

## ***Interactive comment on “Production of oceanic nitrous oxide by ammonia-oxidizing archaea” by C. R. Loescher et al.***

**Anonymous Referee #3**

Received and published: 24 April 2012

This manuscript describes a series of field observations, manipulations and culture experiments which are performed to investigate which group of organisms, ammonia oxidising archaea or bacteria are the dominant producers of nitrous oxide in the marine environment. This study is very timely, and following a small number of edits is entirely appropriate for publication in Biogeosciences.

The manuscript is generally well presented, though I would suggest that the position of the methods section is wrong and should be re-positioned after the introduction. The present arrangement means that one is consistently looking forward to find out what, where and why something has been done.

I would also suggest that the current title is not entirely representative and should be altered to reflect the coastal and shelf seas component of this study.

C770

### *In Section 2 – vertical distribution. . .*

I find that this discussion is not particularly easy to follow and a better approach might be to separate out the description of the two ocean areas. Further to this the interrogation of the relationship between numbers of amoA genes and N<sub>2</sub>O should be more rigorous than a simple comparison of two contour profiles, which do not actually match up as well as is described. A correlative relationship does not prove a direct link, but some statistical investigation should be performed here.

The description of “certain depths at some stations” is very vague and this should be tightened up, I can not tell from this whether the “key genes” for denitrification and anammox were determined in the Pacific study.

The lack of a relationship between  $\Delta$ N<sub>2</sub>O and AOU in the Pacific study merits further discussion.

### *In Section 4 – Potential importance . . .*

I do not understand the statement: . . . AOA might dominate the production of N<sub>2</sub>O and the balance between reduced and oxidised nitrogen species in the ocean, gradually.

Section 7 is much too short and lacking in detail. Description of the methods should be more involved as should the discussion. It would seem that culture conditions are likely to affect the mechanism by which N<sub>2</sub>O is produced, though these are not described.

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Interactive comment on Biogeosciences Discuss., 9, 2095, 2012.