

## Supplementary Material

**Table S1.** Basic statistics for the diatom abundance ( $\text{n yr}^{-1}$ ), chemical species flux ( $\text{ppb kg m}^{-2}$ ) and MPC flux (particles  $\text{kg m}^{-2}$ ) annual records from each ice core. Bold numbers indicate statistically significant linear trend values ( $p < 0.05$ ). (\*) MPC flux record from JUR covers the interval 1992-2011 CE due to missing data.

	Mean	Stdv	Max	Min	Linear trend
<b>SHIC (1999-2019 CE)</b>					
<b>Diatom abundance</b>	54.4	33.7	110	10	2.16
<b>MPC flux</b>	401545	207293	893535	130601	7082.97
<b>nssCa<sup>2+</sup> flux</b>	14898.6	6010.57	24697.7	6623.69	<b>-622.03</b>
<b>nssK<sup>+</sup> flux</b>	14316.9	10140.8	46777.8	4018.41	-631.52
<b>ssNa<sup>+</sup> flux</b>	212145	74777.1	393636	73544.5	895.62
<b>MSA flux</b>	19383.7	9445.86	40421.8	1514.84	-88.773
<b>JUR (1992-2012 CE)</b>					
<b>Diatom abundance</b>	57.0	34.0	166	20	2.07
<b>MPC flux*</b>	133330	45863.3	237952	54783.6	2030.22
<b>nssCa<sup>2+</sup> flux</b>	69827.9	21715.5	115976	34397.1	<b>2568.96</b>
<b>nssK<sup>+</sup> flux</b>	14793.1	9887.22	40259.7	2203.81	<b>1004.18</b>
<b>ssNa<sup>+</sup> flux</b>	46239.9	24722.7	110866	10750.2	1319.76
<b>MSA flux</b>	15543.5	5605.27	23917.6	5058.6	-56.01
<b>SKBL (1999-2019 CE)</b>					
<b>Diatom abundance</b>	29.2	14.9	77	15	-0.41
<b>MPC flux</b>	261143	161326	681947	52610	<b>-16574</b>
<b>nssCa<sup>2+</sup> flux</b>	7662.33	3787.26	17710.2	2985.67	<b>-315.85</b>
<b>nssK<sup>+</sup> flux</b>	3377.75	1317.43	5857	921.31	<b>-155.21</b>
<b>ssNa<sup>+</sup> flux</b>	28285	17079	66427	2355.27	-234.93
<b>MSA flux</b>	2927.59	1896.43	8919.92	773.1	-58.28