**Supplementary Materials**

**High-resolution records of anthropogenic activity and geohazards from the reservoir of Sun-Moon Lake, Central Taiwan**

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Table S1. The variance explained, PC correlation coefficient of each element with PCs of core Sun 2-1. The dominant elements with their strong correlation are marked with bold-face numbers.

**Sun 2-1 upper part (after 1934 CE)**

PC1 PC2 PC3 PC4 PC5

**Variance explained** **51.2%** **14.9%** **10.7% 7.6% 5.5%**

**Loadings**

**Si** -0.157 **-0.889** 0.290 0.061 0.087

Ar 0.033 0.174 -0.237 -0.195 -0397

K -0.240 **-0.751** 0.146 0.060 0.134

**Ca** **0.990** 0.061 0.121-0.014 -0.005

**Ti** -0.144 **-0.757** 0.113 -0.004 0.114

**Mn** 0.129 0.204 -0.210 **0.860** 0.311

Fe -0.467 -0.401 -0.065 -0.005 -0.005

Ni -0.253 0.480 -0.358 -0.063 -0.300

**Cu** -0.026 0.274 -0.289 **-0.533 0.733**

Zn -0.083 0.007 -0.238 -0.243 0.044

Rb -0.2429 0.348 -0.290 -0.100 -0.379

Sr 0.283 0.347 -0.156 -0.121 -0.239

Ba -0.177 -0.231 -0.107 0.154 0.110

**Pb** -0.560 0.449 **0.691** 0.033 0.064

**Mo inc** -0.274 **0.656** -0.387 -0.035 -0.343

**Mo coh** -0.250 **0.634** -0.403 -0.176 -0.421

**Sun 2-1 lower part (before 1934 CE)**

PC1 PC2 PC3 PC4

**Variance explained** **46.6%** **22.5%** **11.1%** 6.5%

**Loadings**

Si -0.046 -0.414 0.234 **0.548**

**Ar** -**0.526** **0.545** 0.205 0.317

**K** -0.210 **-0.608** 0.202 0.063

**Ca** 0.158 **0.907** -0.059 -0.274

Ti -0.356 -0.512 0.186 0.055

**Mn** **0.992** -0.025 0.027 0.115

**Fe** **0.610** 0.384 -0.022 -0.478

**Ni** -0.372 **0.748** 0.133 0.444

**Cu** -0.358 **0.558** 0.153 0.408

Zn -0.228 0.347 0.192 0.471

**Rb** **-0.544** -0.253 0.175 0.309

Sr -0.510 0.356 0.100 -0.038

**Ba** -0.285 **-0.699** 0.249 -0.012

**Pb** -0.096 -0.107 **-0.959** 0.172

**Mo inc** -0.353  **0.769** 0.130 0.435

**Mo coh** -0.344 **0.759** 0.156 0.451

Table S2. The variance explained, PC loadings of each element on PCs of principal analyses of core SM 16 4-3. The dominant elements with their heavy loadings are marked with bold-face numbers.

**SM 16 4-3 upper part (after 1934 CE)**

PC1 PC2 PC3 PC4 PC5

**Variance explained** **42.2%** **20.9%** **11.4% 7.2% 4.3%**

**Loadings**

**Si** **0.603** -0.159 **-0.708** -0.005 -0.174 **K** **0.552** -0.382 **-0.572** 0.201 -0.04 **Ca** **0.804** **0.579** 0.117 0.043 0.007 **Ti** -0.114 -0.272 **-0.533** 0.443 0.006

