Atmos. Chem. Phys. Discuss., 10, C5159–C5162, 2010
www.atmos-chem-phys-discuss.net/10/C5159/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Impact of biomass burning on surface water quality in Southeast Asia through atmospheric deposition: eutrophication modeling" *by* P. Sundarambal et al.

P. Sundarambal et al.

eserbala@nus.edu.sg

Received and published: 11 July 2010

Response to acpd-10-C3078-2010

JOURNAL: Atmospheric Chemistry and Physics

AUTHORS NAME: P., Sundarambal, P., Tkalich, and R., Balasubramanian

TITLE: Impact of biomass burning on surface water quality in Southeast Asia through atmospheric deposition: eutrophication modeling

MS No.: acp-2010-155 Special Issue: Measurement and modeling of aerosol emissions from biomass burning

Reviewer: Anonymous Referee #2 The authors gratefully acknowledge the reviewer's efforts on carefully reviewing the manuscript.

General comments The present study is on nutrients from atmospheric deposition in the coastal water, and their contribution to eutrophication. Besides physical processes (advection – diffusion), biochemical interactions between non-conservative quantities are also considered. The authors used NEUTRO model to quantify water quality parameter variability due to atmospheric derived nutrients and predict the resultant nutrient and phytoplankton dynamics in the coastal region of Singapore. The study provides new information on haze nutrient composition and its impact on aquatic ecosystem for the Singapore region.

On the whole, the paper is very interesting. Authors' response: We thank the reviewer for reviewer's constructive comments.

Specific comments Comment 1: Haze and no-haze periods may be explained properly for better understanding of the seasonal effects. What is the reason for high nutrients during haze period? Are they so high enough to cause eutrophication? Is the source of atmospheric nutrients the loading and unloading of cargo in the port area? It is mentioned in the paper that the biologically available nitrogen from atmospheric wet deposition is the source. If so, which is the nitrogen the author exactly referring to?

Authors' response: The concentrations of nutrients in atmospheric samples during Haze and no-haze periods are elaborated in the companion paper of field observations (Sundarambal, P., Tkalich, P., Balasubramanian, R., and He, J: Impact of biomass burning on surface water quality in Southeast Asia through atmospheric deposition: field observations, Atmospheric Chemistry Physics Discussion, 10, 7745–7778, 2010) and its supplementary materials. The seasonal effects are not in the scope of the present study and will be addresses in a future study. Also, the link between the present paper and the companion paper is now indicated in the introduction for its better understanding.

ACPD

10, C5159–C5162, 2010

The reason for high nutrients during haze period is explained in the complementary paper and supplementary materials. Nutrients like nitrates and phosphates are volatilized from biomass burning into the air while metals and other elements in burned material and soils remain as ash. To understand whether the levels of nutrients in atmospheric samples are high enough to cause eutrophication and to estimate their impact on water quality, the present eutrophication modeling study was carried out (Example see results in Fig.5 and Fig. 8).

The source of atmospheric nutrients is not the loading and unloading of cargo in the port area and there are no many nutrient-related shipping industries in Singapore. The measured high concentration of nutrients in atmospheric samples during biomass burning is supported by backward air trajectories coupled with satellite images of biomass burning sources, so the source of atmospheric nutrients is not related to the loading and unloading of cargo in the port area during biomass burning. The source apportionment of atmospheric nutrients is not included in the current scope of the present study. We would like to highlight that the present research work represents the first study of its kind that is focused on bringing together field-based investigations to quantify atmospheric nutrient deposition and eutrophication modeling to investigate impact of atmospheric nutrient deposition on coastal water quality. This study provides a scientific basis for a more in-depth future study in this region.

The biologically available nitrogen (ammonium, nitrate + nitrite, organic nitrogen, total nitrogen) in atmospheric wet deposition is the source that is addressed in the modeling study. The nitrogen is referred to nitrate + nitrite nitrogen for conservative modeling. The clear explanation of modeling methods and model inputs used for them is given in the revised manuscript.

Technical corrections: Comment 2: Language has to be improved. For example, page 7782, line 22: The need for water quality management tools has arisen as a result of increased eutrophication of coastal waters throughout the world.

ACPD

10, C5159–C5162, 2010

Authors' response: The English language has been considerably improved in the revised manuscript.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 7779, 2010.