

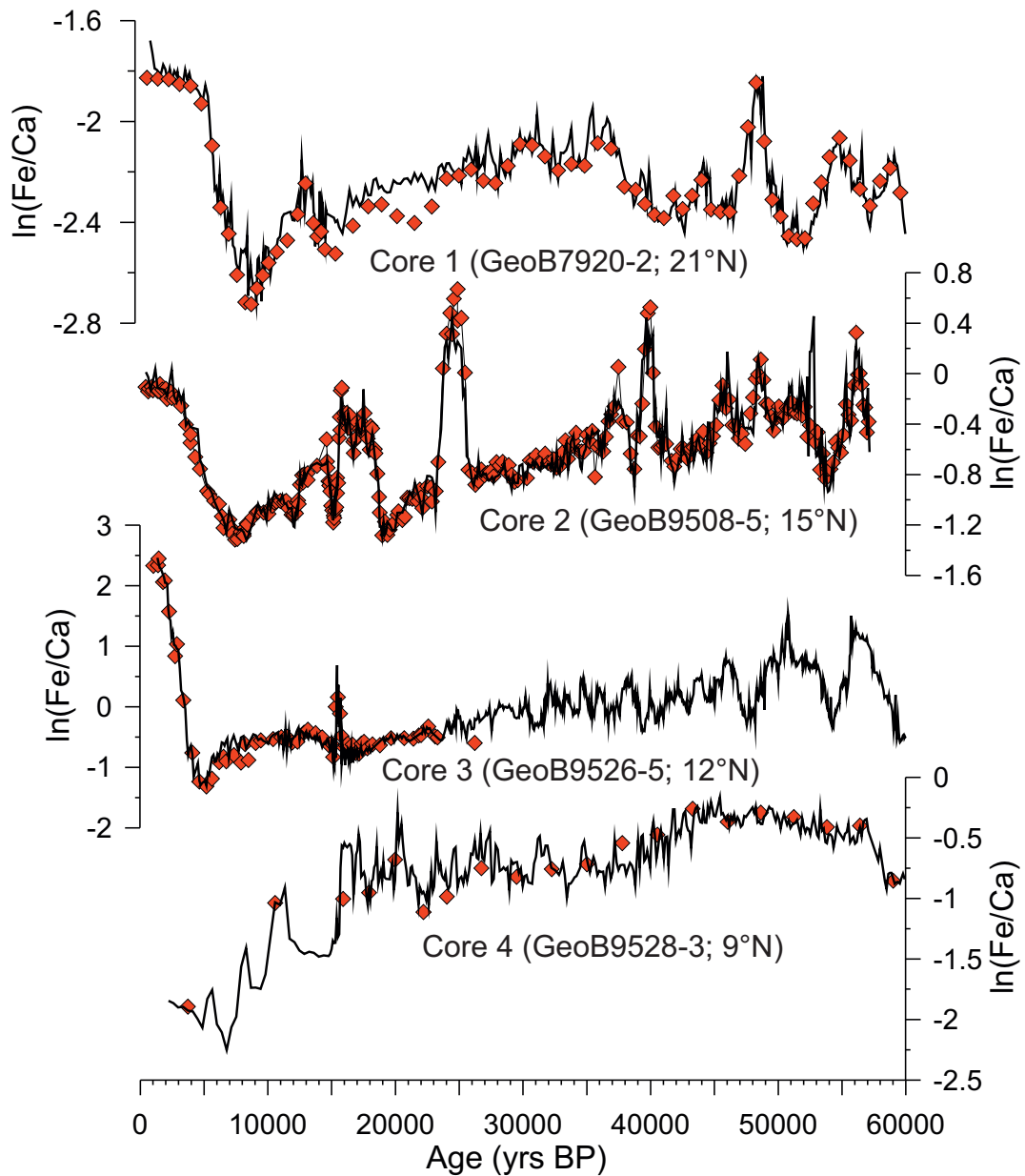
Supplementary Table 1: Major-element composition of the dust, river and marine end-members.

