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Assessing environmental changes in Lake Shihwa, South Korea, based on distributions and δ13C of *n*-alkanes

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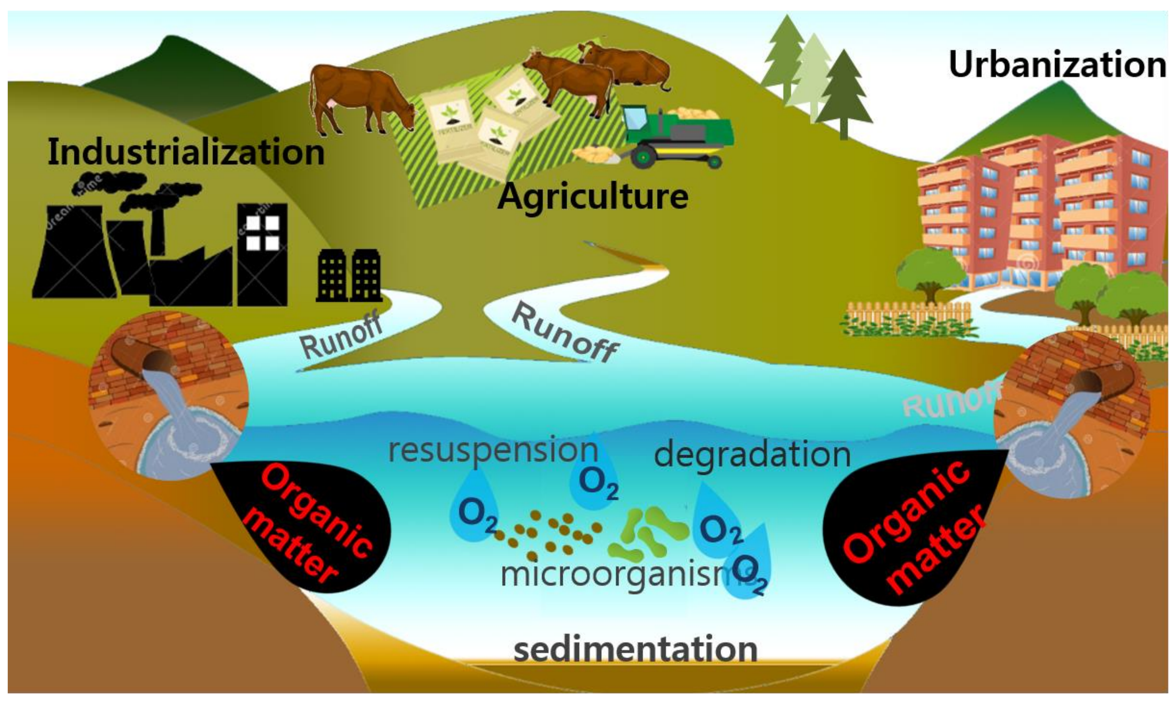
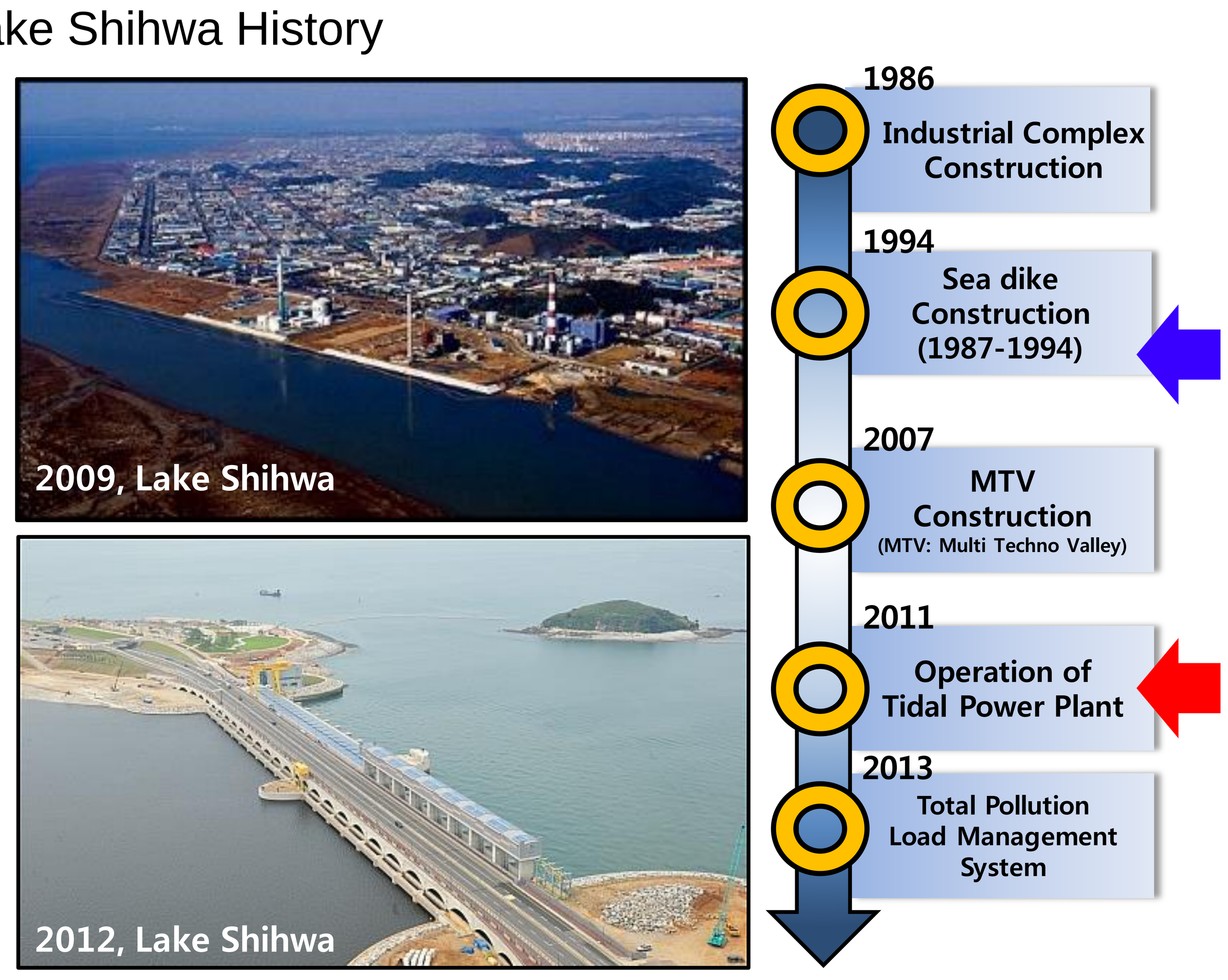
- Lake Shihwa System



