Annexe D. Table results giving the He isotopic compositions and total masses deduced by size range of cosmic dust extracted from the Concordia snow

Size range / Results	> 62 µm (1)	62-25 µm	25-5 µm	< 5 µm	**Total snow tank**	62-250 µm (7)	62-500 µm (7)
Mass of steel filters and aluminium capsules (mg)							
Tank F4 – 15,852 g	551	327	991, 880 and 910	598	-	-	-
Tank F6 – 14,981 g	503	375	848, 936 and 946	297			
Tank F1 Sac 1 – 3,353 g	403	527	903	338			
Sac 2 – 2,023 g	427	440	903				
Sac 3 – 2,006 g	380	478	850				
Sac 4 – 3,064 g	482	489	990				
[^{3}He] (at g^{-1} of snow) (2)							
	$(1.46\pm0.04)\times10^3$	$(2.00\pm0.03)\times10^3$	$(1.34\pm0.02)\times10^4$	40.20 ± 0.03	$(1.26\pm0.01)\times10^4$	-	-
	$(1.34\pm0.03)\times10^3$	$(1.46\pm0.02)\times10^3$	$(9.68\pm0.13)\times10^3$	Ø	$(1.25\pm0.01)\times10^4$		
	$(2.51\pm0.11)\times10^2$	$(1.15\pm0.02)\times10^4$	$(3.37\pm0.04)\times10^3$	47.4 ± 3.3	$(1.52\pm0.01)\times10^4$		
	$(4.54\pm0.71)\times10^1$	$(3.07\pm0.06)\times10^3$	$(5.02\pm0.09)\times10^3$		$(8.18\pm0.11)\times10^3$		
	$(1.84\pm0.52)\times10^1$	$(1.47\pm0.03)\times10^3$	$(1.08\pm0.01)\times10^4$		$(1.23\pm0.01)\times10^4$		
	$(3.14\pm0.47)\times10^1$	$(3.08\pm0.05)\times10^3$	$(5.96\pm0.07)\times10^3$		$(9.12\pm0.09)\times10^3$		
[^{4}He] (at.g^{-1} of snow) (3)							
	$(6.74\pm0.03)\times10^7$	$(5.21\pm0.01)\times10^7$	$(3.76\pm0.001)\times10^8$	$(8.11\pm0.52)\times10^5$	$(3.78\pm0.01)\times10^8$	-	-
	$(3.63\pm0.02)\times10^7$	$(5.51\pm0.02)\times10^7$	$(8.27\pm0.05)\times10^7$	Ø	$(1.61\pm0.01)\times10^8$		
	$(5.20\pm0.04)\times10^7$	$(1.66\pm0.01)\times10^8$	$(3.70\pm0.01)\times10^7$	$(1.47\pm0.02)\times10^7$	$(2.69\pm0.01)\times10^8$		
	$(1.06\pm0.13)\times10^7$	$(2.25\pm0.02)\times10^8$	$(1.84\pm0.03)\times10^8$		$(4.34\pm0.03)\times10^8$		
	$(4.2\pm0.9)\times10^6$	$(2.22\pm0.02)\times10^8$	$(2.81\pm0.03)\times10^8$		$(5.19\pm0.03)\times10^8$		
	$(4.09\pm0.07)\times10^7$	$(7.32\pm0.08)\times10^7$	$(1.24\pm0.02)\times10^8$		$(2.53\pm0.02)\times10^8$		

