Supplementary Table DR1: Accelerator Mass Spectrometry ^{14}C ages.

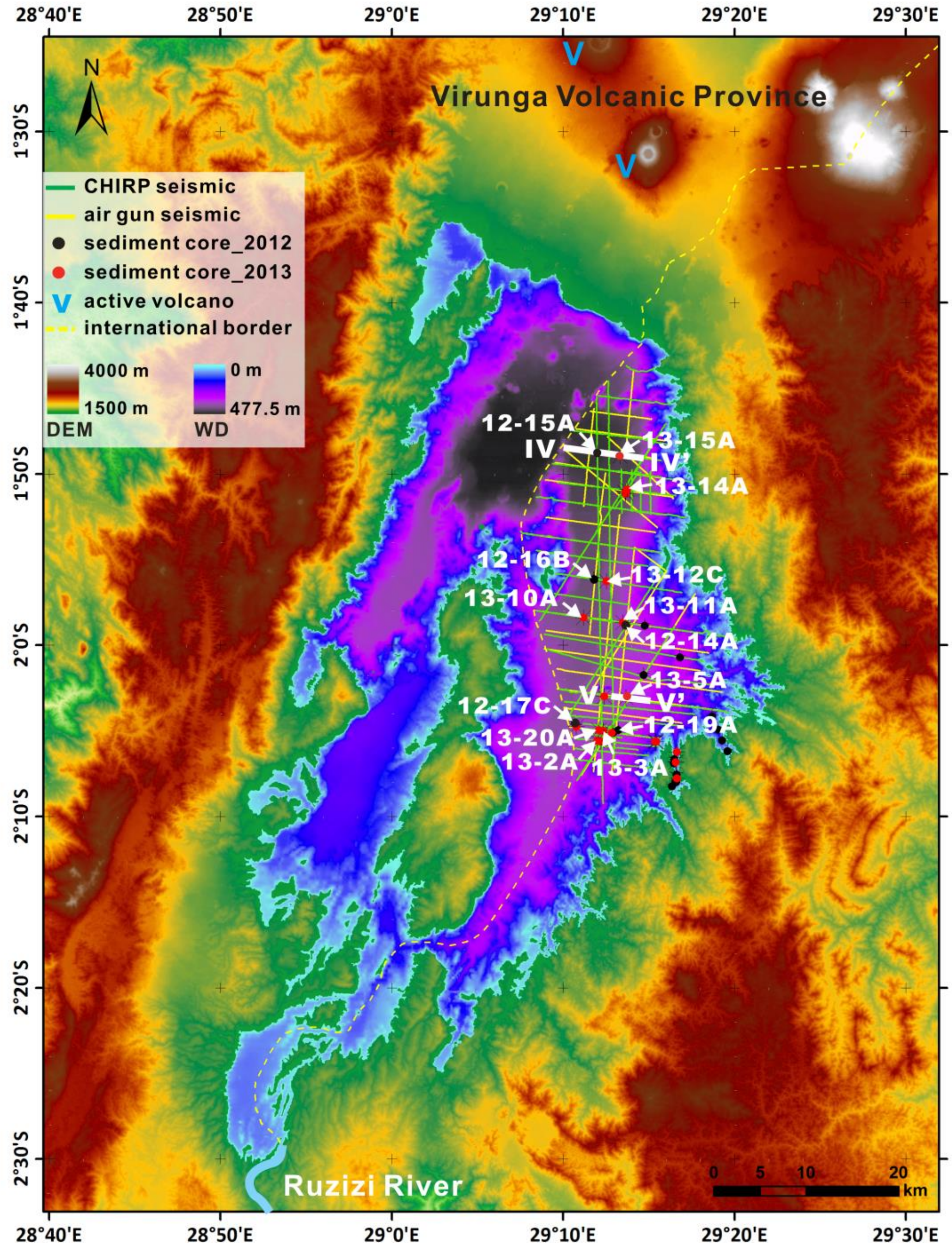
Core	Section	Depth (cm)	Material	SD (cm)	Age (^{14}C yr BP)	Age (cal yr BP)
12-19A	4	55	macroplant	371, 334	3390 ± 30	3641 ± 40
	5	12.5	macroplant	413.5, 376.4	4440 ± 30	5104 ± 117
	6	45.5	macroplant	515.5, 476.7	5960 ± 30	6800 ± 44
	6	94	macroplant	564, 524.8	6270 ± 40	7212 ± 36
	7	18	macroplant	638, 566.1	7430 ± 40	8265 ± 52
	7	35	macroplant	655, 582.8	8100 ± 40	9051 ± 40
13-12C	4	60	macroplant	473.5, 435.4	5270 ± 40	6068 ± 84
	5	51	macroplant	615, 544.1	7060 ± 40	7900 ± 38
13-15A	5	104	macroplant	608.5, 537.6	6670 ± 40	7545 ± 32
	6	39.5	macroplant	642, 570.1	7210 ± 40	8044 ± 57
13-20A	3	123	macroplant	297, 266.8	2140 ± 30	2172 ± 95
	7	59	macroplant	776.5, 691.5	9100 ± 50	10284 ± 54
13-2A	7	104	macroplant	711, 626.8	8390 ± 40	9408 ± 59
	7	135.5	gastropod	852, 766.8	25220 ± 240	30095 ± 291*
13-5A	6	49.5	macroplant	796.5, 711.3	10000 ± 40	11496 ± 142
	6	92-95	bulk sediments	845.5, 760.3	19380 ± 80	23142 ± 272*
	6	106	macroplant	849, 763.8	160 ± 30	144 ± 114*
	6	108	macroplant	851, 765.8	1860 ± 30	1799 ± 48*
	6	108	macroplant	851, 765.8	8420 ± 40	9469 ± 28*