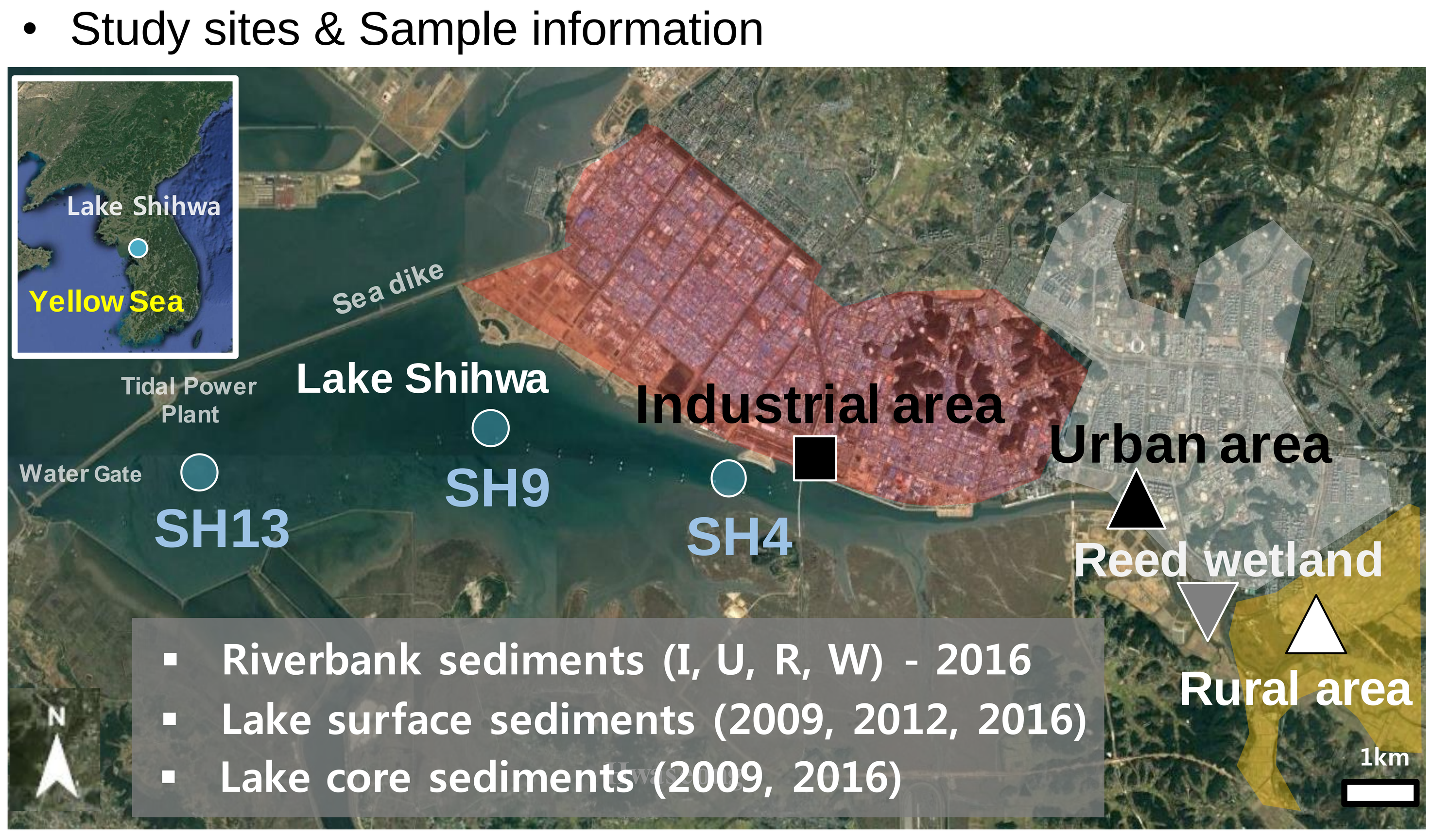
- Lake Shihwa History



Lake Shihwa has experienced severe environmental changes.

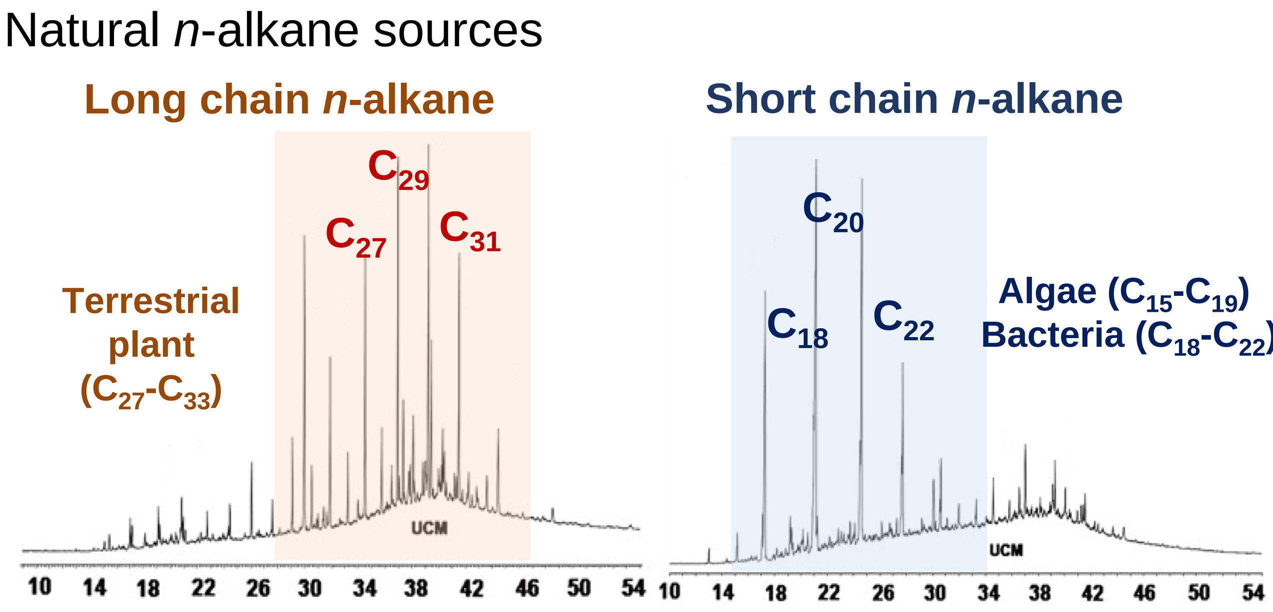
- **Since 1987 : Sea dike construction**
- **Since 2011 : Tidal power plant operation**

