Supplementary Materials

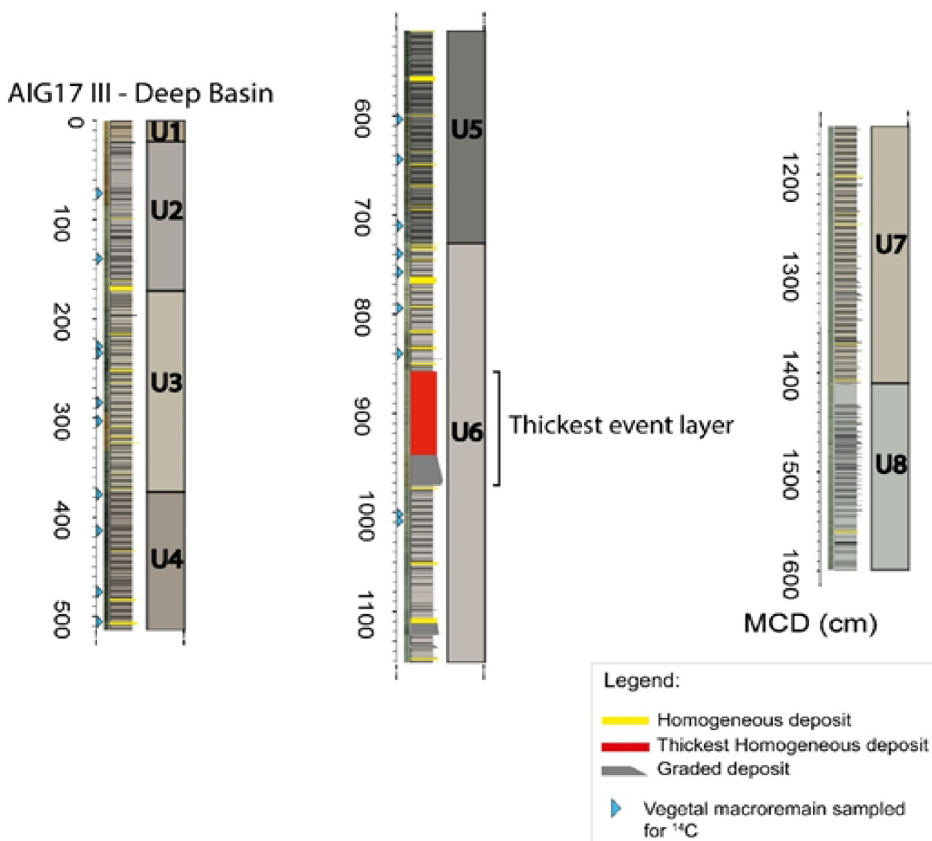
SM-1: (A) Description of the AIG17III (Lake Aiguebelette deep basin) sequence and its 8 units (from Banjan et al. 2023); (B) Detailed log of the AIG17III sequence (also available in Banjan et al. 2023, Supplementary Materials).

(A)