SD: standardized depth scale relative to core 12-19A. The SD depths before and after adjustments for core caps and turbidites are given for each radiocarbon sample. Due to the instantaneous nature of turbidite sedimentation, turbidites were removed from the depth scale before developing age models. Measured radiocarbon dates were calibrated using the calibration curve CalPal2007_HULU (CalPal-2007^{online}, Danzeglocke et al., 2013).

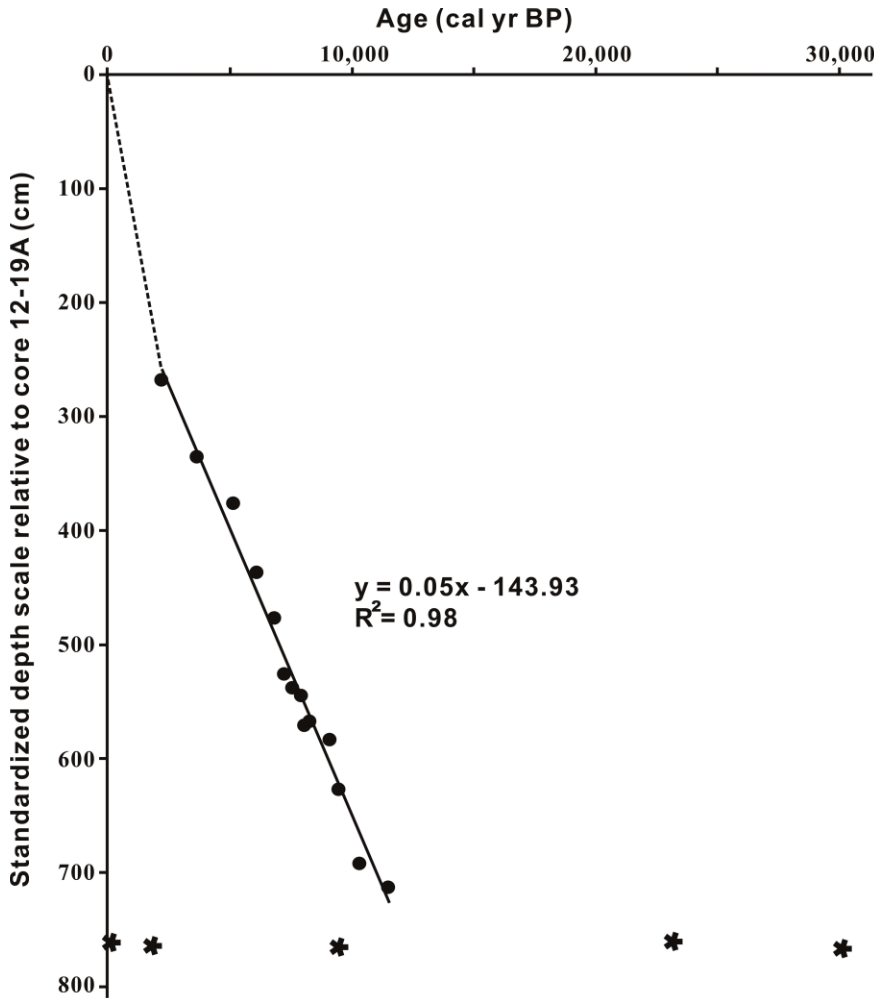
*: ^{14}C dates that are excluded. The ^{14}C samples of bulk sediments and gastropod shells give extremely old dates due to input of geogenic old carbon from hydrothermal activity. The three macroplant samples appearing above ooids at the bottom of core 13-5A give inverted dates; these were contaminated from shallower depths during the coring process.

