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The role of mangrove afforestation in altering intertidal groundwater nutrients in different seasons

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Mangroves are highly productive and outstanding carbon sinks at the confluence of land and sea. They play an active role in regulating the intertidal groundwater nutrients. However, over the past 50 years, approximately one-third of the world's mangrove forests have been lost. Fortunately, afforestation has been widely planned, which will increase the nursery zone at the cost of reducing the bare mudflat area. While the newly added transition zone increases the carbon sink potential, it is not clear how the intertidal groundwater trophic status is changed with seasons. We conducted an investigation in Hailing Island (HLI) National Mangrove Wetland Park, China (**Fig. 1**).

A typical intertidal transect with a distinct undulated topography and mangrove plants was set up. Along the transect, we set up five monitoring wells (W1-W5) to monitor the groundwater level, electrical conductivity, temperature [1] and take water samples at winter and summer, 2020. The transect was classified into the pristine mangroves (landward), afforestation zone (middle), and bare mudflat (seaward). The pristine mangrove zone has a relatively higher surface elevation, mainly occupied by bushy and tall (2-3m) Avicennia marina trees. The afforestation zone with a lower elevation and gentle slope is composed of small and sparse seedlings.

The groundwater nutrient concentrations (mmol L-1) in the entire transect are in the order of DSi>DIN>DIP in both seasons. And they were higher in summer than those in winter. The NH4-N concentration on the seaward side was generally higher than that on the landward one. For the NO3-N and NO2-N in groundwater around the afforestation zone, their concentrations were significantly higher in summer than those in winter. Under the impact of different vegetation zonation, it is concluded that afforestation may increase ammonia uptake and provide more oxygen into the underlying groundwater in summer than in winter.

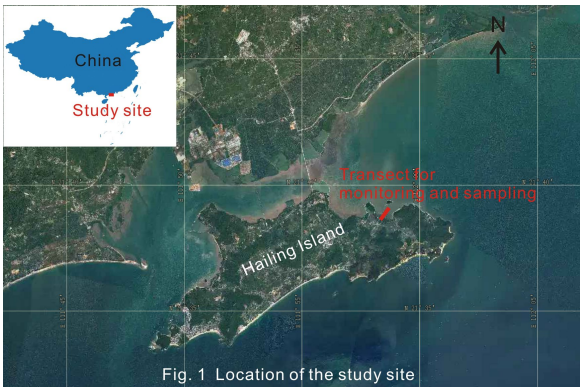

Fig. 1 Location of the study site

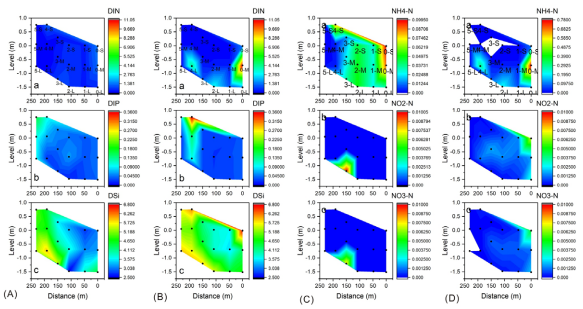

Fig. 2 The nutrient concentrations in intertidal groundwater in (A) winter and (B) summer, and those of different nitrogen forms in (C) winter and (D) summer

Reference

[1] Li Z, Pan F, Xiao K, Li H, Zheng C, Wang X, Zhang Y, Wang Q, Zhang L (2022), An integrated study of the spatiotemporal character, pollution assessment, and migration mechanism of heavy metals in the groundwater of a subtropical mangrove wetland. J Hydrol 612: 128251