Dust end-member: Sahara-Sahel dust and soils									
Latitude	Longitude	Al(%)	Si (%)	K (%)	Ca (%)	Ti (%)	Fe (%)	Reference	Material
27° 50.00' N	12° 53.00' W	11.1	55.0	3.8	21.9	0.9	7.3	(Moreno et al., 2006)	Soil
27° 02.00' N	13° 05.00' W	8.9	52.0	3.3	30.4	0.6	4.7	(Moreno et al., 2006)	Soil
26° 37.00' N	13° 03.00' E	6.3	62.3	2.6	20.5	1.3	6.9	(Moreno et al., 2006)	Soil
25° 30.00' N	05° 00.00' E	16.2	63.5	3.9	4.6	1.7	10.1	(Guieu and Thomas, 1996)	Soil
25° 30.00' N	05° 00.00' E	15.2	67.3	5.0	3.7	1.1	7.8	(Guieu and Thomas, 1996)	Soil
22° 55.00' N	5° 29.00' E	17.1	63.5	4.5	3.8	1.8	9.3	(Moreno et al., 2006)	Soil
22° 47.00' N	5° 32.00' E	16.3	66.1	4.6	3.2	1.7	8.2	(Moreno et al., 2006)	Soil
17° 45.00' N	17° 48.00' E	16.6	66.5	2.7	2.2	1.4	10.6	(Moreno et al., 2006)	Soil
16° 37.00' N	15° 02.00' W	11.7	76.2	1.9	1.3	1.2	7.7	(Orange and Gac, 1990)	Aerosol Dust
16° 37.00' N	15° 02.00' W	12.1	75.7	2.0	1.0	1.2	7.9	(Orange et al., 1993)	Aerosol Dust
16° 37.00' N	15° 02.00' W	11.0	76.9	1.8	1.7	1.1	7.4	(Orange et al., 1993)	Aerosol Dust
15° 00.00' N	10° 00.00' E	13.6	72.5	2.8	2.2	1.5	7.3	(Moreno et al., 2006)	Aerosol Dust
14° 69.00' N	17° 45.00' W	13.7	71.1	3.7	3.0	1.2	7.3	(Orange et al., 1993)	Aerosol Dust
14° 69.00' N	17° 45.00' W	14.2	70.2	3.8	3.1	1.2	7.4	(Orange et al., 1993)	Aerosol Dust
14° 69.00' N	17° 45.00' W	12.5	72.3	2.7	3.1	1.1	8.3	(Orange et al., 1993)	Aerosol Dust
14° 69.00' N	17° 45.00' W	10.7	74.3	1.8	3.7	1.0	8.5	(Orange et al., 1993)	Aerosol Dust