Supplementary Table DR2: Metadata of sediment cores.

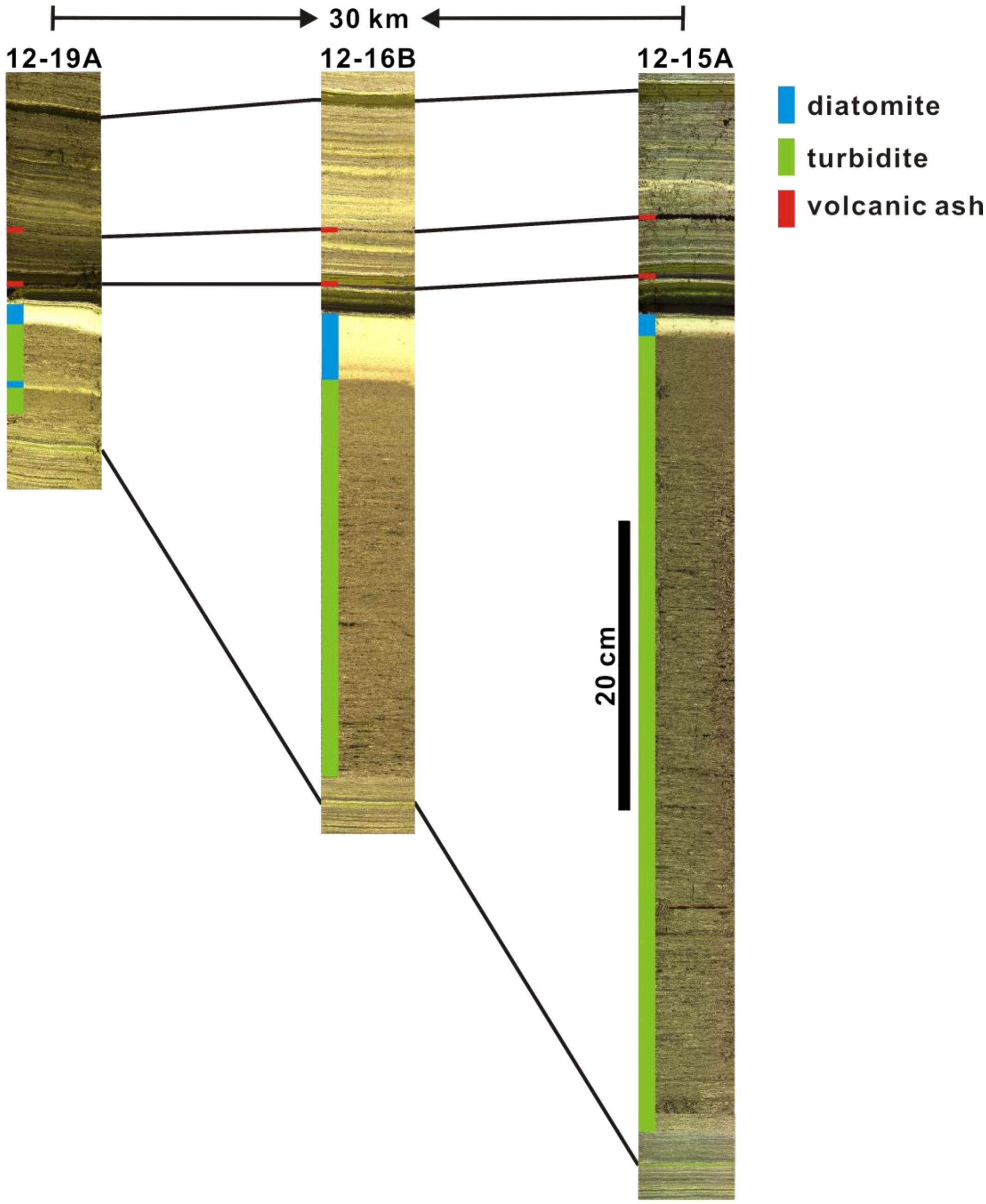
Core ID	Latitude	Longitude	Water Depth (m)	Core Length (m)
12-11A	-2.01180°	29.28016°	318	7.9
12-13A	-1.98098°	29.24598°	319	8.0
12-14A	-1.97789°	29.22484°	356	7.9
12-15A	-1.81299°	29.19967°	455	6.9
12-16B	-1.93542°	29.19668°	414	8.0
12-17C	-2.07861°	29.17939°	365	7.1
12-19A	-2.08513°	29.21562°	352	8.6
13-2A	-2.09288°	29.19973°	355	7.4
13-3A	-2.08340°	29.20585°	372	7.1
13-5A	-2.05102°	29.22775°	361	6.9
13-10A	-1.97307°	29.18649°	412	6.6
13-11A	-1.97778°	29.22491°	364	6.4
13-12C	-1.93763°	29.20860°	385	8.4
13-14A	-1.84836°	29.22823°	428	8.7
13-15A	-1.81590°	29.22179°	444	8.1
13-20A	-2.08260°	29.20123°	370	8.2