- Study sites & Sample information



- Bulk parameters: TOC, TN, C/N ratio, $\delta^{13}C_{TOC}$, $\delta^{15}N_{TN}$
- *n*-alkane parameters: relative abundances, $\delta^{13}C_{n\text{-alkanes}}$

- Natural *n*-alkane sources



Objectives

- ✓ Characterization of sedimentary organic matter sources in Lake Shihwa
- ✓ Investigating historical environmental changes in Lake Shihwa

- Bulk parameters

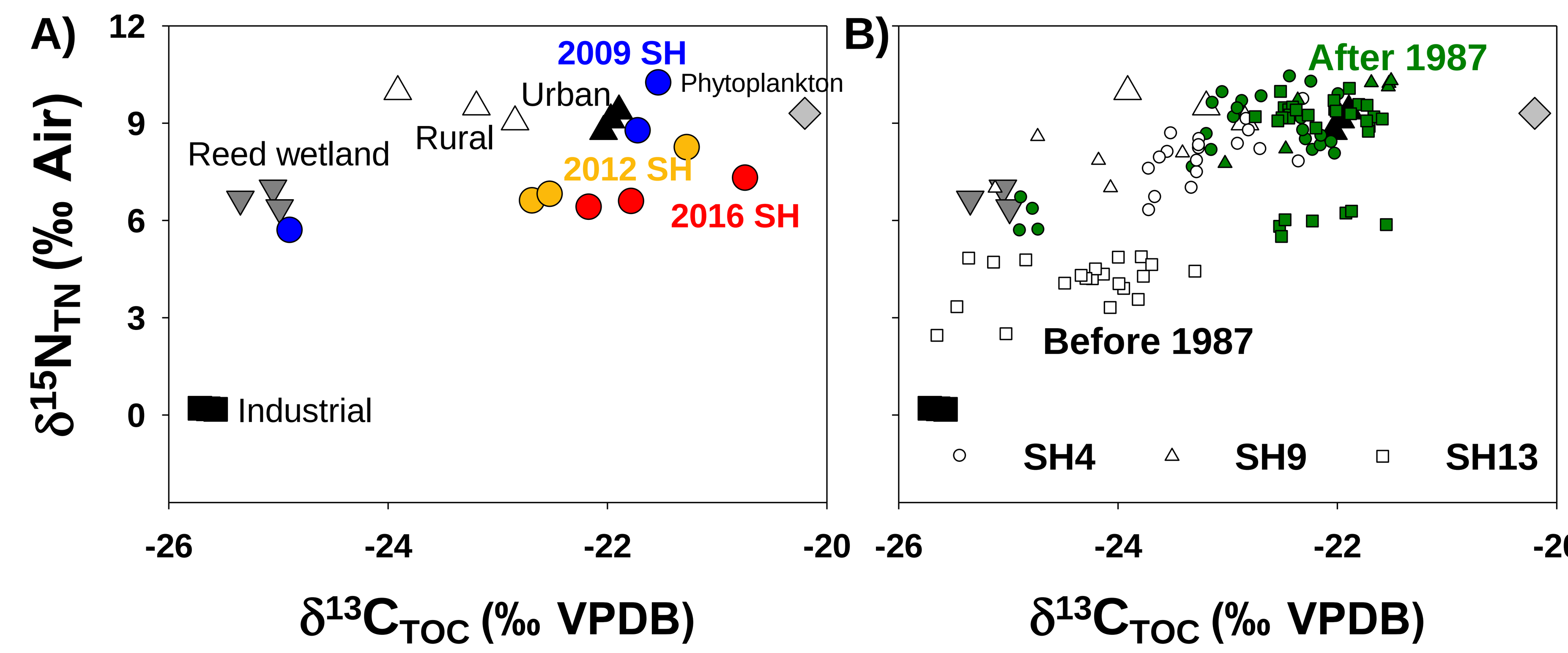


Fig. 1. A scatter plot comparing $\delta^{13}C_{TOC}$ (‰, VPDB) and $\delta^{15}N_{TN}$ (‰, Air) values (A) for riverbank and lake surface sediments and (B) for lake core sediments.