$^3He/^4He$ (.Ra^{-1}) (4)	15.7±0.4 26.6±0.7 3.5±0.2 3.1±0.7 3.2±1.1 0.6±0.1	27.7±0.4 25.0±0.4 50.3±0.6 9.9±0.2 4.8±0.1 30.4±0.6	25.8±0.3 84.6±1.3 65.7±1.7 19.8±0.5 27.7±0.4 34.8±0.6	35.8±2.3 Ø 2.0±0.2	-	-	-
$^3He_{ET}$ fraction (%) (4)	99.88±0.06 99.93±0.03 99.44±0.28 99.36±0.34 99.38±0.98 99.4±1.9	99.93±0.03 99.93±0.04 99.97±0.02 99.81±0.10 99.59±0.20 99.94±0.03	99.93±0.03 99.98±0.01 99.98±0.01 99.91±0.05 99.94±0.03 99.95±0.02	99.95±0.02 Ø 99.03±0.49	-	-	-
[^4He] Terrigenous (at.g^{-1} of snow)	(6.21±0.27)×10^7 (3.15±0.24)×10^7 (5.11±0.04)×10^7 (1.04±0.13)×10^7 (4.1±0.9)×10^6 (4.08±0.01)×10^7	(4.49±0.36)×10^7 (4.82±0.26)×10^7 (1.24±0.01)×10^8 (2.14±0.02)×10^8 (2.17±0.02)×10^8 (6.20±0.08)×10^7	(3.28±0.24)×10^8 (4.8±1.8)×10^7 (2.49±0.08)×10^7 (1.65±0.03)×10^8 (2.42±0.03)×10^8 (1.02±0.02)×10^8	(6.66±0.85)×10^5 Ø (1.45±0.02)×10^7	(3.33±0.17)×10^8 (1.16±0.18)×10^8 (2.06±0.01)×10^8 (3.92±0.03)×10^8 (4.62±0.04)×10^8 (2.09±0.02)×10^8	-	-
$^3He_{ET}$ flux (pcc STP.cm^{-2}.ka^{-1})	0.15±0.01 0.13±0.01 (2.51±0.14)×10^{-2} (4.56±0.73)×10^{-3} (1.84±0.53)×10^{-3} (3.16±0.47)×10^{-3}	0.20±0.01 0.15±0.01 1.16±0.04 0.31±0.01 (14.8±0.6)×10^{-2} 0.31±0.01	1.35±0.05 0.97±0.04 (33.9±1.3)×10^{-2} 0.51±0.02 1.08±0.04 0.60±0.02	(4.04±0.15)×10^{-3} Ø (4.16±0.36)×10^{-3}	1.27±0.05 1.25±0.04 1.52±0.05 0.83±0.02 1.23±0.04 0.91±0.03	-	-

	$\overline{\text{Flux}}$ (pico cc STP.cm^{-2}.Ka^{-1}) **1.25 ± 0.03 (weighted mean$\pm$1SD)**					-	-
ET mass flux from weighted mean (µg.m^{-2}.a^{-1}) (5)	$4.4\pm^{0.8}_{0.3}$ $4.0\pm^{0.8}_{0.3}$ $0.7\pm^{0.1}_{0.1}$ $0.1\pm^{0.03}_{0.01}$ $0.055\pm^{0.010}_{0.004}$ $0.09\pm^{0.02}_{0.01}$	$1.4\pm^{0.9}_{0.3}$ $1.0\pm^{0.7}_{0.2}$ $8.0\pm^{5.0}_{2.0}$ $2.1\pm^{1.4}_{0.4}$ $1.0\pm^{0.6}_{0.2}$ $2.1\pm^{1.4}_{0.4}$	$0.6\pm^{0.7}_{0.1}$ $0.4\pm^{0.5}_{0.1}$ $0.15\pm^{0.18}_{0.03}$ $0.23\pm^{0.27}_{0.04}$ $0.5\pm^{0.6}_{0.1}$ $0.3\pm^{0.3}_{0.1}$	--- $\emptyset$ ---	$6.8\pm^{2.4}_{0.7}$ $5.4\pm^{1.9}_{0.5}$ $9\pm^{5.5}_{1.6}$ $2.5\pm^{1.7}_{0.5}$ $1.6\pm^{1.2}_{0.3}$ $2.5\pm^{1.7}_{0.5}$	$8.6\pm^{1.6}_{0.6}$ $7.9\pm^{1.5}_{0.5}$ $1.5\pm^{0.3}_{0.1}$ $0.27\pm^{0.05}_{0.02}$ $0.11\pm^{0.02}_{0.01}$ $0.19\pm^{0.03}_{0.01}$	$37\pm^{11}_{4}$ $33\pm^{10}_{3}$ $6.5\pm^{2.0}_{0.6}$ $1.2\pm^{0.4}_{0.1}$ $0.46\pm^{0.14}_{0.05}$ $0.79\pm^{0.25}_{0.08}$
	$\overline{\text{Flux}}$ (µg.m^{-2}.a^{-1}) $2.9\pm^{0.6}_{0.2}$	$2.3\pm^{1.5}_{0.5}$	$0.44\pm^{0.51}_{0.08}$ **$5.6\pm^{1.7}_{0.5}$ (weighted mean$\pm$1SD)**				
ET mass flux from regression (µg.m^{-2}.a^{-1}) (5)	6.7 ± 2.0 6.2 ± 1.8 1.2 ± 0.4 0.2 ± 0.1 0.08 ± 0.03 0.14 ± 0.05	1.3 ± 0.4 0.9 ± 0.3 7.4 ± 2.0 2.0 ± 0.5 1.0 ± 0.3 2.0 ± 0.5	0.24 ± 0.05 0.17 ± 0.04 0.06 ± 0.01 0.09 ± 0.02 0.19 ± 0.04 0.11 ± 0.02	$(2.84\pm0.43)\times10^{-7}$ $\emptyset$ $(2.92\pm0.49)\times10^{-7}$	9 ± 2 7 ± 2 9 ± 2 2.3 ± 0.5 1.2 ± 0.3 2.2 ± 0.6	25 ± 8 23 ± 7 4 ± 1 0.8 ± 0.3 0.3 ± 0.1 0.5 ± 0.2	60 ± 20 66 ± 22 11 ± 4 2.3 ± 0.9 0.8 ± 0.4 1.4 ± 0.5