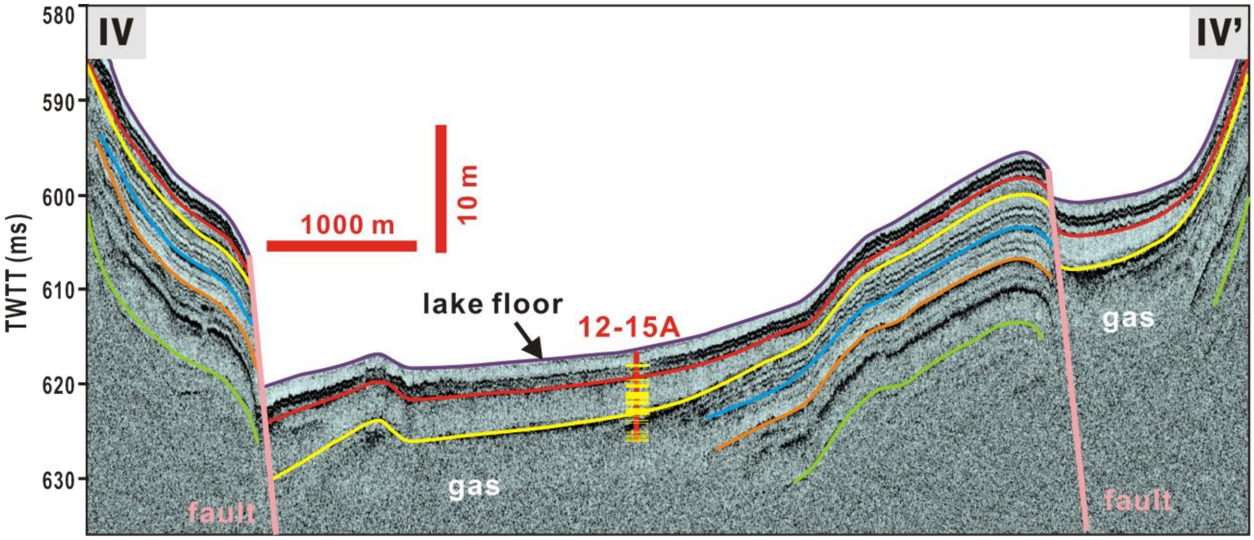
Supplementary Figure DR1: Basemap of Lake Kivu showing regional Digital Elevation Model (ASTER GDEM, a product of METI and NASA), lake-floor bathymetry (Zal, 2014), seismic tracklines, and sediment core stations. DEM = Digital Elevation Model; and WD = water depth. IV-IV' and V-V' are seismic profiles displayed in Supplementary Figures 4 and 7.