- The $\delta^{15}N_{TN}$ values of industrial riverbank sediments were distinctive with extremely depleted values.
- SH4 was more strongly affected by organic matter inputs from industrial complexes than other sites before 1987.

- Lake surface sediments

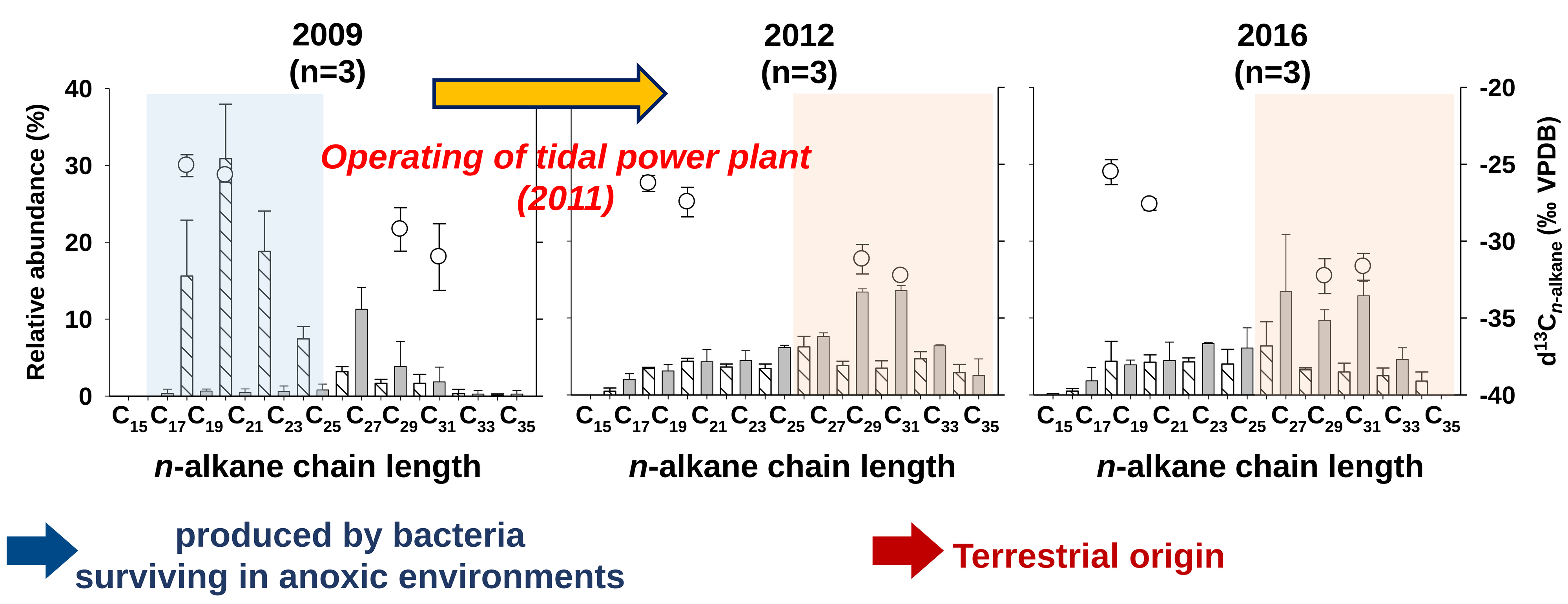


Fig. 2. Relative abundances and stable carbon isotopes of *n*-alkanes for lake surface sediments.

- 2009: ***n*-C_{18} to *n*-C_{22}** dominant,
- 2012/2016: ***n*-C_{25} to *n*-C_{35}** dominant

→ This difference might be linked to environmental changes caused by operation of the tidal power plant in 2001.

- The lake surface sediments collected in 2009 can be ascribed to non-photosynthetic bacterial sources thriving in anoxic environments.