**Mn** -0.189 0.132 0.271 **-0.613** 0.422

Fe -0.485 -0.259 -0.210 -0.088 0.346

Ni -0.009 -0.380 0.507 0.210 0.009

**Cu** 0.224 0.169 **0.553** 0.064 **0.655**

Zn -0.385 -0.196 0.298 -0.226 -0.069

**Rb** 0.101 -0.482 0.184 **0.678** 0.130

Sr 0.137 0.190 0.434 0.279 0.181

**Pb** **-0.814** **0.545** -0.143 0.128 -0.015

**Mo inc** -0.146 -0.406 **0.607** 0.105 0.078

**Mo coh** 0.040 -0.209 0.391 **0.673** 0.266

**SM16 4-3** **lower part (before 1934 CE)**

PC1 PC2 PC3 PC4 PC5

**Variance explained** **42.7%** **19.1%** 14.1% 7.1% 5.1%

**Loadings**

**Si** -0.225 **-0.816** -0.186 -0.339 0.289

**Ar** 0.149 **0.547** 0.033 0.249 -0.186

**K** -0.446 **-0.72**2 0.049 -0.266 0.150

**Ca** -0154 0.208 **-0.958** 0.097 -0.041

**Ti** 0.053 **-0716** 0.164 -0.287 0.070

Mn -0.317 -0.175 -0.254 -0.198 0.029

Fe 0.416 -0.331 0.241 -0.175 -0.195

**Ni** **-0.553** 0295 0.218 -0.145 -0.094

**Cu** -0.232 0.536 0.206 0.394 **0.675**

Zn -0.151 -0215 0.387 -0.031 -0.068

**Rb** -0.498 0.282  **0.503** -0.185 -0.210

Sr -0.150 0.541 0.198 -0.149 -0.323

Zr 0.070 0.382 0.260 -0.100 -0.281

**Ba** -0.0074 **-0.737** 0.124 **0.624** -0.183

**Pb** **0.997** 0.014 -0.010 -0.025 0.023

**Mo inc** **-0.644** 0.485 0.250 -0.227 -0.162

**Mo coh** **-0.550** **0.572** 0.329 -0.237 -0.253

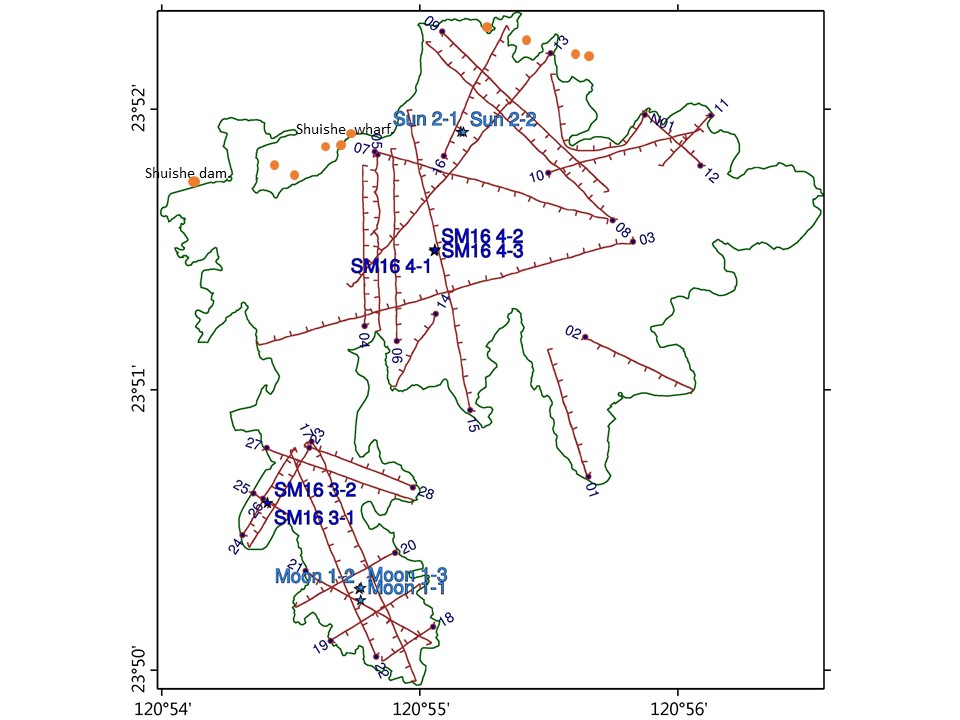


Fig. S1. Paths of bottom profiling of the Sun and Moon Lakes. The red lines represent the surveying paths and the blue stars mark the coring sites. The orange circles mean collapse of big hotels, and damages of Shuishe dam and Shuishe wharf in the northern of Sun Lake. After 1999 Chi-Chi earthquake, many public facilities, houses and hotels were rebuilt in this region for long times.