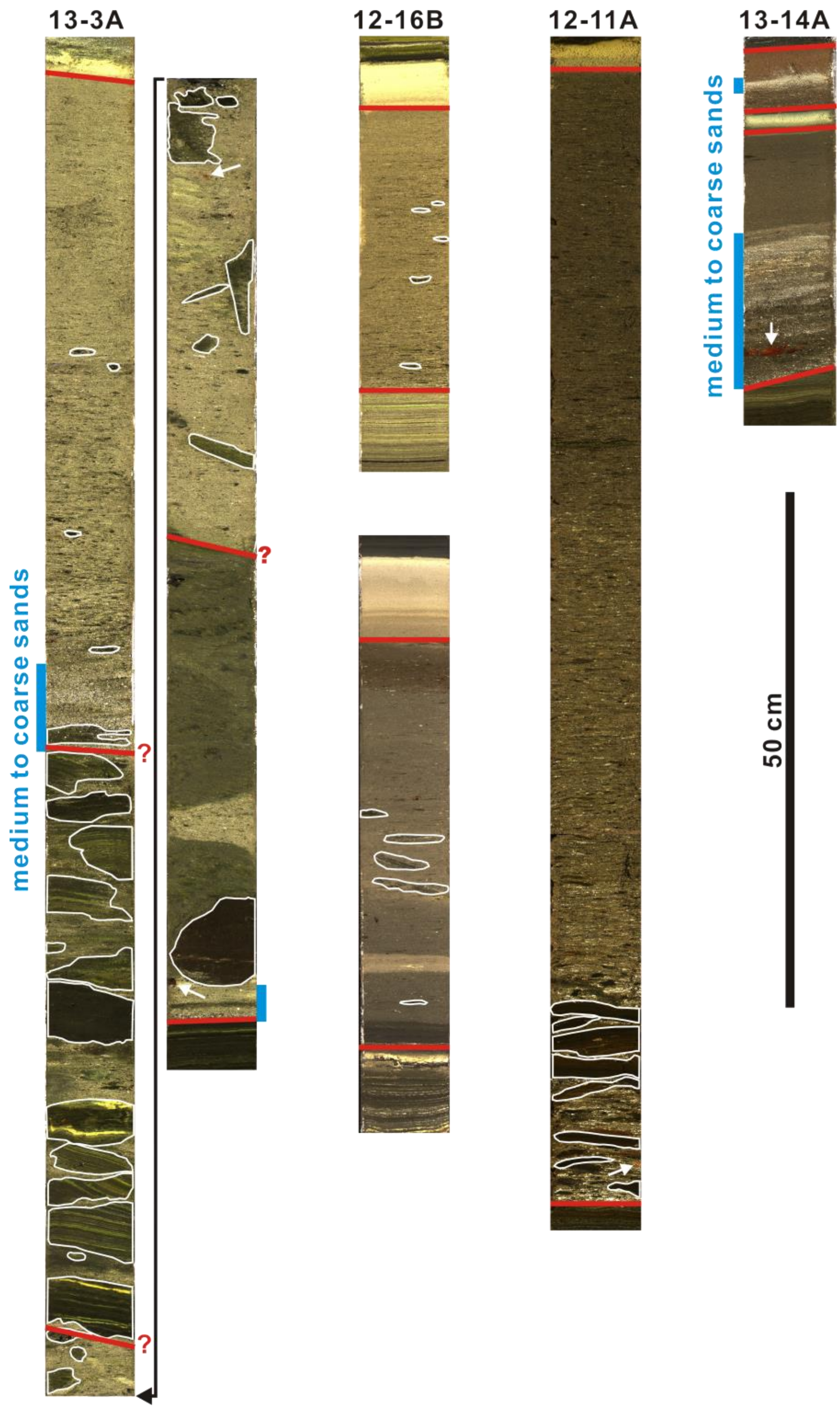
Supplementary Figure DR2: The age model of sediment core 12-19A. ^{14}C dates indicated by * are not used (Also see Supplementary Table DR1). The upper ~1.5 m sediment column of 12-19A is disturbed and saturated with water due to outgassing when the core was brought to surface.



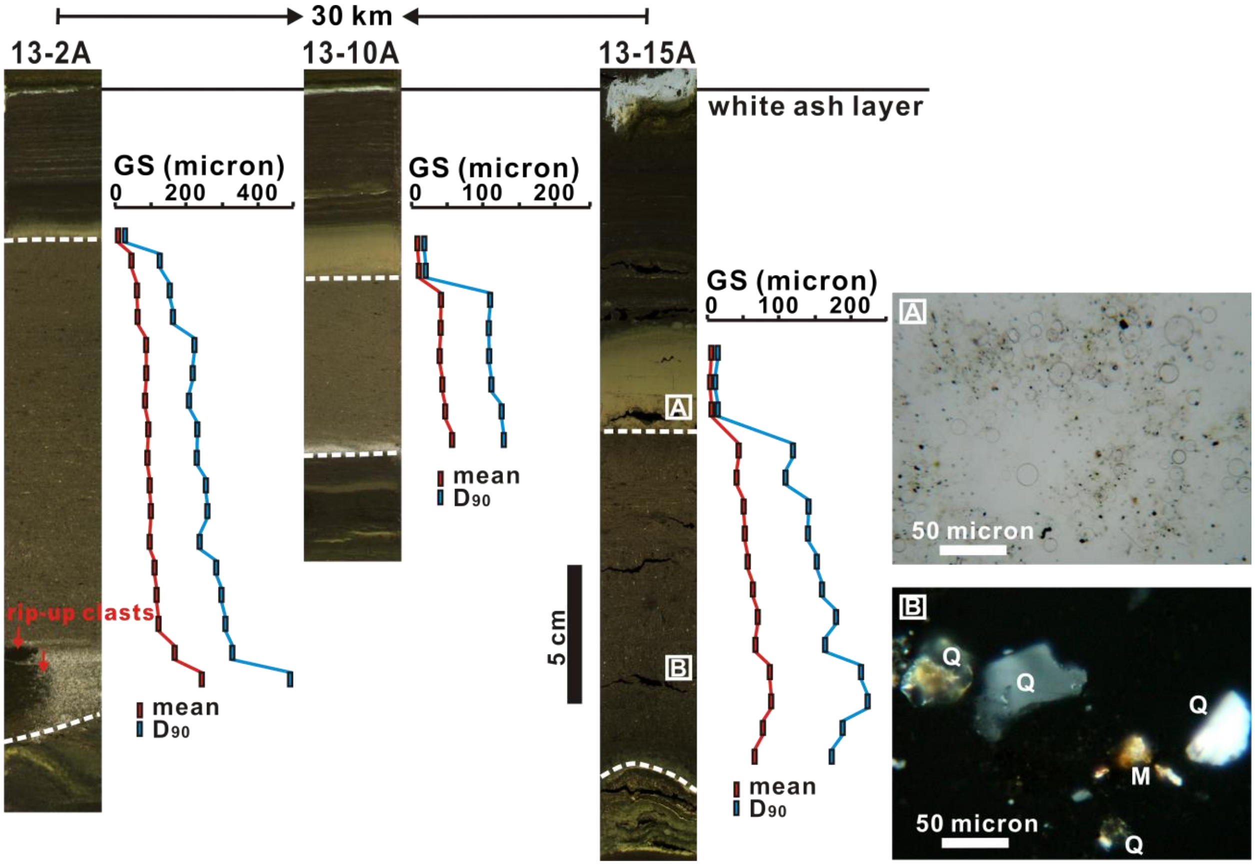
Supplementary Figure DR3: An example of core-to-core correlation over ~30 km, using various distinctive stratigraphic markers. Note the turbidites are capped by thick diatomites. See the core locations in Supplementary Figure DR1.



