

Reviewer's Report  
 EGU Hydrology and Earth System Sciences  
 For the Editors

Title	Nitrogen attenuation, dilution, and recycling at the groundwater-surface water interface of a subtropical estuary inferred from the stable isotope composition of nitrate and water
Author(s)	Sébastien Lamontagne, Frédéric Cosme, Andrew Minard, and Andrew Holloway
Journal	EUG Hydrology and Earth System Sciences

EGU Numerical Evaluation by the Reviewer

	Excellent (1)	Good (2)	Fair (3)	Poor (4)
<b>Scientific significance:</b> Does the manuscript represent a substantial contribution to scientific progress within the scope of Hydrology and Earth System Sciences (substantial new concepts, ideas, methods, or data)?	X			
<b>Scientific quality:</b> Are the scientific approach and applied methods valid? Are the results discussed in an appropriate and balanced way (consideration of related work, including appropriate references)?		X		
<b>Presentation quality:</b> Are the scientific results and conclusions presented in a clear, concise, and well-structured way (number and quality of figures/tables, appropriate use of English language)?		X		

This is the first paper that I have seen that focuses on a combined hyporheic and intertidal mixing zone and the possible biogeochemical interactions that might occur in this zone. The paper also demonstrates that some of the techniques that are used to study these zones separately might be used to characterize the biogeochemistry of a zone with mixed processes, as the dominant physical process for both of these zones is mixing. I think that the authors could do a better job of emphasizing the novelty of their field setting and the novelty of their approach.

This is also the first environmental science paper that I have seen in over thirty years in the field where the location of the field site is intentionally not provided by the authors. I understand that the funders of this research may have reason to want the location to be obscured, but I think that the authors, perhaps with the assistance of HESS editors, need to convince these patrons to allow the setting to be identified. I am not sure that HESS editors should even permit this article to be published, as novel and as interesting as it is, without the location information. Certainly, the lack of an identified field location dramatically will reduce the scientific utility and impact of the

submission. Personally, I would be reluctant to cite this paper, given the lack of a well-characterized and identified field site.

Given that the most novel aspect of this paper is how the hyporheic processes in the tidal river interact with the intertidal processes of the estuarine boundary, the title should reflect this novelty. I suggest that the title be changed slightly to: "Nitrogen attenuation, dilution, and recycling in an intertidal hyporheic zone *somewhere, not identified, in Australia*" (Note: the italicized part of the title should be changed to reflect the actual location, if at all possible).

Lastly, I think that the conceptual illustrations provided with this manuscript are excellent and with a few modifications (to indicate both the longitudinal as well as the cross-sectional geometries) these illustrations are likely to stimulate more interest in both hyporheic and intertidal mixing and exchange.

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For the Public Release on the Journal Website

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This is the first paper that I have seen that focuses on the biogeochemistry of a combined hyporheic and intertidal mixing zone at the margins of an estuarine tidal channel and the biogeochemical interactions that occur in this zone. Hyporheic exchange is the entrainment and exchange fluids between a streambed and a channel due to spatial and temporal changes in pore pressures driven by streamflow and stream topography. Intertidal mixing is the exchange of surface and porewaters in a typically porous (sandy) beach due to tides and waves. Both processes lead to mixing between surface and porewaters. And both processes must occur and interact in estuarine tidal channels; the relative importance of the two processes is probably related to the channel flow rates, stream topography, intertidal topography and tidal range.

Beachfaces and stream margins are also zones of high biogeochemical reactivity due to the availability and interaction of fresh and reactive organic matter from primary productivity, and oxidants, such as  $O_2$  and  $NO_3^-$ . These zones may serve to mitigate the effects of nutrient contamination on potentially fragile coastal ecosystems, in a manner analogous to the use of slow sand filters in wastewater processing.

The paper further demonstrates that some of the techniques that are used to study these zones separately (such as deviations from linearity of reactive property vs conservative property diagrams that are often used to study the biogeochemistry of more traditional estuarine mixing zones.) This is a novel observation and the authors could do a better job of describing and emphasizing the novelty of both their field setting and their approach.

This is also the first environmental science paper that I have seen in over thirty years in the field where the location of the field site is intentionally not provided by the authors. I understand that the funders of this research may have reason to want the location to be obscured, but I think that the authors, perhaps with the assistance of HESS editors, need to convince these patrons to allow the setting to be identified. I am not sure that HESS editors should even permit this article to be published, as novel and as interesting as it is, without the location information or, at least, some agreement that location information will be provided to researchers in the future. Certainly, the lack of an identified field location will dramatically reduce the scientific utility and impact of the submission. Personally, I would be reluctant to cite this paper, given the lack of a well-characterized and identified field site. I am also concerned that the patrons of this work are interfering with the normally "open" scientific process. I urge the authors and editors to seek permission from the patrons of this research to disclose the site location.

Given that the most novel aspect of this paper is how the hyporheic processes in the tidal river interact with the intertidal processes of the estuarine boundary, the tidal should reflect this novelty. I suggest that the title be changed slightly to: "Nitrogen attenuation, dilution, and recycling in an intertidal hyporheic zone *somewhere, not identified, in Australia*" (Note: the italicized part of the title should be changed to reflect the actual location, if at all possible).

I have recommended some additional editorial modifications to the authors. With these modifications, the paper should be acceptable for publication, particularly if the problem of "site-anonymity" can be resolved to the editors' satisfaction. Certainly this work, once and if it is published, will serve as a model for future biogeochemical and biogeophysical studies of similar marginal marine zones.