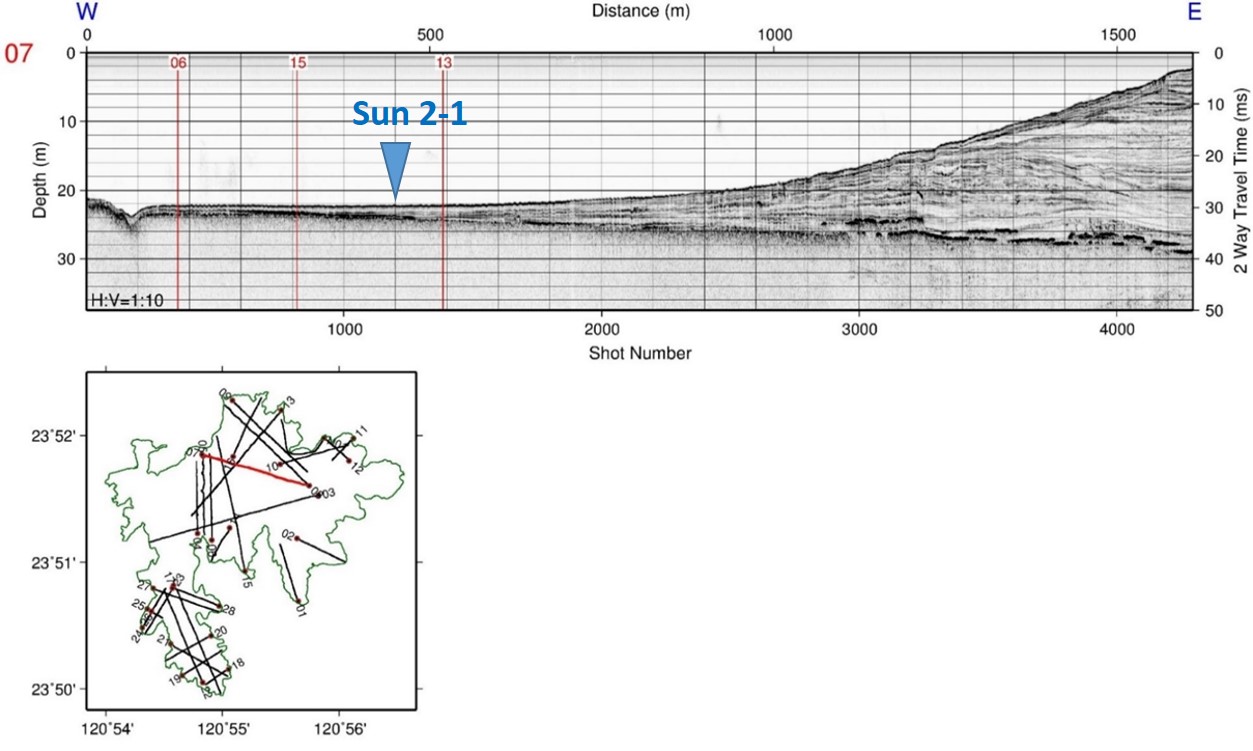


Figure S2. Seismic profile of line 07 in Sun-Moon Lake.