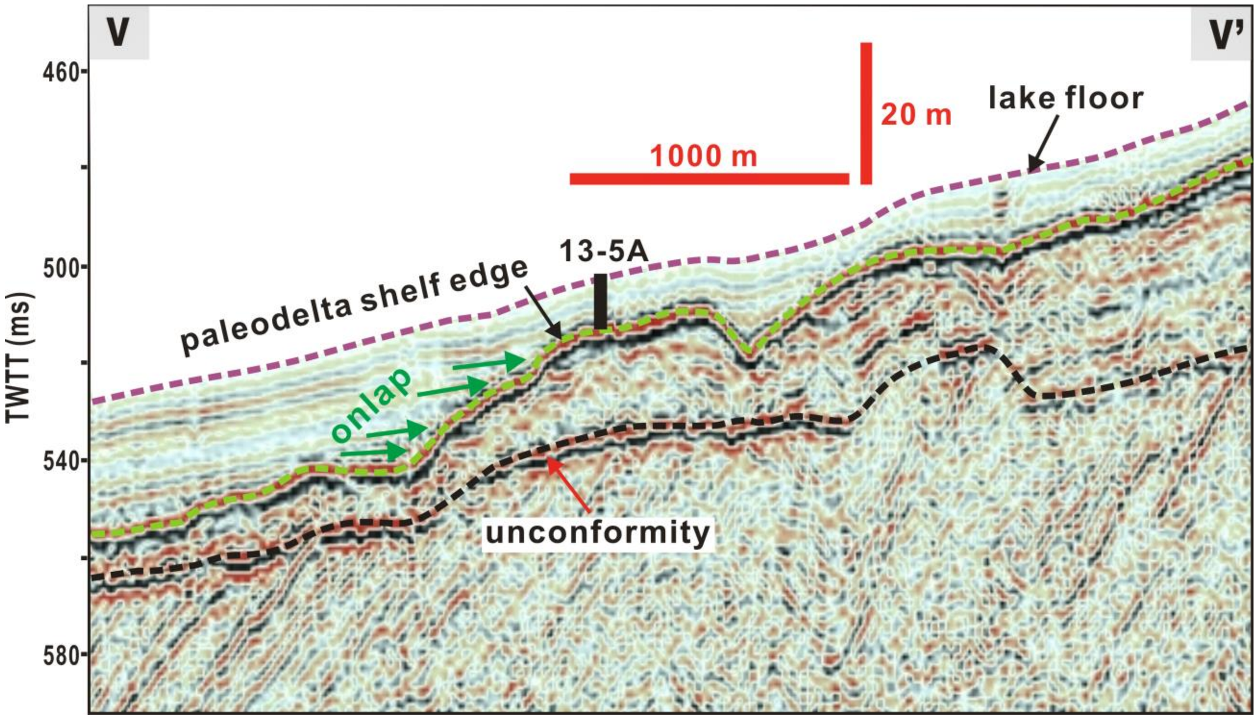
Supplementary Figure DR4: A CHIRP seismic profile showing the development of turbidite systems in the deepest part of the Eastern Basin. Turbidites identified in core 12-15A are shown in yellow. See the location of the seismic line in Supplementary Figure DR1.