- Lake core sediments

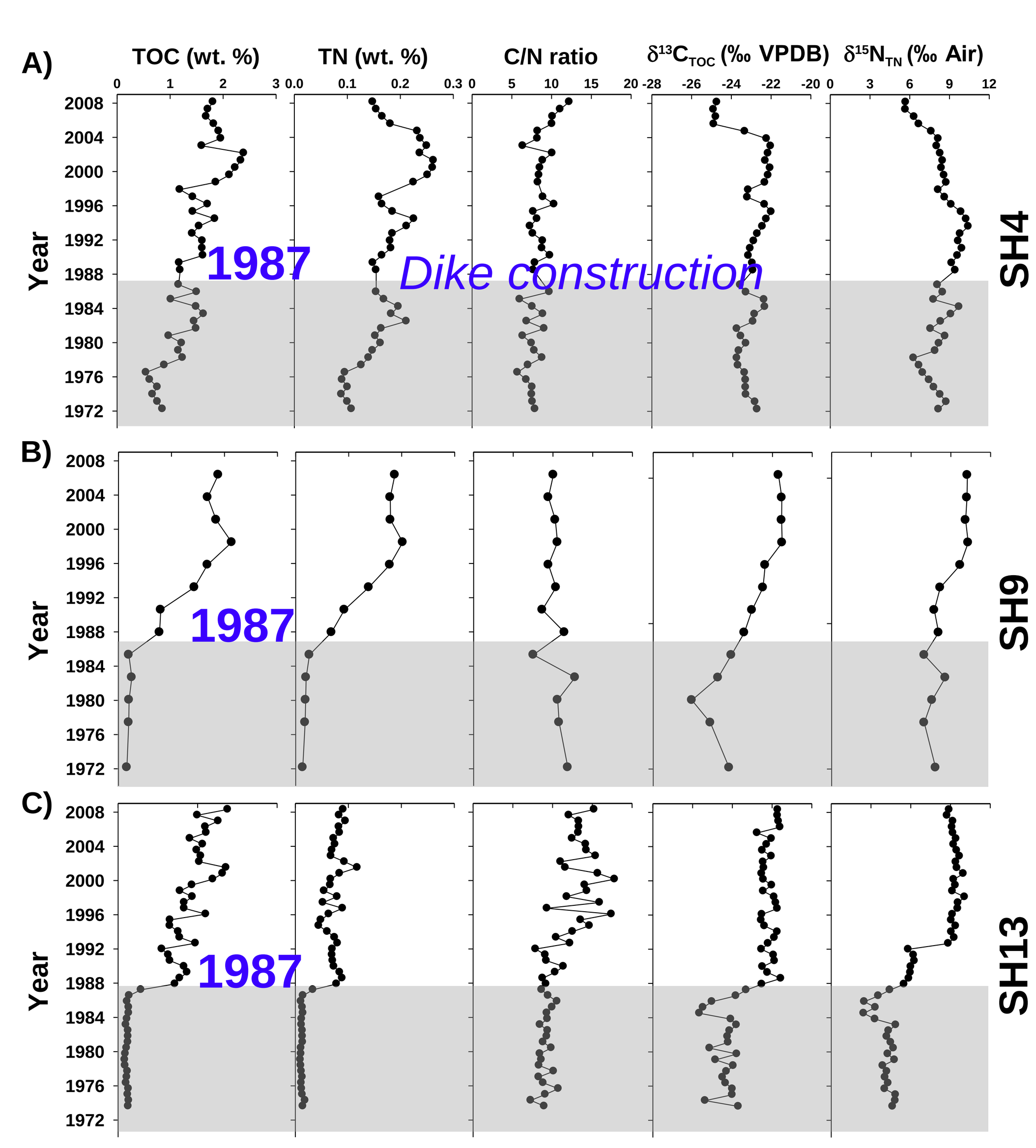


Fig. 3. Core depth profiles of bulk parameters.

- The depth of each core was divided into two layers: before and after 1987. Drastic shifts around 1987 with the Shihwa reclamation project.