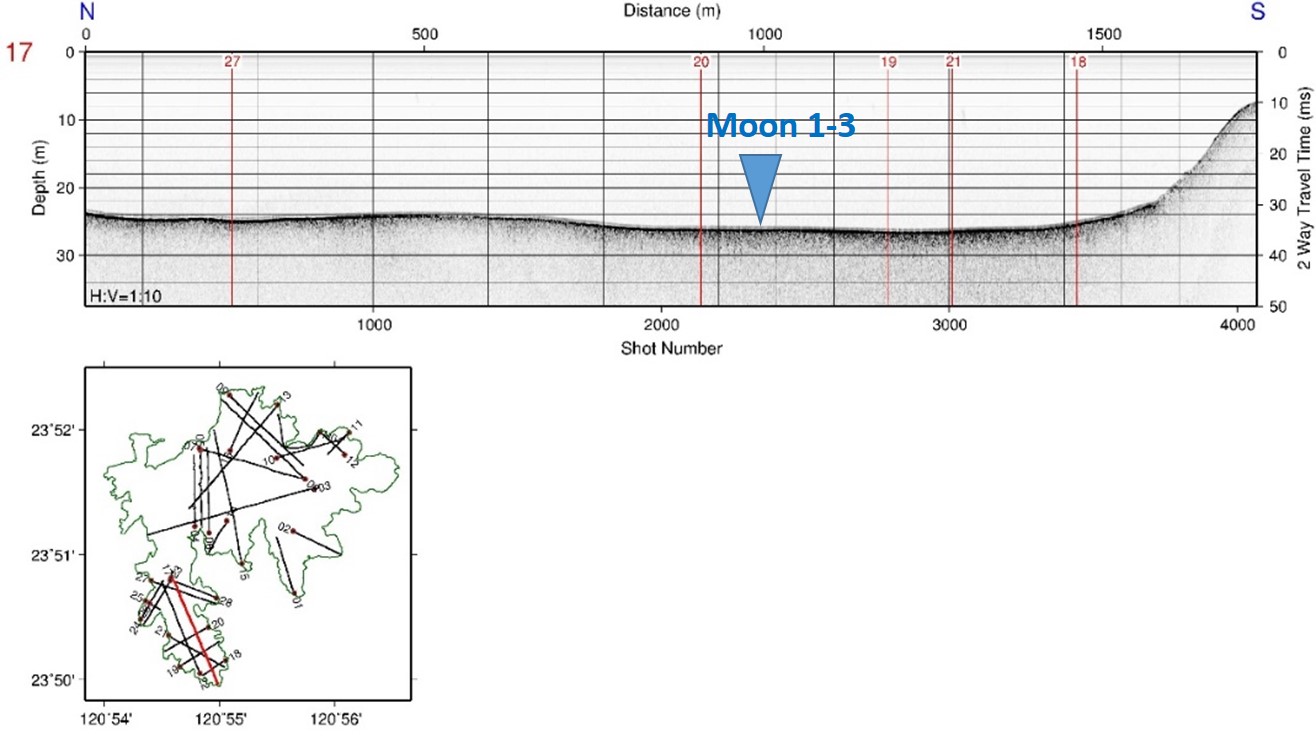


Figure S3. Seismic profile of line 17 in Sun-Moon Lake

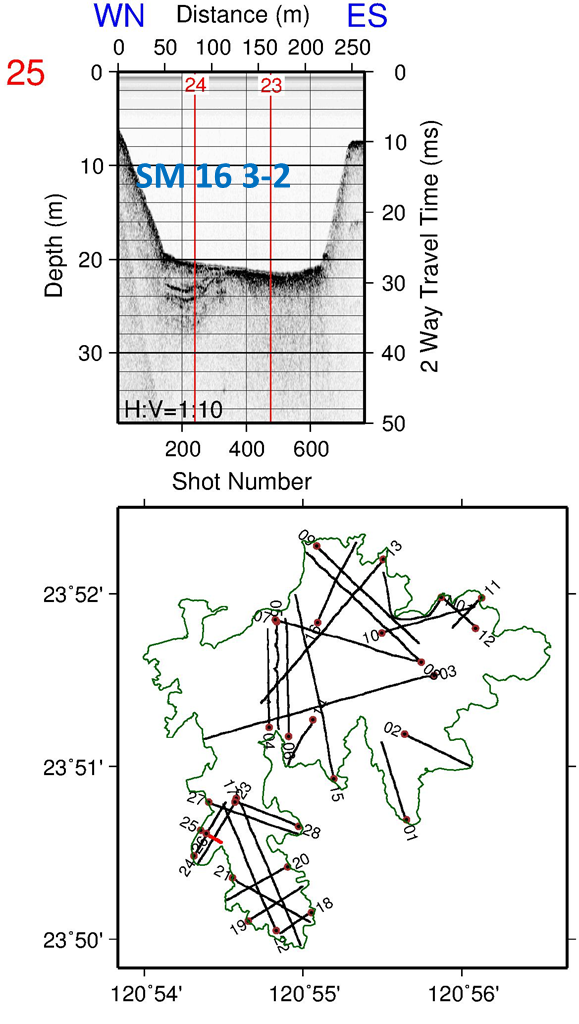


Figure S4. Seismic profile of line 25 in Sun-Moon Lake

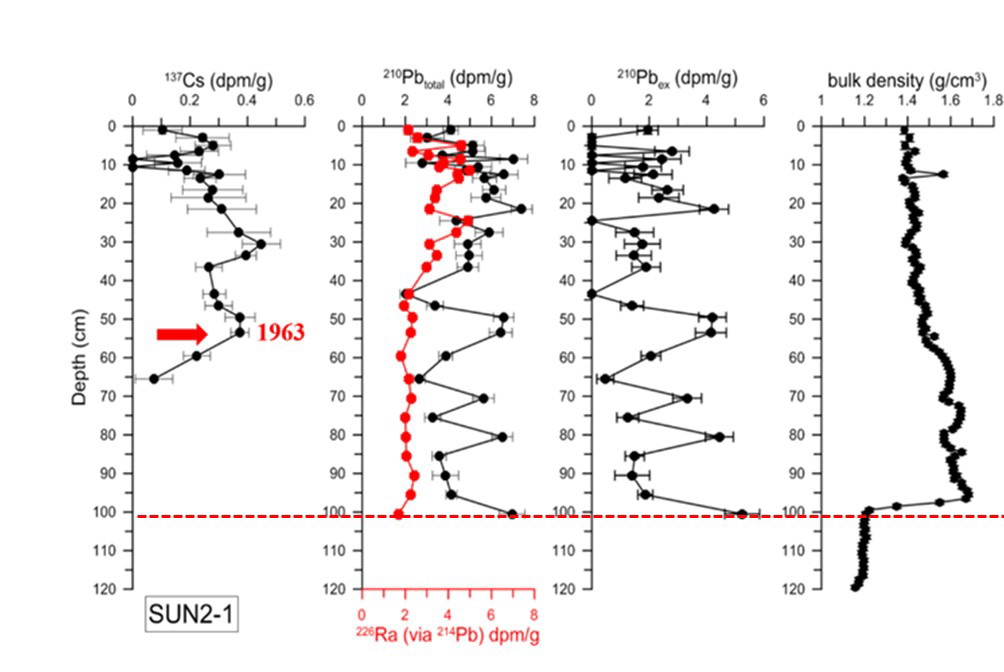


Fig. S5. 210Pb and137Cs dating results of core Sun 2-1 from Sun Lake. The red arrow shows the peak of global nuclear testing events