

# ***Interactive comment on “Evaluation of atmospheric nitrogen inputs into marine ecosystems of the North Sea and Baltic Sea – part A: validation and time scales of nutrient accumulation” by Daniel Neumann et al.***

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Received and published: 9 January 2019

This study aims to evaluate the contribution of atmospheric nitrogen deposition to marine ecosystems of North Sea and Baltic Sea emphasizing on the residence time of N. Authors state that “the concentrations of dissolved and particulate nitrogen in the sea are not only determined by the input, but also by the residence time of nitrogen in the system before it is removed by biogeochemical processes or physical advection”. This is miss-leading. The concept of residence time is based on concentration of nutrient in the steady-state and rate of input or removal from the ecosystem. Thus, use of model

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to validate time-scales of nutrient accumulation is not well understood. Moreover, Authors have arrived at some obvious conclusions that results are consistent with the published residence time of nutrients. Nevertheless, the use of model has some basic limitations with respect to spatio-temporal variability in simulating DIN and impact on marine ecosystem. The simulation and validation of the model to attain steady-state is not adequately explained with respect to atmospheric deposition of nitrogen. The evaluation of uncertainties associated with the model needs better approach and quantification. Overall, evaluation of biogeochemical cycling of nitrogen (and nutrients) is not rigorously built in the manuscript with respect to sources other than atmospheric deposition (example, redox conditions in the sediments). Relying only on surface water concentrations does not meet the objectives. Authors have discussed number of shortcomings, but still assume that “the relative contribution of atmospheric nitrogen deposition to the marine nitrogen budget was properly reproduced”. Authors also believe these shortcomings should be evaluated in detail in future studies. The reference made to second part of study further raises limitation on the suitability of the existing model

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-364>, 2018.

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