Geophysical Research Letters

Supporting Information for

Sources of Cosmic Dust in the Earth's Atmosphere

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Introduction

The purpose of this Supporting Information is to describe the results of fitting the three cosmic dust sources when the JFC particle size distribution with $D_{break} = 100$ μm, derived from IRAS observations of the Zodiacal Cloud, is used [*Nesvorný et al.*, 2011; 2010]. This provides a comparison with the main paper, where the more recent Planck satellite observations with $D_{break} = 36$ μm is used [*Ade et al.*, 2014; *Fixsen and Dwek*, 2002].

Figure S1 depicts the cumulative mass and size distributions inferred from the JFC-IRAS and JFC-Planck distributions. The Planck distribution has a sharp break at around radius = 18 μm (i.e. $D_{break} = 36$ μm), and can be parameterized following a double power law with a differential index of -1.4 ± 0.3 below the break diameter, and a differential index of -4.3 ± 0.1 above the break size. In contrast, the IRAS distribution exhibits differential indices of -2.7 ± 1.8 and -4.8 ± 0.1 below and above the break diameter, respectively. Thus, as shown in Figures 1a and 1b of the main paper, the JFC-Planck particle mass distribution is shifted ~2-orders of magnitude lower than the JFC-IRAS distribution.

We have assumed the same Na enrichment factor of 2.5 for the IRAS model (termed ZCM-IRAS). Consequently, $\alpha = 0.41 \pm 0.17$, $\beta = (2.73 \pm 2.00) \times 10^{-2}$, $\gamma = (6.78 \pm 1.72) \times 10^{-2}$. In terms of the global mass input rate, the contributions of the JFC, AST and LPC particles are 13.7 ± 5.7 t d^{-1} (57%), 2.9 ± 2.1 t d^{-1} (13%) and 7.4 ± 1.9 t d^{-1} (30%), respectively. The Total Input Mass (TIM) for the ZCM-IRAS model is 24.0 ± 6.4 t d^{-1}.
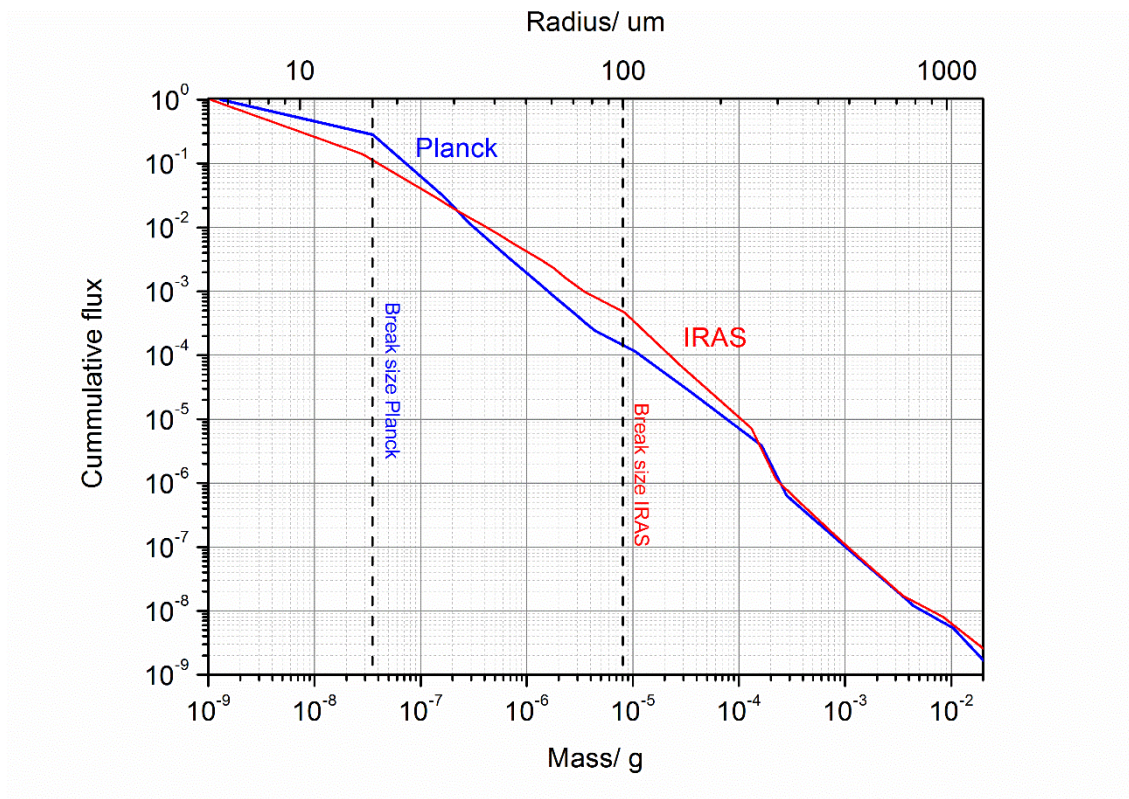
Figure S1