in 1963 CE and the red dotted line indicates the dam construction in 1934 CE.

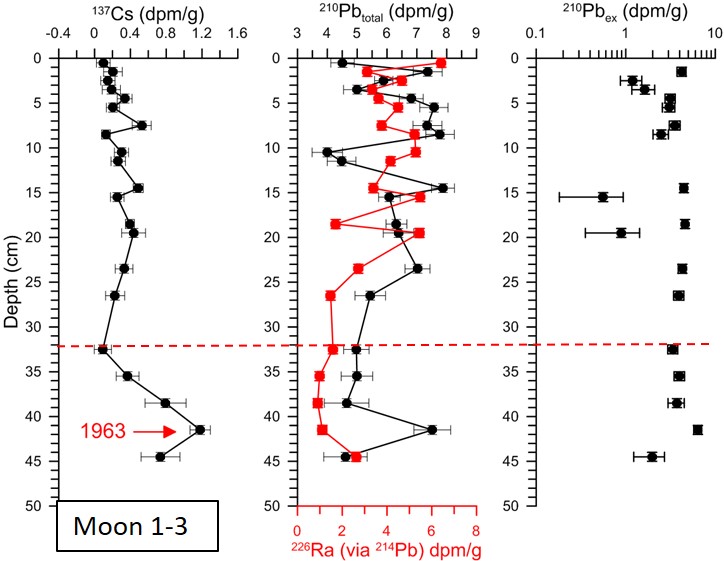


Fig. S6 210Pb and137Cs dating results of core Moon 1-3 from Moon Lake. The red arrow shows the peak of global nuclear testing events in 1963 CE and the red dotted line indicates the dam construction in 1934 CE. This reversed age is unreasonable.

