Occurrence and transport of persistent toxic substances in the North Pacific - Arctic region under climate change

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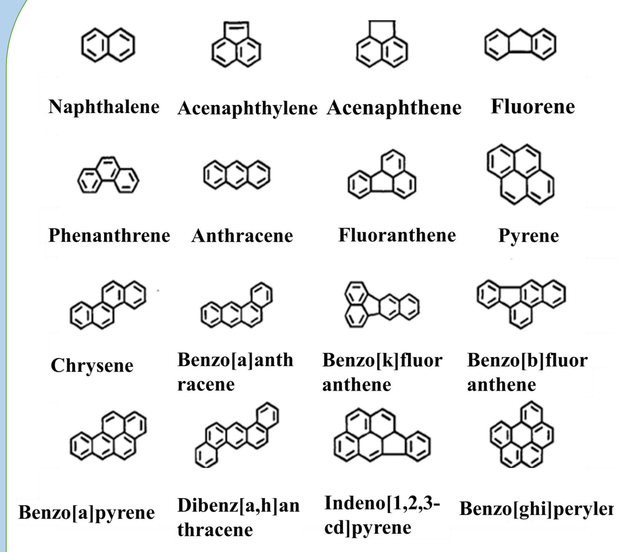
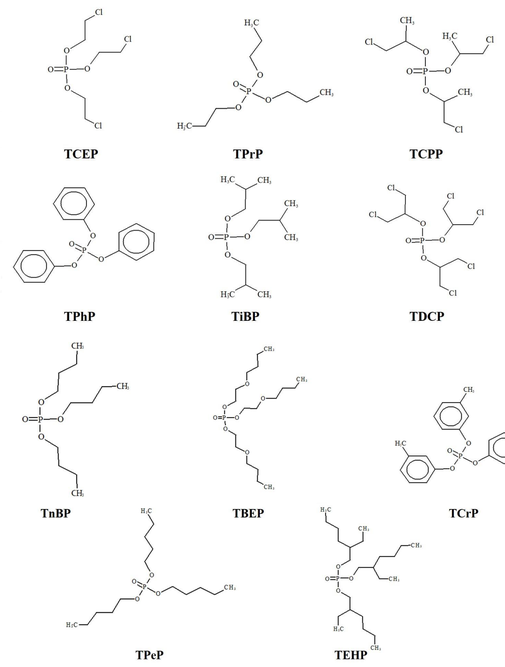
1. Target compounds