Figure S1. Cumulative size/mass distributions of JFC particles inferred from observations of emission from the Zodiacal Cloud by the Planck (blue) and IRAS (red) satellites.

Table S1. Global mass input from the four cosmic dust sources for the JFC-IRAS fit. Elemental ablation inputs are italicized; the percentages in parentheses show the fraction of each element that ablates from its total atmospheric input from each source.

Mass flux	JFC (t d^{-1})	AST (t d^{-1})	LPC=HTC (t d^{-1})	Total (t d^{-1})	LPC=OCC (t d^{-1})
Unmelted micrometeorites	8.5	1.0	0.4	9.9	0.07
Cosmic spherules	3.1	1.4	0.6	5.1	0.1
Ablated atoms	2.1	0.5	6.4	9.0	6.5
Cosmic spherules [†]	2.8	1.4	0.4	4.6	0.08
Unmelted ($\emptyset > 50\ \mu m$)	2.4	0.9	0.3	3.6	0.04
Na	*0.1 (45%)*	*0.02 (75%)*	*0.1 (99%)*	*0.2 (48%)*	*0.1 (100%)*
K	*4.9×10^{-3} (44%)*	*1.8×10^{-3} (74%)*	*5.9×10^{-3} (97%)*	*0.01 (51%)*	*5.6×10^{-3} (100%)*
Fe	*0.8 (20%)*	*0.2 (28%)*	*1.9 (90%)*	*2.9 (43%)*	*1.9 (98%)*
Si	*0.3 (13%)*	*0.08 (16%)*	*1.0 (87%)*	*1.4 (37%)*	*1.0 (97%)*
Mg	*0.2 (11%)*	*0.05 (11%)*	*0.9 (85%)*	*1.1 (31%)*	*0.9 (97%)*
Ca	*6.2×10^{-3} (3%)*	*1.4×10^{-4} (0.4%)*	*0.07 (70%)*	*0.08 (27%)*	*0.08 (93%)*
Al	*3.4×10^{-3} (2%)*	*4.3×10^{-5} (0.1%)*	*0.06 (59%)*	*0.06 (19%)*	*0.08 (88%)*
Ti	*3.2×10^{-5} (4%)*	*1.4×10^{-6} (0.8%)*	*3.7×10^{-4} (84%)*	*4.0×10^{-4} (28%)*	*4.5×10^{-4} (100%)*
O	*0.7 (14%)*	*0.2 (18%)*	*2.4 (90%)*	*3.3 (38%)*	*2.4 (99%)*
Total	**13.7**	**2.9**	**7.4**	**24.0**	**6.7**
%$Na|_{87.5\ km}$ [††]	76%	46%	99%	**86%**	100%
%$Fe|_{87.5\ km}$ [††]	39%	0.9%	92%	**70%**	98%

[†] Spherules in the size range $50\ \mu m \leq \emptyset \leq 700\ \mu m$ corresponding to measurements at South Pole [*Taylor et al.*, 1998].

[††]Fraction of Na and Fe ablated above 87.5 km.

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