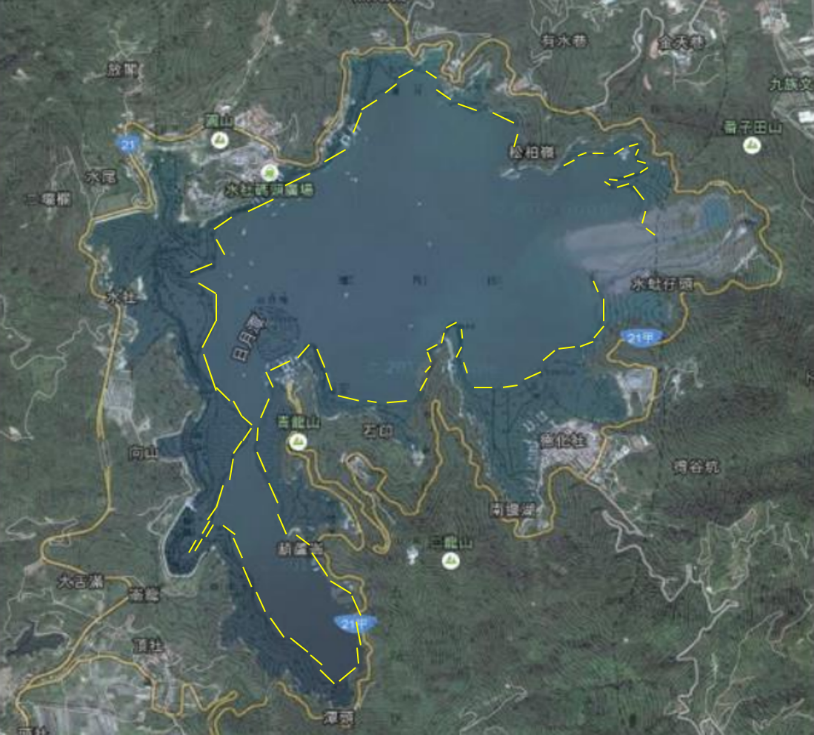


Figure S7. Ancient (yellow dotted line) and resent shorelines of Sun-Moon Lake revised from Old Map of Taiwan 1898. (Leung,2015)