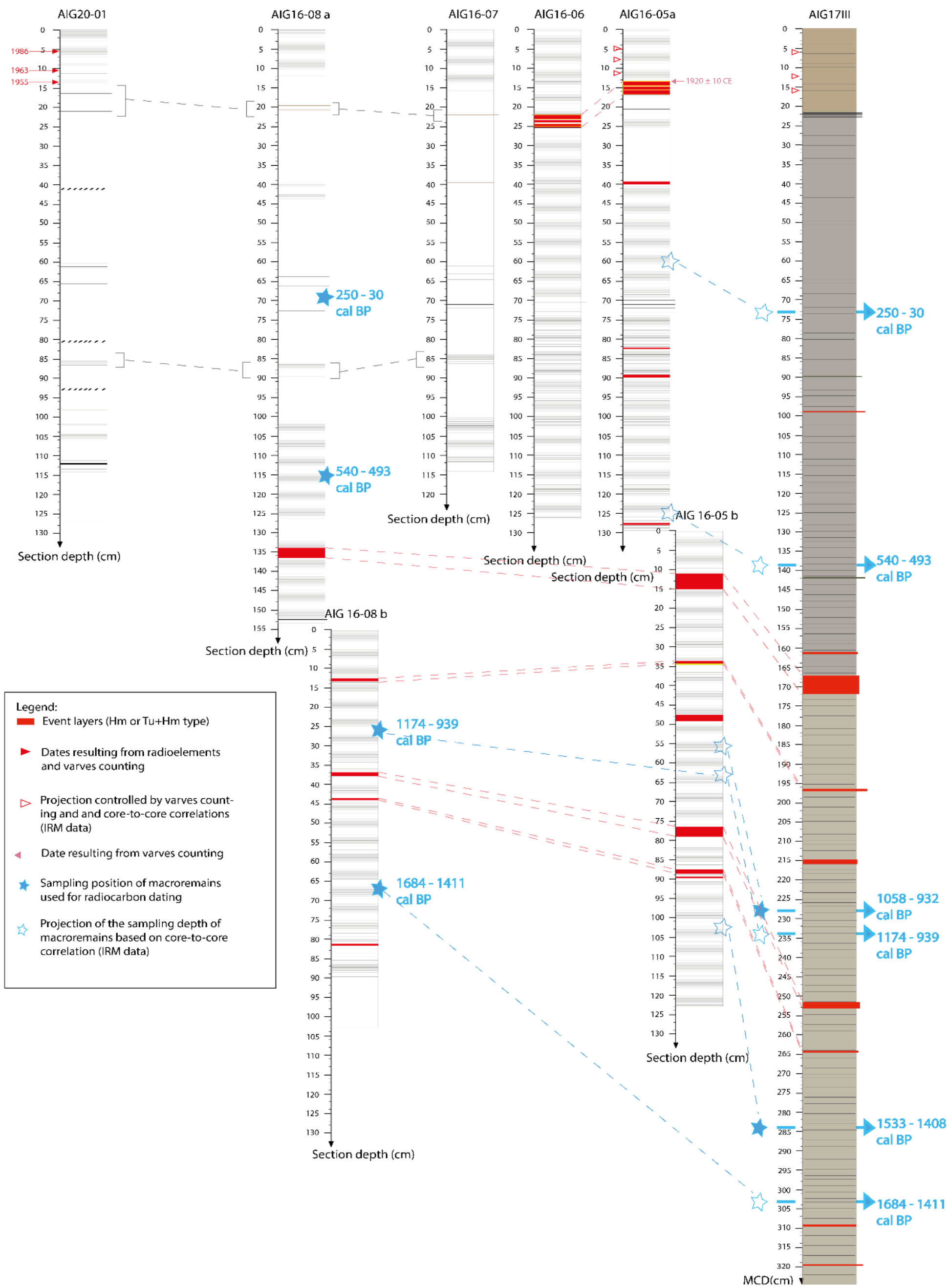
Unit	Depth MCD (master core depth (cm))	Description	Specific characteristics
1	0 - 21	Brown to greenish clays with alternations of type 1), 2) and 3) laminae	Topped by three silty layers (of 2 to 3 mm each); laminae are less diffuse from 104.5 to 165 cm MCD
2	21.1 - 165.5	Gray to brownish clay with faint lamination	
3	165.5 - 374.2	Gray to brownish sediments with alternation of type 1), 2) and 3) laminae	Topped by a 5 cm-thick visually homogeneous brown clayey to silty event layer (the thickest one observed in this unit)
4	374.2 - 513.9	Olive brown clays	Alternating thin clayey to silty dark sections and clear gray to yellow laminae
5	513.9 - 728.7	Thin clayey to silty layers of brown to greenish-gray with submillimeter-scale darker laminae	
6	728.7 - 1150.3	Brown to greenish-gray clayey-silty sediment with millimeter-scale laminae	Part of this unit is composed of an event layer. This event layer is constituted by a 31.4 cm thick sandy graded base topped by an 83.6 cm thick homogenous deposit (Fig. 6). These two facies

			constitute the thickest (115 cm) event layer of the sediment sequence
7	1150.3 - 1410.7	Gray—brownish clay and silt with fine millimeter-scale dark and clear gray laminae with no specific repetitive pattern	Millimetric- to centimetric-graded sandy event layers are observed in this unit
8	1410.7 - 1597.6	Clayey to silty gray and olive green sediments with thicker (several mm thick) laminae	The lower 70 cm are characterized by faint lamination