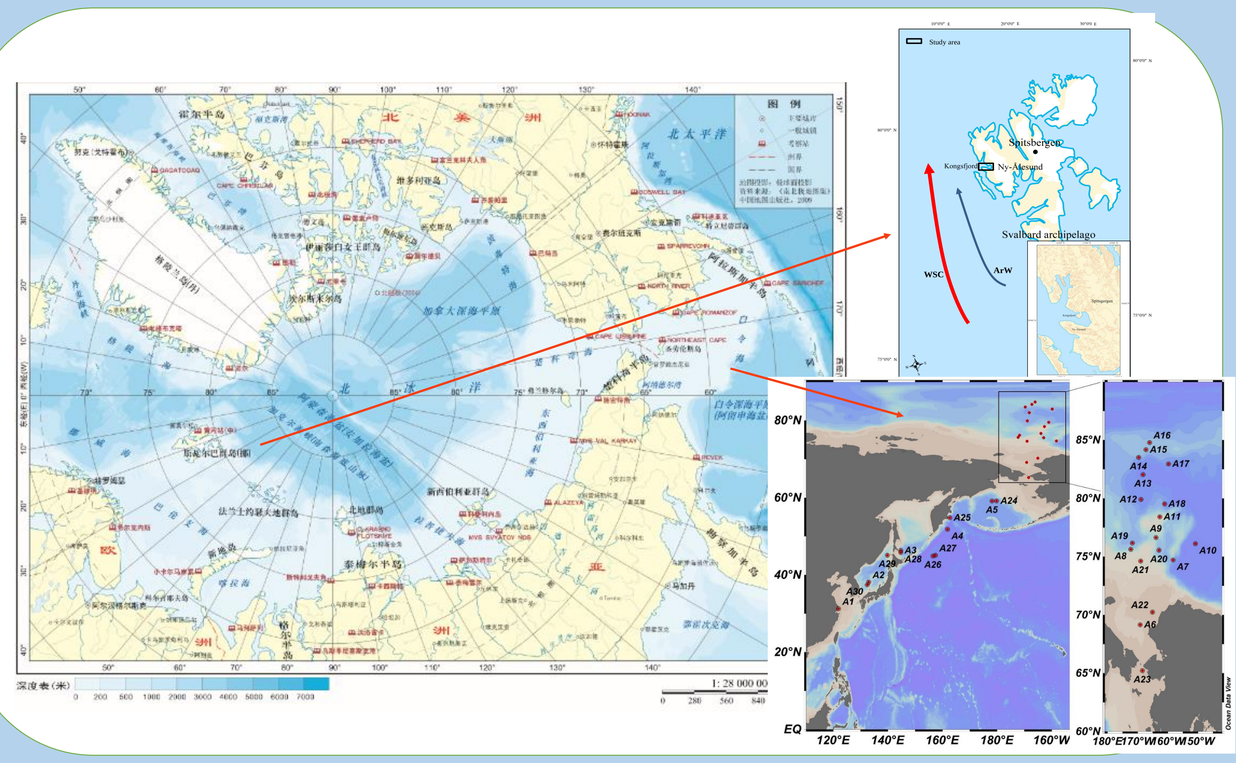


16 USEPA priority polycyclic aromatic hydrocarbons (PAHs)



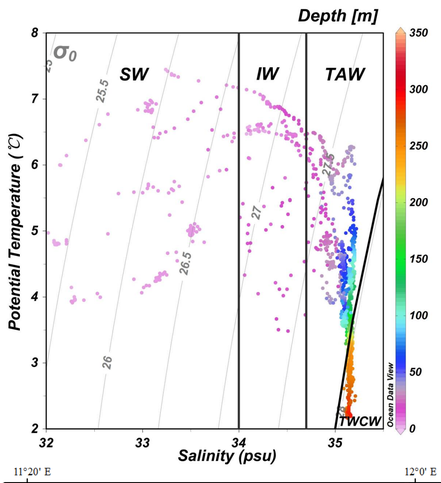
Organophosphate esters (OPEs)

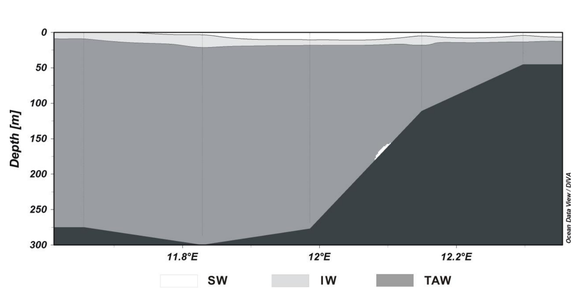
2. Region

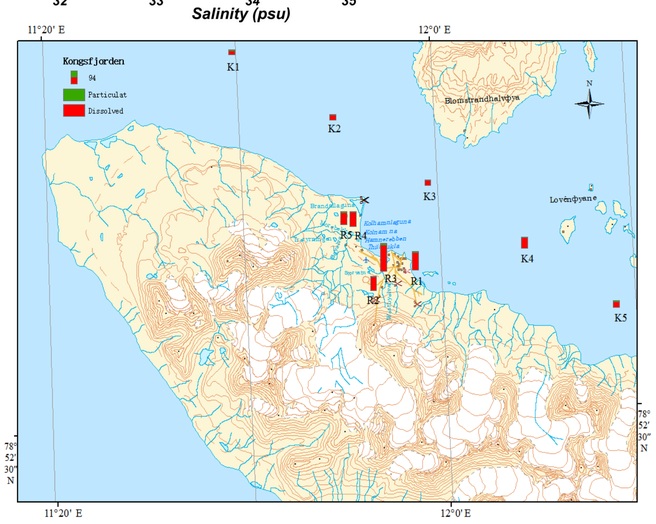


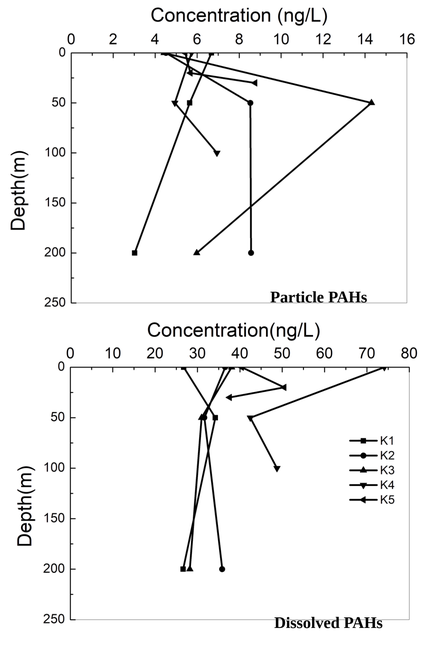
3. Distribution and Sources of Polycyclic Aromatic Hydrocarbons in the Water Column of Kongsfjorden, Arctic

The surface water SW is relatively thick in the Bay and can reach about 10 m, but can not extend to the mouth of the bay. The IW of middle water is only about 10 m water column height. The water body in the bay is mainly controlled by the Atlantic variable water taw, which can extend to a depth of more than 200 meters.