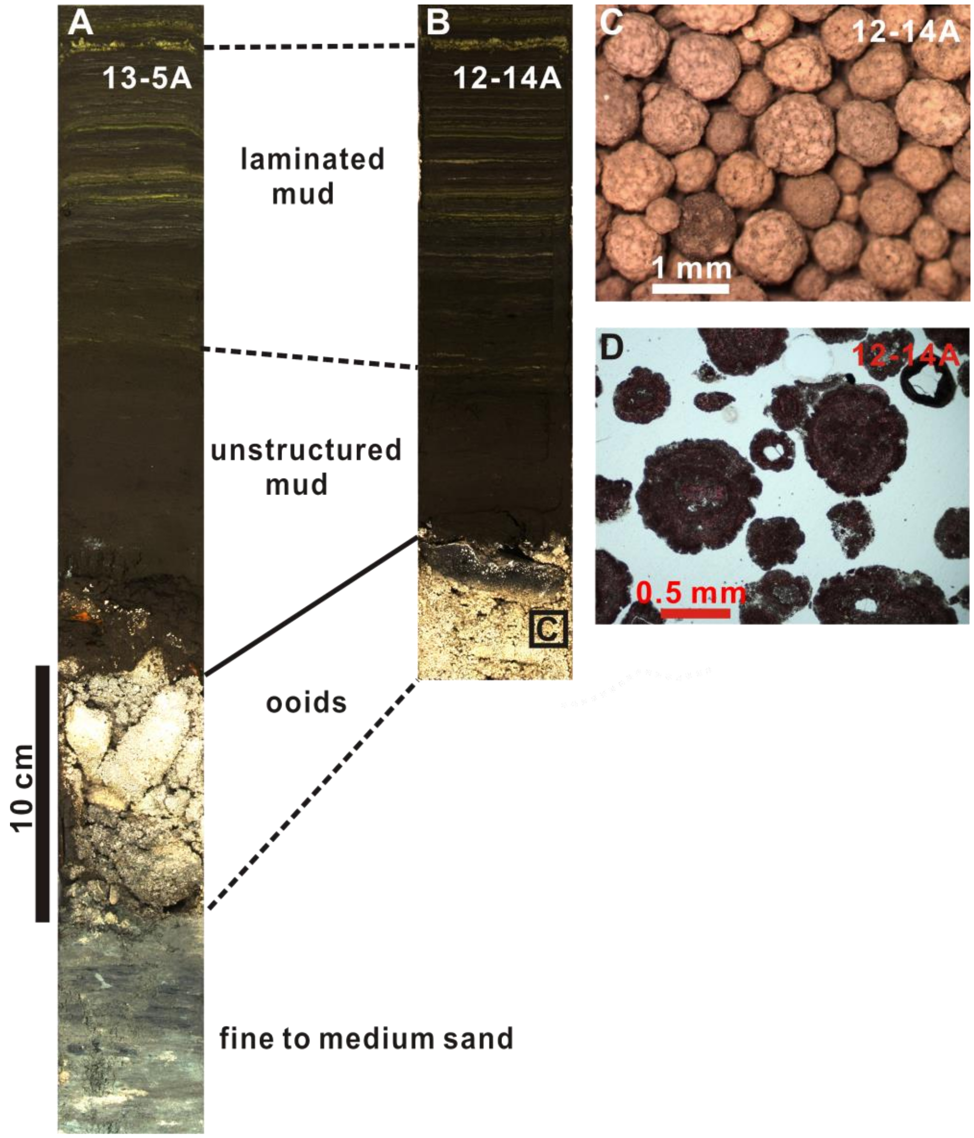
Supplementary Figure DR5: Rip-up clasts and centimeter-thick previously deposited mud (outlined in white) are abundant in thick beds (bounded by the red lines) of turbidite channel (13-3A and 13-14A) and lobe (12-16B) deposits. Terrestrial macroplants are indicated by arrows. Note the thick turbidites are commonly capped by diatomites. See the core locations in Supplementary Figure DR1.