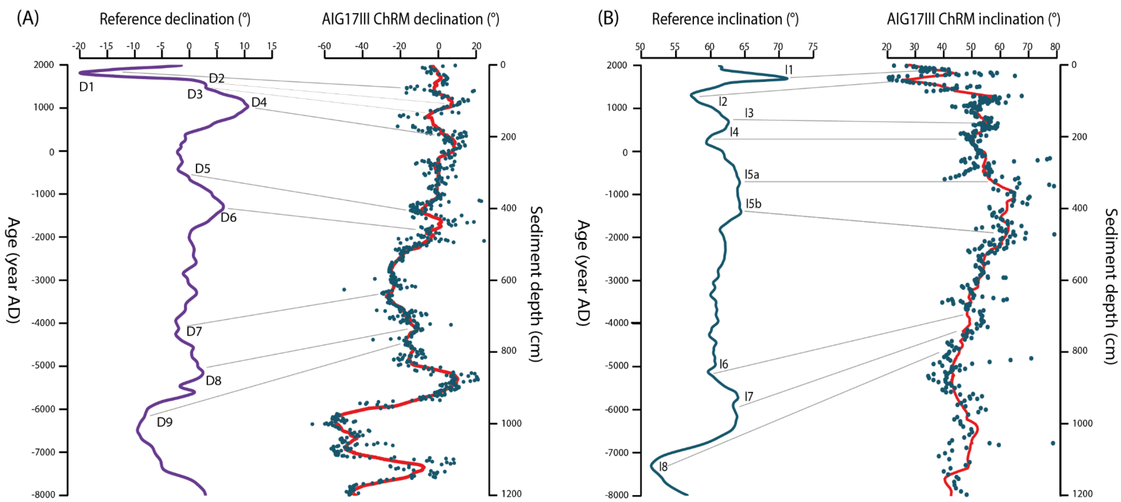
(B)



SM-2: Correlations between cores from Lake Aiguebelette deep basin.



SM-3: Correlations of the ChRM data with the continuous global magnetic field model Cals10K from Korte et al. (2011).



SM-4: Standard deviation (STD) and maximal angular variation (MAV) of the declination and inclination of the Characteristic Remanent Magnetization for different studied lakes compared to the Arch 3k model. Lake Aiguebelette is indicated in bold. The data from several lakes from Crouzet et al. (2019a) and Lund and Platzman (2016) are indicated for comparison. The number (Nb) of values used for calculation is indicated.

	Declination		Inclination			Nb
	STD	MAV	Average	STD	MAV	
THU	24.8	101.3	56.8	8.1	48.3	218
ALO	5.2	21.8	49.6	7.1	34.8	64
BLB	15.0	61.8	56.6	7.2	30.6	49
EYC	19.6	76.5	62.5	9.8	37.4	46
DOS	18.8	68.8	72.5	6.5	25.0	33
ZACA	-	65.0	50.0	-	20	-
AIG (0-300)	8.8	58.1	46.1	11.7	49.7	178
Arch 3k	10.7	39.7	61.9	4.2	14.5	160

SM-5: Presentation of the event layers (Hm or Tu+Hm type) interpreted as seismically-induced and correlations between cores at the scale of the deep basin (AIG16-05; AIG17III). Possible correlations to historical earthquakes identified in other regional lakes are suggested in this table. The depositional date of the event layer is given based on (based on the age-depth model (Fig. 8) and core-to-core correlations). The thickness of each event layer is indicated in red and the depth in orange (cm MCD). Based on this study, a confidence index is provided: (+) indicates it is highly possible that the historical earthquake triggered the archived event layer, whereas (-) indicates that a correlation is possible in terms of occurrence but has been disregarded.