	$\overline{\text{Flux}}$ (μg.m^{-2}.a^{-1}) 5±1		2.14±0.40	0.17±0.02	(2.88±0.22)×10^{-7}		
	7±1 (weighted mean±1SD)						
Mass flux of terrestrial silicate particles (mg.m^{-2}.a^{-1}) (6)	1.42±0.06 0.72±0.43 1.17±0.03 0.24±0.03 0.01±0.03 0.93±0.04	6.15±0.50 5.07±0.36 16.98±0.35 29.3±1.9 29.7±1.8 8.6±0.3	77.2±5.7 11.2±4.1 5.86±0.23 39.0±2.7 57.1±3.6 24.14±0.85	0.29±0.04 Ø 6.33±0.29	16.2±1.1 17.0±4.1 26.8±0.4 69.4±3.3 87.8±4.0 35.4±0.9	-	-
	$\overline{\text{Flux}}$ (mg/m²/an) 1.46±0.05		11.5±0.4	39.0±3.0	1.96±0.09	-	-
	44±3 (weighted mean±1SD)						

The results in color correspond to the different snow tanks. Data are reported for different particle size ranges. The snow masses were weighted prior to melting. The size range labeled '< 5 µm' shows results for evaporated meltwater in aluminum capsules. In one of the three capsules, ^3He was below the aluminum blank level ($[^3He_{ET}]$ = $(6.06\pm0.54)x10^5$ atoms of $^3He.g\_Al^{-1}$). Arithmetic means of the $^3He_{ET}$ flux and total cosmic dust mass were calculated across the snow tanks and integrated over the particle size ranges. Two ET mass flux estimates are provided: one using the weighted mean of $^3He_{ET}$ for each size range and, and the second one from $[^3He_{ET}]$-Mass regression described in **Fig.6**. Units are given in brackets in the first column. Errors are 1σ and were calculated using Taylor's uncertainty propagation. The symbol 'Ø' indicates abundances below the blank level.

(1) *ET mass flux estimates, based on $^3He_{ET}$ concentrations, are obtained using 62-100 microns size range.*

(2) *Helium isotopic abundances obtained from total snow masses (see,* ***Annexe A*** gives exposure-parameters for each snow tank*).*

(3) *He isotopic ratios in Ra, the Earth atmospheric ratio (Ra = 1.384×10^{-6}, Ozima and Podosek, (2002)).*

(4) $^3He_{ET}$ *fractions calculated using a two components mixing equation (e.g., Marcantonio et al., (1995); McGee and Mukhopadhyay, (2013)) (($^3He/^4He$)extraterrestrial = 0.02 Ra (Benkert et al., (1993); Heber et al., (2009), (2012)) ; ($^3He/^4He$)terrigenous = 200 Ra; (e.g., Marcantonio et al., (1995); Farley and Patterson, (1995); Winckler et al., (2005)).*

(5) *Cosmic mass fluxes are calculated from $^3He_{ET}$ abundances measured from the filters and using the [$^3He_{ET}$] weighted mean and [$^3He_{ET}$] -Mass empirical relationship obtained from the exhaustive database (**Fig.6**). For the first method, masses were converted into fluxes taking into account the snow accumulation rate of* $\boldsymbol{R_{snow} = 2.7\pm0.1\ g.cm^{-2}.a^{-1}}$ *(Frezzotti et al., (2005); Le Meur et al., (2018)). Uncertainties of the cosmic dust density were computed considering two endmembers: (0.8 $g.cm^{-3}$ (cometary dust 67P-Churyumov-Gerasimenko, Fulle et al., (2016)) to 2.2 $g.cm^{-3}$ (carbonaceous chondrites mean-density, Consolmagno et al., (2008); Flynn and Sutton, (1991); Joswiak et al., (2007); Love et al., (1994))) and propagated using parent body contributions from Carrillo-Sánchez et al., (2021). For the second method, we fixed a mean density of 1 $g.cm^{-3}$.*

(6) *Mass flux of terrestrial dust was calculated considering ^4He concentrations in dust from McGee et al. (2016), following: $(1.18\pm0.03)\times10^{15}$, $(1.97\pm0.05)\times10^{14}$, $(1.15\pm0.03)\times10^{14}$ and $(6.20\pm0.79)\times10^{15}$ $at.g^{-1}$ for > 62 µm, 25-62 µm, 5-25 µm and < 5 µm size ranges, respectively.*

(7) *Cosmic Mass flux by changing the upper limit of the integrated $^3He_{ET}$ concentrations.*