



Supplement of

Dissolved inorganic nitrogen in a tropical estuary in Malaysia: transport and transformation

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Fig. S1 Photos for the Rajang: (A) was taken from the Sibu yard; (B) was taken in the river mouth (Lassa branch).



Fig. S2 Sketch for the calculation process of the reaction factor (*f* in the equation 4, reduction pattern). The calculation is based on the integration of conservative mixing and observed mixing along the salinity gradient. In particular, an integration for the conservative mixing line from fresh river (salinity: 0) to saline water (salinity: 35 here) is conducted, which offers the area of the triangle region (A_{con}). Subsequently, the other integration for the observed mixing line along the salinity gradient is conducted, generating a smaller area (A_{obs}) than the conservative integration (difference is the shadow region in the figure) in the reduction scenario. Afterwards, A_{obs} is divided by A_{con} , producing the reaction factor (without unit). Notably, in the reduction scenario, the reaction factor is < 1, while the addition leads to >1 factors.



Fig. S3 DO, water temperature and water pH in the Rajang and adjacent coastal ocean in three cruises.



Fig. S4 Distribution of water pH and DO along the salinity gradient in three cruises.



Fig. S5 Oxygen Undersaturation Degree (OUD) along the salinity gradient and mean values in fresh river water, marine water, as well as mixing zones in three tributaries.



Fig. S6 Composition of particle nitrogen (PN) in suspended particle matter (SPM) and PN concentration in the Rajang and adjacent coastal ocean



Fig. S7 Distribution of SPM and PN content along the salinity gradient



Fig. S8 Distribution of δ^{15} N-PN along the salinity gradient and the correlation between δ^{15} N-PN and PN in SPM.



Fig. S9 Concentrations of NO₂⁻ and DON in the Rajang and coastal ocean.



Fig. S10 Distribution of NO₂⁻ and DON concentration along the salinity gradient.



Fig. S11 Distribution of δ^{18} O-NO₃⁻ along the salinity gradient; correlation between δ^{15} N-NO₃⁻ and NO₃⁻ concentration; and distribution of δ^{18} O-NO₃⁻ offset along the salinity gradient.

Table S1 Reaction factors (f) of NO₃⁻, NO₂⁻ and NH₄⁺ in different tributaries among three cruises. If f > 1, solute addition occurs and vice versa. The value of f is proportional to the magnitude of addition or removal. In the table, flux (t N d⁻¹) is the magnitude of riverine flux to the coastal sea based on the mean factor (the average among Rajang, Lassa and Igan tributaries), river water concentrations (Fig. 7) and Rajang discharge rate.

	Rajang	Lassa	Igan	Flux
August 2016				
NH4 ⁺	1.06	1.41	1.21	24.7
NO ₂ -	13.1	6.94	1.17	6.28
NO ₃ -	3.13	3.08	1.26	46.3
February 2017				
NH4 ⁺	0.92	0.95		20.1
NO ₂ -	9.61	4.75		8.14
NO ₃ -	1.21	1.59		73.3
September 2017				
$\mathrm{NH_{4}^{+}}$	1.02	1.21	1.05	4.57
NO ₂ -	3.63	3.45	0.68	1.16
NO ₃ -	1.52	1.48	2.32	82.4