AIG16-05	AIG17III	Depositional date of the event layer (y cal CE)	Possible triggering historical earthquake, confidence index	Earthquake archived in the sediments of Lake
0.2 82.2-82.5		1760-1824	*1822 CE Bugey, (-) **1784 CE Chartreuse, (+)	*Bourget: Chapron et al. (1999) **Paladru (?): Chapron et al. (2016)
0.7 89.3-90		1528-1586		
0.5 127.5-128		1581-1647		
4 140.5-144.5	4.8 166.6-171.4	1327-1372	1356 CE Basel, (-)	Zurich: Strasser et al. (2013) Baldedegger See: Monecke et al. (2004) Vierwaldstatter See: Schnellmann et al. (2002)
0.6 163.2-163.8	0.6 195.9-196.5	1186-1256		
0.6 205.8-208.6		1039-1127		
2.8 205.8-208.6	1.7 250.9-252.6	712-801		
1 217.2-218.2	0.4 263.6-264	630 – 729		

SM-6: Records of historical earthquakes in lakes Aiguebelette (AIG), Le Bourget (LDB) and Paladru (LP). Data for LDB and LP are from Chapron et al. (2016). The presence of event layers in the lake at a compatible date with the earthquake occurrence is indicated by a cross. Lake Aiguebelette event layer has a depositional time window compatible with two seismic events. The 1784 CE event is the favoured triggering seismic event (discussed in section 5.2.2).

<table>
<tr><th>AIG</th><th>LDB</th><th>LP</th><th>Historical earthquake</th></tr>
<tr><td></td><td></td><td>x</td><td>1881 CE</td></tr>
<tr><td></td><td></td><td>x</td><td>1869 CE</td></tr>
<tr><td rowspan="2">x</td><td>x</td><td></td><td>1822 CE</td></tr>
<tr><td></td><td></td><td>1784 CE</td></tr>
<tr><td></td><td></td><td>x</td><td>1754 CE</td></tr>
</table>

Given the depositional time uncertainties, relative comparisons (see table above) of historical earthquakes archived in regional lakes Aiguebelette, Le Bourget and Paladru suggest the possibility of synchronous to quasi-synchronous event layers:

1754 CE: According to Chapron et al. (2016), the event layer labelled MWD3 in lake Paladru is described as possibly contemporary to the 1754 CE Voreppe event. The age of this event layer is estimated at 1660 ± 100 CE based on seismic stratigraphy and the age-depth model available in Simonneau et al. (2013). Given the broad range of this estimate, the possibility that both Lake Aiguebelette and Lake Paladru may have archived the 1784 CE Chartreuse earthquake is not excluded. This indicates that the 1784 CE event, not discussed in other regional studies until now, may have had an influence on event layer deposition at a regional scale.

1822 CE: In Chapron (1999), the depositional time of a homogenite identified in Lake Bourget was constrained by an extrapolation of the sedimentation rate with a 10-yr resolution, based on the upper sediment ^{210}Pb data. This gives an age of 1831 CE at the top of this homogenite. This event layer was correlated to the seismic event of 1822 CE. Since then, no new data constrained its depositional date. This “1822 CE” homogenite is considered as a chronological marker in Lake Bourget.

In Lake Aiguebelette, the 1784 CE seismic event was favoured over the 1822 CE earthquake as the triggering mechanism for the homogenite that deposited in the 1760-1824 CE range (see section 5.2.2.). Even if the depositional time window of this event layer in Lake Aiguebelette is compatible with the 1822 CE seismic event and homogenite in Lake Bourget, it is unlikely that the two event layers in each lake deposited at the same time.

More recent historical earthquakes have not been archived at a regional scale (one or more lakes, including AIG, LDB or LP).

<u>SM-7</u>: Age and thickness of the Hm and Tu+Hm event layers (≥ 0.5 cm) archived in the studied cores of Lake Aiguebette deep basin. The "best age" in CE is estimated based on the multi-proxy age-depth model (Fig. 8). This data table was used to generate the histograms (Fig. 12 and Fig. 13).

Age (CE)	Thickness (cm)
1760	0.8
1581	0.7
1327	0.5
1288	4.8
1186	4
1143	0.6
1031	1.2
775	1.7
380	0.8
316	0.5
277	0.6
-2164	2.5
-2261	0.5
-2936	4.3
-3449	0.7
-3469	0.5
-4221	1
-4600	0.5
-4982	0.6
-5053	0.7
-5914	0.8
-5967	1.2
-6242	0.5
-6780	0.5
-6783	6.3
-7570	1.2
-8427	2.2
-9044	2.4
-9340	1.8
-9508	1.8
-9785	83.6
-9884	1.1

References (Supplementary Materials):

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