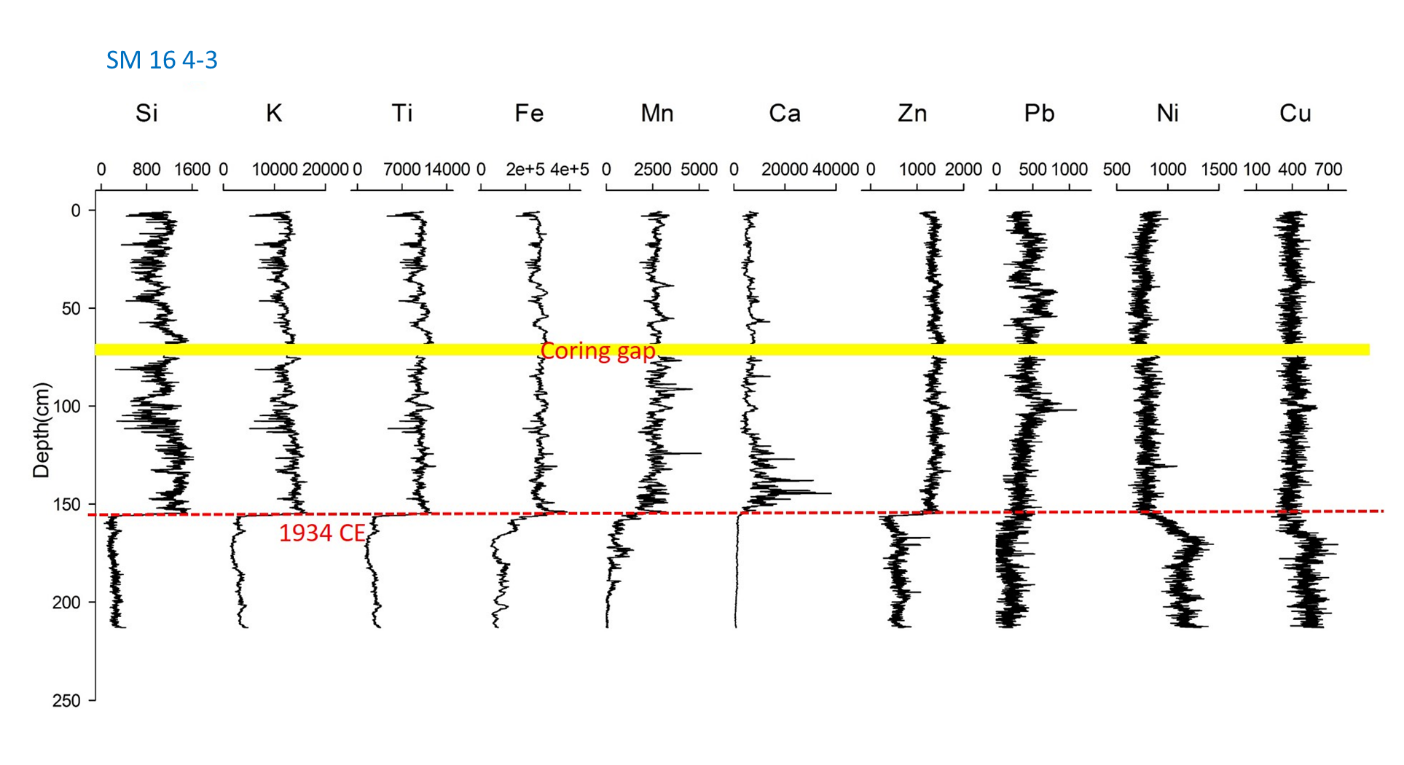


Figure S8. The XRF results of core SM 16 4-3. Most terrestrial elements Si, K, Ti, Fe, Mn raise in the upper core (post 1934 CE), but only Ni and Cu enrich in the lower core (prior to 1934 CE). Element Ca from cement source also increases after 1934 CE.