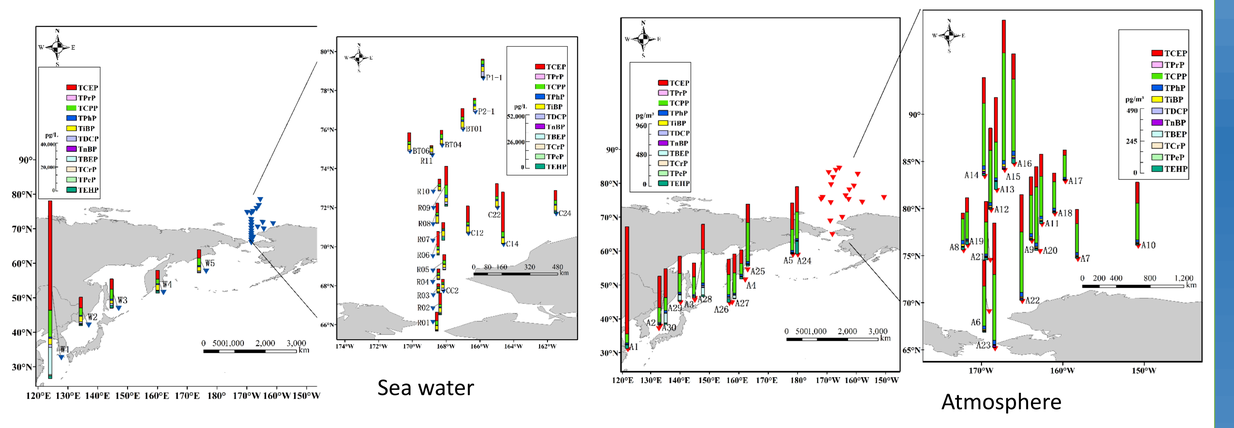




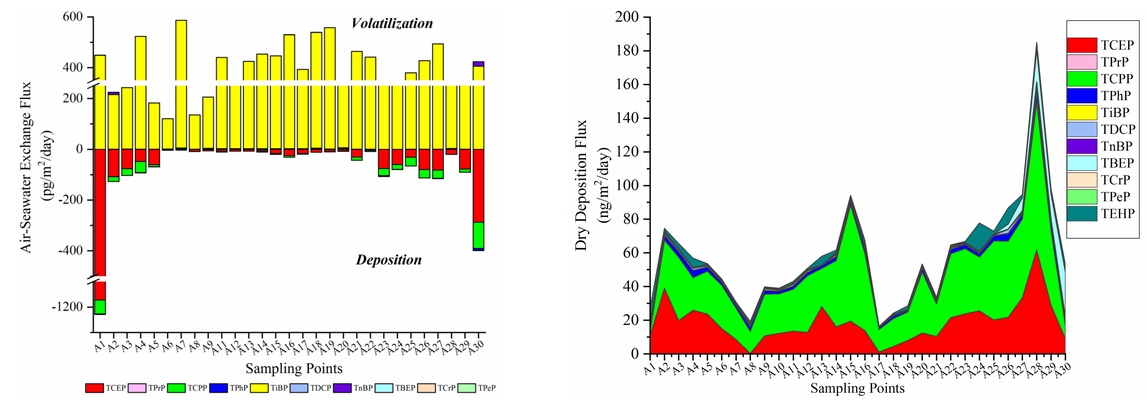
- On the whole, the concentration of PAHs in river water (92.3～201.4 ng / L) was higher than that in seawater (33.4～79.8 ng / L), and the concentration of PAHs in dissolved state was higher than that in particulate state
- In horizontal direction, PAHs are mainly concentrated in the middle of wangwan, which is located in the front of glacier. It is inferred that the input of glacial melt water may introduce a large number of PAHs.

4. Atmospheric Migration of Organophosphate Esters (OPEs) from the Northwestern Pacific to the Arctic Ocean

- The concentration of Σ_{11}OPEs in air and seawater samples ranged from 231 to 1,884 pg/m^3 and from 8.5 to 143 ng/L, respectively.
- For individual OPEs, the percentages of particular chemicals increased as the latitude increased.



- Net exchange flux of ΣOPEs in the study area ranged from -780 to 583 pg/m^2/day. TiBP contributed most of the exchange flux in various sampling areas, ranging from 120 to 581 pg/m^2/day.
- Although most of the net exchange direction is from the surface of the sea to the bottom air layer, exchange fluxes of TCEP and TCPP exhibited the contrary result, particularly in the area of the northwestern Pacific Ocean (samples A1 to A4, A25 to A30), the Bering Strait (samples A5, A21 to A24), and the high Arctic



The dry deposition flux ranged from 16.4 to 185 ng/m^2/day.
TCPP and TCEP had the most dominant contribution to total deposition flux, ranging from 0.3 to 61.6 ng/m^2/day and from 2.6 to 88.0 ng/m^2/day, respectively.
High values of dry deposition flux appeared in the Bering Strait and the high Arctic

5. Conclusion

- The spatial distribution of PAHs in the water body is closely related to the distribution of suspended particles caused by glacial melt water.
- Bering Strait and the Arctic Ocean may be the gathering places of OPEs in the atmosphere of Asian continent.
- Temperature might be a driving factor of LRAT of OPEs from the Asian continent to the Arctic Ocean.

Acknowledgement

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