14° 41.57' N	17° 36.80' W	12.2	73.8	4.2	3.4	0.9	5.6	(Orange and Gac, 1990)	Aerosol Dust
14° 25.00' N	16° 58.00' W	11.8	75.6	1.9	1.5	1.1	8.1	(Orange et al., 1993)	Aerosol Dust
14° 25.00' N	16° 58.00' W	10.9	77.1	1.8	1.7	1.1	7.5	(Orange et al., 1993)	Aerosol Dust
13° 23.00' N	2° 28.00' E	14.0	74.3	2.3	0.6	1.9	7.0	(Moreno et al., 2006)	Aerosol Dust
13° 23.00' N	2° 28.00' E	14.3	69.4	3.3	2.6	1.5	8.9	(Moreno et al., 2006)	Aerosol Dust
12° 00.00' N	8° 31.00' E	15.1	63.1	5.8	6.1	1.2	8.7	(Wilke et al., 1984)	Aerosol Dust
12° 00.00' N	8° 31.00' E	14.3	66.0	5.7	5.1	1.2	7.7	(Wilke et al., 1984)	Aerosol Dust
12° 00.00' N	8° 31.00' E	13.7	72.1	4.0	1.9	1.0	7.3	(Orange and Gac, 1990)	Aerosol Dust
11° 04.00' N	7° 42.00' E	13.8	65.9	6.6	5.0	1.2	7.4	(Wilke et al., 1984)	Aerosol Dust
11° 04.00' N	7° 42.00' E	12.4	71.2	5.7	3.2	1.3	6.2	(Wilke et al., 1984)	Aerosol Dust
10° 07.00' N	14° 22.00' E	11.7	71.8	2.5	6.7	0.7	6.5	(Nguetnkam et al., 2008)	Soil
10° 07.00' N	14° 22.00' E	14.5	69.0	2.3	5.0	1.0	8.2	(Nguetnkam et al., 2008)	Soil
	Mean	13.1	69.1	3.5	5.4	1.2	7.7		
	Std Dev.	2.4	6.3	1.4	7.0	0.3	1.2		

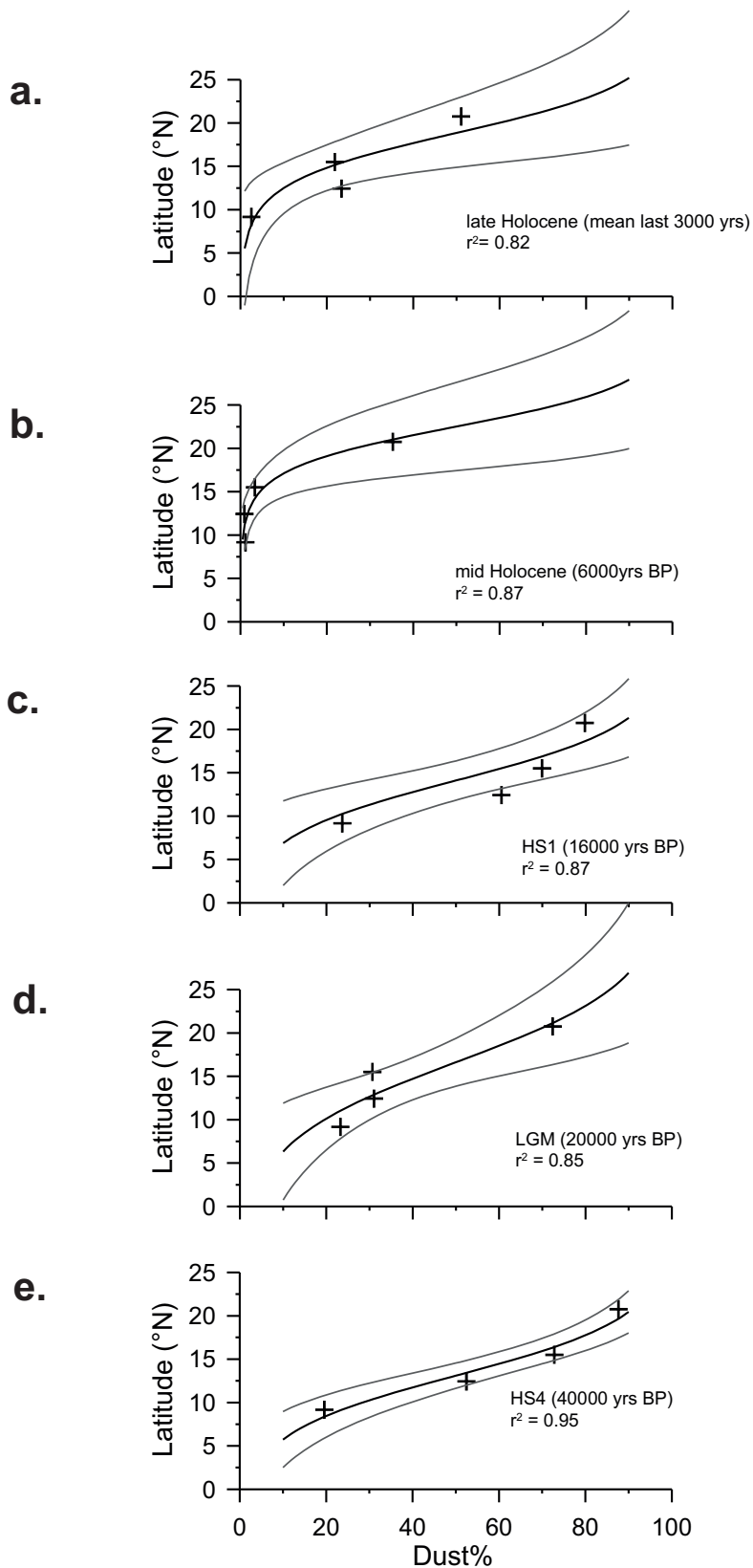
River end-member: Senegal River suspension									
Latitude	Longitude	Al(%)	Si (%)	K (%)	Ca (%)	Ti (%)	Fe (%)	Reference	Material
16°02' N	16°30' W	28.4	51.2	3.6	0.5	1.3	15.0	(Gac and Kane, 1986)	Senegal River suspension
16°02' N	16°30' W	28.1	51.5	3.2	0.5	1.2	15.4	(Gac and Kane, 1986)	Senegal River suspension
16°02' N	16°30' W	27.9	52.9	2.9	0.3	1.3	14.7	(Gac and Kane, 1986)	Senegal River suspension
