USA)

R. H. Hewins (Rutgers Univ., New Brunswick, NJ, USA)

J. C. Laul (Battelle Pacific Northwest Labs, Richland, WA, USA)

E. K. Gibson, Jr. (NASA/Johnson Space Center, Houston, TX, USA)

W. H. Zoller (Univ. of Maryland, College Park, MD, USA)

T. Esat (Australian National Univ., Canberra, Australia)

K. Yamakoshi (Univ. of Tokyo, Japan)

J. Bradley (McCrone & Associates, Chicago, IL, USA)

R.D. Vis (Natuurkundig Laboratorium, Amsterdam, The Netherlands)

M.E. Zolensky (NASA/Johnson Space Center, Houston, TX, USA)

F.J. Rietmeijer (University of New Mexico, NM, USA)

A.O. Nier (University of Minnesota, MN, USA)

I.D.R. Mackinnon (University of New Mexico, NM, USA)

C. Pillinger (Open University, Buckinghamshire, UK)

G. Flynn (SUNY Plattsburgh, NY, USA)

J. Darius (London Science Museum, UK)

K. Thomas (Lockheed-LEMSCO, JSC, Houston, TX, USA)

C.Y. Fan (University of Arizona, Tucson, AZ USA)

G. Blanford (University of Houston, Houston, TX, USA)

W. Klock (NRC/Johnson Space Center, Houston, TX, USA)

T. Bunch (NASA/Ames Research Center, Moffett Field, CA, USA)

L. Schramm (University of Washington, Seattle, WA, USA)

E. Jessberger (Max Planck Institute, Heidelberg, FRG)

## **GUIDELINES FOR PREPARING A SAMPLE REQUEST**

All sample requests should be made in writing to:

**Curator/Cosmic Dust  
Code SN2  
Planetary Materials Branch  
NASA/Johnson Space Center  
Houston, TX 77058 USA.**

Information may be obtained by telephone via (713) 483-5128 [FTS 525-5128].

Each request should refer to specific samples by their official identification numbers and should contain enough information to permit evaluation of the proposed study and the adequacy of the requestor's facilities. All necessary information should probably be condensable into a one- or two-page letter, although informative attachments (e.g., copies of pages from related proposals, reprints of publications, flow diagrams for analyses) are welcome. In addition, a brief statement regarding the desired method of mounting or containerizing the samples for shipment to the requestor should be

included (see article on "Sample Containers for Shipment of Allocated Dust Particles" on pages 14-21 of Cosmic Dust Courier No. 4). Each sample request will be reviewed by the Cosmic Dust Committee (CDC), and the Lunar and Planetary Sample Team (LAPST), committees of scientists that advises NASA on matters related to the curation and allocation of extraterrestrial samples. The NASA/JSC Planetary Materials Branch will arrange for all required CDC and LAPST reviews and will inform investigators of results as rapidly as possible. Prospective sample requestors may select samples from among those described in any issue of the Cosmic Dust Catalog or Cosmic Dust Courier series. However, reference should be made to the sample availability table of this newsletter to check the status of each sample before it is requested. In addition, we encourage investigators to contact us in advance of submitting their sample requests if further information is desired.





