Supplementary Table 2. Results of three-way ANOVA of deep sediment cores

| Variable | df | Sum square | Mean square | F-value | p (> F) | Variable | df | Sum square | Mean square | F-value | p (> F) |
|----------|----|------------|-------------|---------|---------|----------|----|------------|-------------|---------|---------|
| **Three-way ANOVA** | | | | | | **Chl-a (μg/L)** | | | | | |
| Carbohydrate (mg/g) | | | | | | Model | 39 | 153.611 | 3.939 | 4.15 | < 0.001 | Time | 1 | 4690280.1 | 120263.59 | 10.6 | < 0.001 |
| | | | | | | Depth | 9 | 3555222.8 | 395024.75 | 34.819 | < 0.001 | Site | 1 | 149733.77 | 149733.77 | 13.198 | < 0.001 |
| | | | | | | Time × Depth | 9 | 20.524 | 2.28 | 2.402 | 0.015 | Time × Depth | 9 | 169075.08 | 18786.12 | 1.656 | 0.107 |
| | | | | | | Time × Site | 1 | 3.664 | 3.664 | 3.861 | 0.052 | Time × Site | 1 | 5.333 | 5.333 | 0 | 0.983 |
| | | | | | | Depth × Site | 9 | 28.507 | 3.167 | 3.337 | 0.001 | Depth × Site | 9 | 299513.04 | 33279.227 | 2.933 | 0.004 |
| Time × Depth × Site | 9 | 33.997 | 3.777 | 3.98 | < 0.001 | Time × Depth × Site | 9 | 273739.89 | 30415.543 | 2.681 | 0.007 |
| **OM (%)** | | | | | | **Sulfide (mg/kg)** | | | | | |
| Model | 39 | 66.83 | 1.714 | 2.503 | < 0.001 | Model | 39 | 1318182.3 | 33799.54 | 4.585 | < 0.001 |
| Time | 1 | 0.046 | 0.046 | 0.067 | 0.796 | Time | 1 | 84250.109 | 84250.109 | 11.43 | < 0.001 |
| Depth | 9 | 13.638 | 1.515 | 2.213 | 0.026 | Depth | 9 | 513079.28 | 57008.808 | 7.734 | < 0.001 |
| Site | 1 | 31.87 | 31.87 | 46.549 | < 0.001 | Site | 1 | 9478.975 | 9478.975 | 1.286 | 0.259 |
| Time × Depth | 9 | 6.334 | 0.704 | 1.028 | 0.422 | Time × Depth | 9 | 339674.79 | 37741.643 | 5.12 | < 0.001 |
| Time × Site | 1 | 5.046 | 5.046 | 7.371 | 0.008 | Time × Site | 1 | 53263.354 | 53263.354 | 7.226 | 0.008 |
| Depth × Site | 9 | 3.018 | 0.335 | 0.49 | 0.879 | Depth × Site | 9 | 127459.03 | 14162.115 | 1.921 | 0.055 |
| Time × Depth × Site | 9 | 6.876 | 0.764 | 1.116 | 0.357 | Time × Depth × Site | 9 | 190976.51 | 2121961.2 | 2.879 | 0.004 |
| **TN (mg/kg)** | | | | | | **Moisture content (%)** | | | | | |
| Model | 39 | 3812333.3 | 97752.137 | 17.25 | < 0.001 | Model | 39 | 1043.292 | 26.751 | 4.686 | < 0.001 |
| Time | 1 | 1002777.78 | 1002777.8 | 176.961 | < 0.001 | Time | 1 | 213.933 | 213.933 | 37.475 | < 0.001 |
|                |   |                |    |                |    |                |    |
|----------------|---|----------------|----|----------------|----|----------------|----|
| **Depth**      | 9 | 1000111.1     | 111123.46 | 19.61          | < 0.001 | **Depth**      | 9  | 339.778 | 37.753 | 6.613 | < 0.001 |
| **Site**       | 1 | 1002777.8     | 1002777.8 | 176.961        | < 0.001 | **Site**       | 1  | 18.709  | 18.709 | 3.277 | 0.073  |
| **Time × Depth** | 9 | 140555.56     | 15617.284 | 2.756          | 0.006   | **Time × Depth** | 9  | 270.515 | 30.057 | 5.265 | < 0.001 |
| **Time × Site** | 1 | 186777.78     | 186777.78 | 32.961         | < 0.001 | **Time × Site** | 1  | 20.376  | 20.376 | 3.569 | 0.061  |
| **Depth × Site** | 9 | 225000        | 25000     | 4.412          | < 0.001 | **Depth × Site** | 9  | 143.853 | 15.984 | 2.8   | 0.005  |
| **Time × Depth × Site** | 9 | 254333.33     | 28259.259 | 4.987          | < 0.001 | **Time × Depth × Site** | 9  | 36.129  | 4.014  | 0.703 | 0.705  |
| **TOC (g/kg)** |   |               |           |                |         | **TP (mg/kg)** |     |          |        |       |        |
| **Model**      | 39| 14.196        | 0.364     | 12.473         | < 0.001 | **Model**      | 39 | 36319.371 | 931.266 | 1.784 | 0.009  |
| **Time**       | 1 | 0.098         | 0.098     | 3.375          | 0.069   | **Time**       | 1  | 1645.21 | 1645.21 | 3.152 | 0.078  |
| **Depth**      | 9 | 3.012         | 0.335     | 11.47          | < 0.001 | **Depth**      | 9  | 15646.167 | 1738.463 | 3.331 | 0.001  |
| **Site**       | 1 | 6.506         | 6.506     | 222.936        | < 0.001 | **Site**       | 1  | 175.85  | 175.85  | 0.337 | 0.563  |
| **Time × Depth** | 9 | 1.277         | 0.142     | 4.861          | < 0.001 | **Time × Depth** | 9  | 6691.928 | 743.548 | 1.425 | 0.185  |
| **Time × Site** | 1 | 0.142         | 0.142     | 4.86           | 0.029   | **Time × Site** | 1  | 1943.131| 1943.131| 3.723 | 0.056  |
| **Depth × Site** | 9 | 2.973         | 0.33      | 11.319         | < 0.001 | **Depth × Site** | 9  | 6760.198 | 751.133 | 1.439 | 0.179  |
| **Time × Depth × Site** | 9 | 0.188         | 0.021     | 0.717          | 0.693   | **Time × Depth × Site** | 9  | 3456.887 | 384.099 | 0.736 | 0.675  |