16°02' N	16°30' W	28.9	51.3	3.0	0.3	1.2	15.3	(Gac and Kane, 1986)	Senegal River suspension
16°02' N	16°30' W	28.1	52.7	3.0	0.3	1.2	14.7	(Gac and Kane, 1986)	Senegal River suspension
16°02' N	16°30' W	27.5	52.7	3.1	0.3	1.2	15.2	(Gac and Kane, 1986)	Senegal River suspension
16°02' N	16°30' W	28.1	52.3	3.2	0.5	1.2	14.7	(Gac and Kane, 1986)	Senegal River suspension
16°02' N	16°30' W	27.1	52.4	3.2	0.8	1.2	15.2	(Gac and Kane, 1986)	Senegal River suspension
16°02' N	16°30' W	29.2	50.6	3.1	0.3	1.1	15.8	(Gac and Kane, 1986)	Senegal River suspension
16°02' N	16°30' W	29.4	50.7	3.1	0.3	1.1	15.4	(Gac and Kane, 1986)	Senegal River suspension
	Mean	28.3	51.8	3.1	0.4	1.2	15.1		
	Std Dev.	0.7	0.9	0.2	0.2	0.1	0.4		

Marine end-member								
	Al(%)	Si (%)	K (%)	Ca (%)	Ti (%)	Fe (%)	Reference	
GeoB7920-2	0	4 ± 2	0	96 ± 2	0	0	(Mulitza et al., 2010; Collins et al., 2011)	
GeoB9508-5	0	16 ± 6	0	84 ± 6	0	0	(Mulitza et al., 2010; Collins et al., 2011)	
GeoB9526-5	0	29 ± 9	0	71 ± 9	0	0	(Mulitza et al., 2010; Collins et al., 2011)	
GeoB9528-3	0	9 ± 2	0	91 ± 2	0	0	(Mulitza et al., 2010; Collins et al., 2011)	

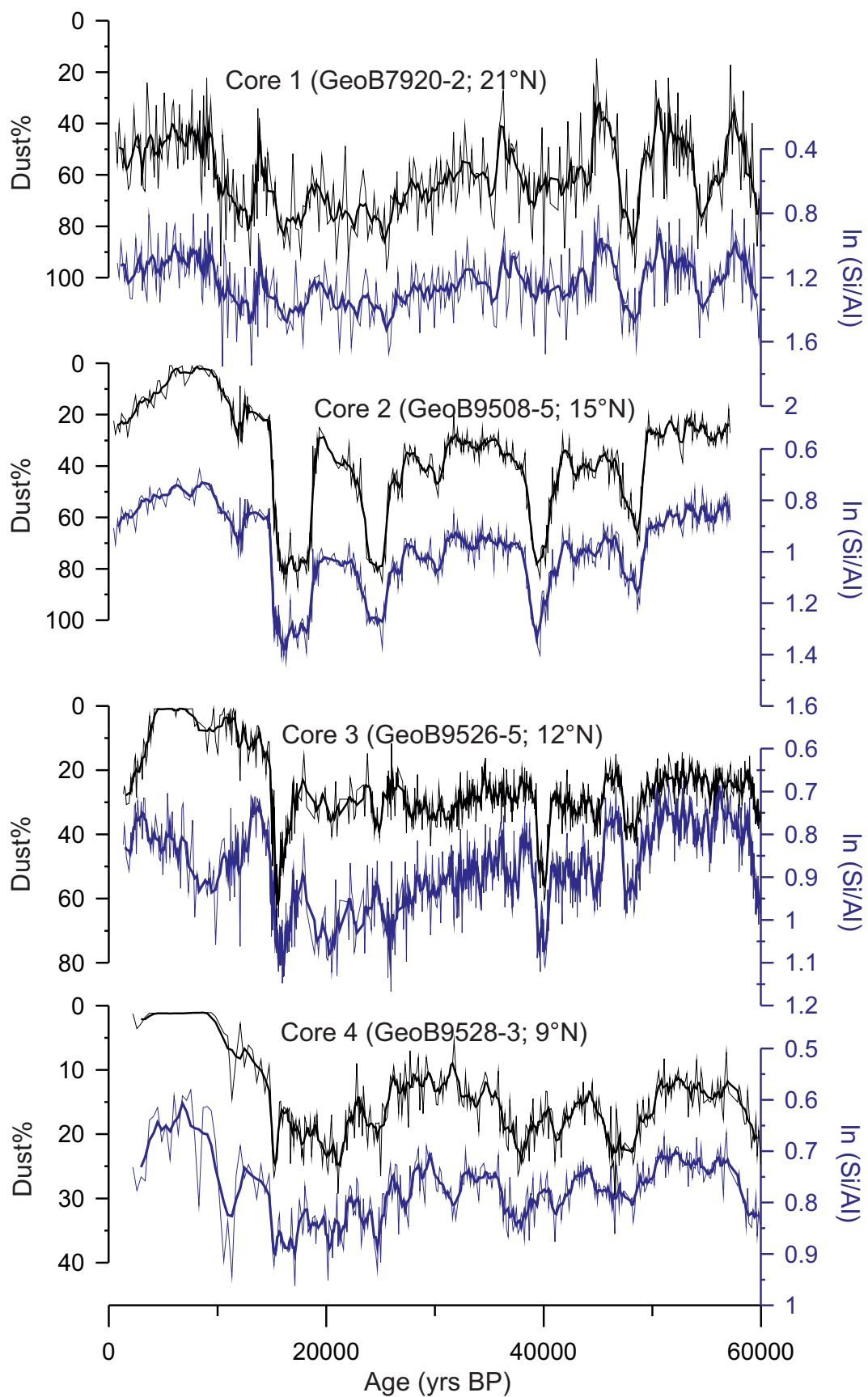
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Supplementary Figure 1. Fit of the calibrated scanner data with the discrete powder samples. Calibrated scanner data (black line) and EDP-XRF powder data (red diamonds) plotted against age. The calibration regresses the scanner data against the