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***Interactive comment on “Nitrogen turnover in
a tidal flat sediment: assimilation and
dissimilation by bacteria and benthic microalgae”
by K. Dähnke et al.***

Anonymous Referee #2

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This work has tried to investigate reactive nitrogen cycling by a number of microbial processes in a tidal flat sediment, with a particular focus on the relative importance of assimilatory versus dissimilatory processes and the role of benthic microalgae in these processes. The combination approach of using ^{15}N labelled nitrate and ammonium and modelling is an excellent idea. However, the authors have used a wrong experiment design, ie, used sediment slurry for the experiments instead of intact sediment cores. Benthic microalgae are usually grown on the surface of the sediment. Benthic diatoms can migrate up and down on a very thin layer of the surface sediment, with the tidal cycles. So the photosynthetic N assimilation is very much dependent on the light/dark regimes and also N availability. Destruction of sediment structure can totally

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alter the living environment for these algae. So the result on slurry experiment can not show the actual rate and fate of N transformation by the algae. Particularly, in slurry, the algae will be buried so the light effect will be greatly reduced. Denitrification is the major dissimilatory process responsible for nitrate removal from the sediments, which occur in an anoxic layer of sediment. Making slurry of sediment will change the redox of the sediment and inhibits rate of denitrification, so slurry experiment can not represent the actual rate of denitrification in the sediment. So the relative importance of assimilatory versus dissimilatory processes by slurry experiments is artificial rather than actual. My suggestion is that intact sediment core should be used for the experiment to examine the relative importance of assimilatory versus dissimilatory N transformation processes in intertidal sediments, although using intact sediment core are more difficult than using sediment slurry. If the authors are to use this new experiment design, they can not only get a real picture of N cycling in sediment, but also show a comparison of slurry sediment versus intact sediment in the research of this kind.

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