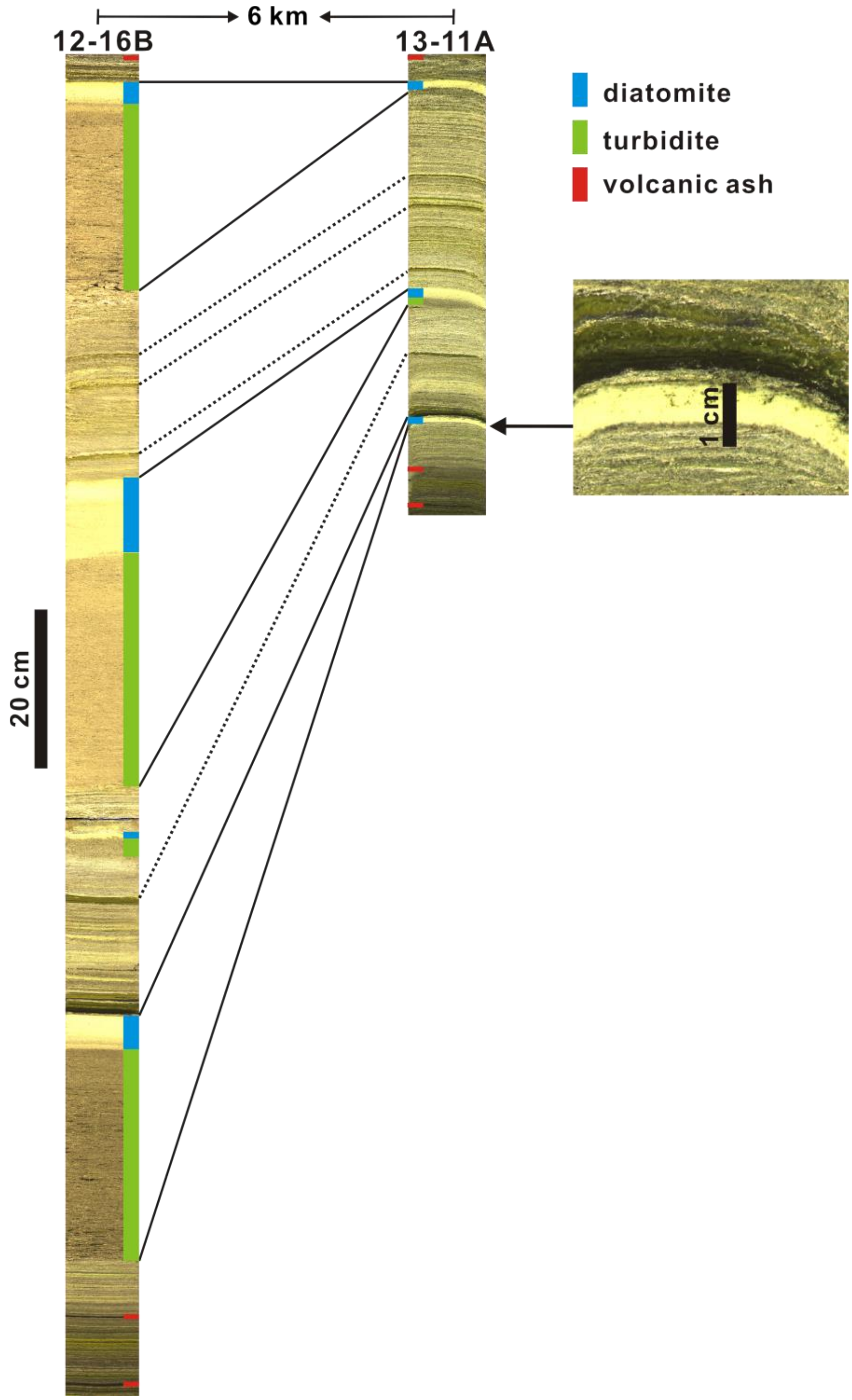
Supplementary Figure DR6: Sediment texture and composition of correlative hyperpycnite beds (bounded by the white dash lines) and the overlying diatomites from cores 13-2A, 13-10A, and 13-15A. Note the sharp decrease in particle size (measured with a Beckman Coulter LS230 Laser Diffraction Particle Size Analyzer) across the hyperpycnite-diatomite boundary. Large rip-up clasts are present in core 13-2A. M = muscovite; Q = quartz; GS = grain size; and D_{90} = the 90th particle size percentile. See the core locations in Supplementary Figure DR1.



Supplementary Figure DR7: A single-channel air gun seismic reflection profile showing the ~12.2 ka lowstand indicated by paleo-deltas that are 380 m below present lake-level. See the core image of 13-5A in Supplementary Figure DR8 and the location of the seismic line in Supplementary Figure DR1.



Supplementary Figure DR8: A-B: Core images of 13-5A and 12-14A showing the transition from deltaic and ooid facies to laminated mud facies at ~12 ka. C: Ooids from core 12-14A. D: Petrographic image of the ooids with calcite stained in red. Note the nuclei of many ooids are quartz grains. See the core locations in Supplementary Figure DR1.



Supplementary Figure DR9: Correlation between sediment cores 12-16B and 13-11A showing the presence of diatomites without the presence of hyperpycnites in shallower water cores. Cores 12-16 and 13-11 were recovered in water depth of 414 m and 364 m, respectively. See the core locations in Supplementary Figure DR1.

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