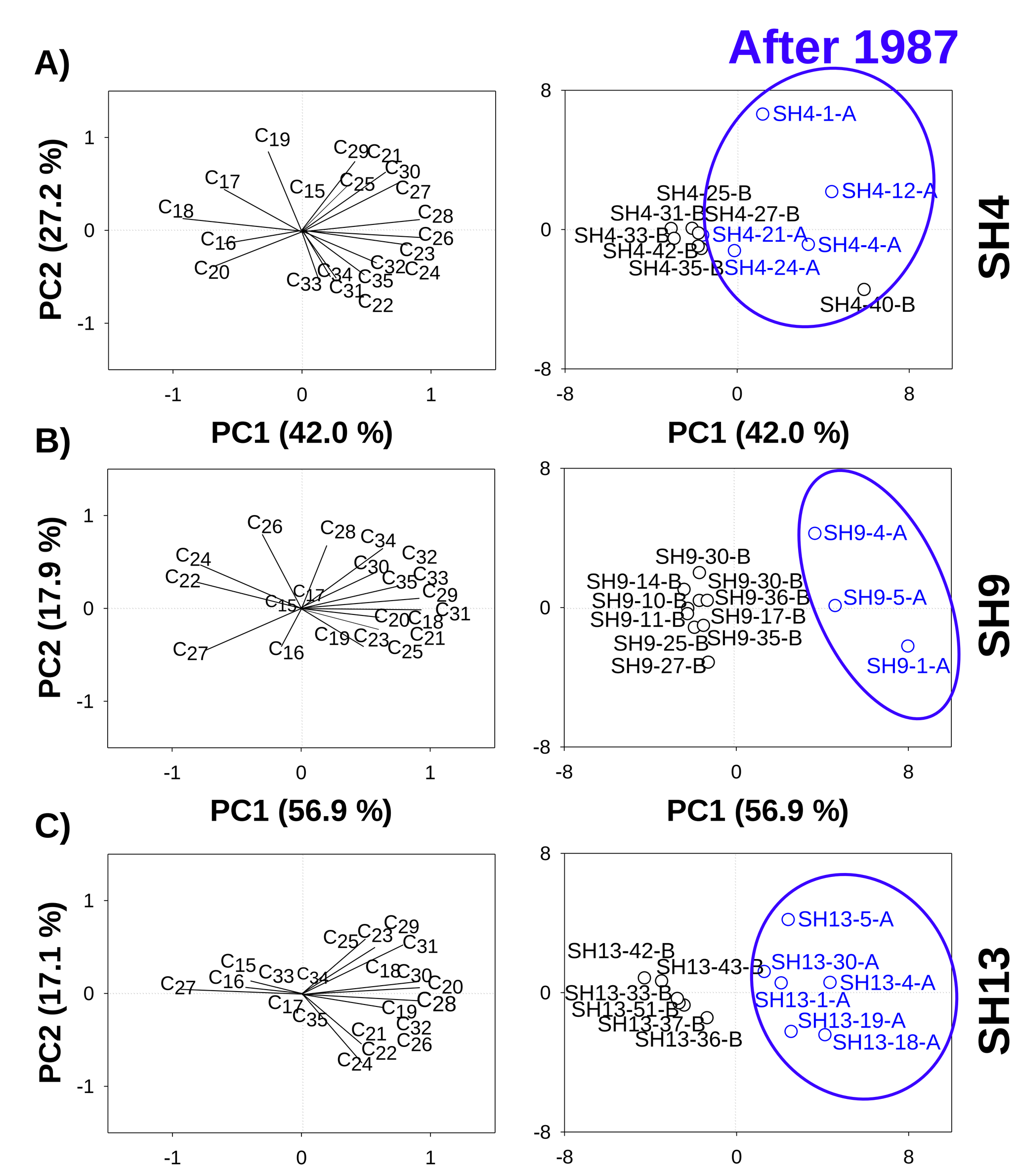


Fig. 4. Results of the Principal Component Analysis (PCA) of the fractional abundances of *n*-alkanes for lake sediment cores.

- The black and blue open circles indicate samples before and after damming, respectively.

Conclusion

- ➢ The artificial Lake Shihwa in South Korea has steadily been affected by continuous organic matter inputs from surrounding areas.
- ➢ Lake Shihwa has experienced severe environmental changes due to the **sea dike construction in 1987** and the **tidal power plant operation since 2011.**
- ➢ Our data suggests that the level of dissolved oxygen in the water column might be an important factor controlling the carbon chain length distribution and the isotopic composition of burial *n*-alkanes in sediments.

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