powder data for all element log-ratios (with Ca as the denominator). Mean r^2 values for all the log(element/Ca) regressions are: 0.74 (GeoB7920-2), 0.91 (GeoB9508-5), 0.95 (GeoB9526-5) and 0.93 (GeoB9528-3). Although the discrete powder samples do not cover the entire core for GeoB9526-5, they cover the most extreme sediment compositions, as recommended by Weltje and Tjallingii (2008). As such, any additional powder samples would be unlikely to modify the calibrated scanner data. For core GeoB9528-3 the full core is calibrated using 50 samples covering the entire core (although only 20 cover this section of the core). Again, any additional samples would be unlikely to change the calibrated data.



Supplementary Figure 2. Linear regression of dust% and latitude for past timeslices. (a) Late Holocene (mean of last 3000 yrs). **(b)** mid Holocene (timestep at 6000 yrs BP). **(c)** Heinrich Stadial 1 (timestep at 16000 yrs BP). **(d)** Last Glacial Maximum (timestep at 23000 yrs BP). **(e)** Heinrich Stadial 4 (timestep at 40000 yrs BP). Crosses mark sediment Cores 1-4. Black lines represent robust linear regression. Data have been transformed as $\log((100-\text{dust\%})/\text{dust\%})$ so that the regression lies in the interval (0, 100). Grey lines represent 68% confidence intervals. Regression is plotted between 0.5-90% dust for (a)-(b) and 10-90% dust for (c)-(e).



Supplementary Figure 3. Dust% and ln(Si/Al) ratios for the last 60ka for sediment cores 1-4.