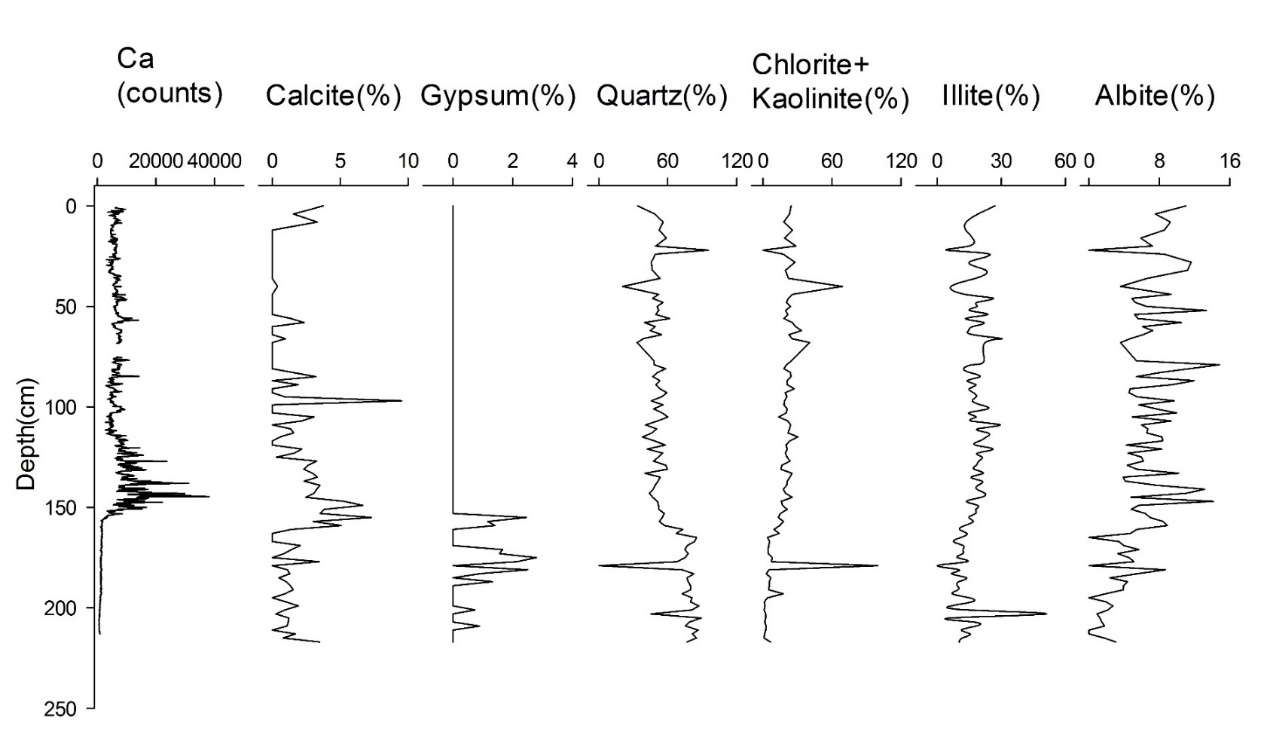


Figure S9. The semiquantiative results of mineral content by XRD for core SM 16 4-3. Its Ca content corresponds to the calcite content from cement source.

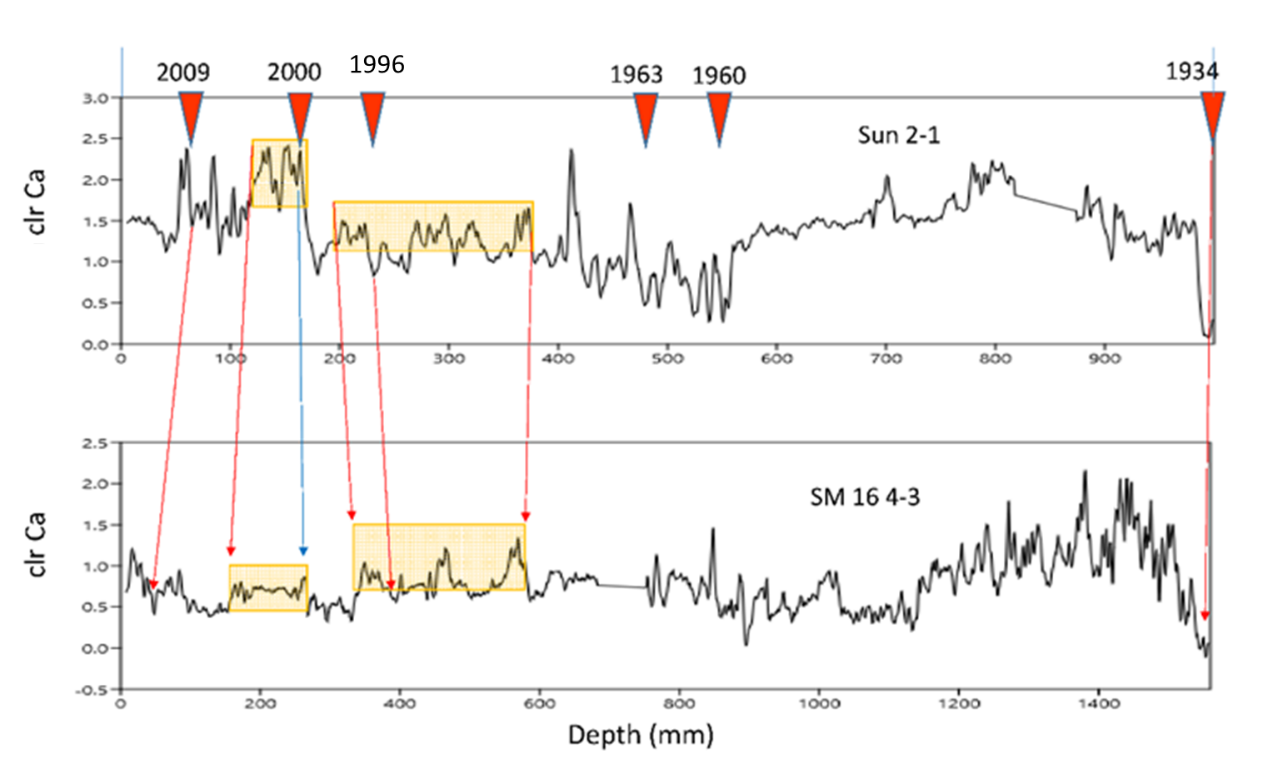


Figure S10. Correlation between cores Sun 2-1 and SM 16 4-3 by using the sigmnals of clr Ca.