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Impact of biomass burning on nutrient deposition to the global ocean

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Atmospheric deposition of trace constituents, both of natural and anthropogenic origin, can act as a nutrient source into the open ocean and affect marine ecosystem functioning and subsequently the exchange of CO_2 between the atmosphere and the global ocean. Dust is known as a major source of nutrients (Fe and P) into the atmosphere, but only a fraction of these nutrients is released in soluble form that can be assimilated by the ecosystems. Dust is also known to enhance N deposition by interacting with anthropogenic pollutants and neutralisation of part of the acidity of the atmosphere by crustal alkaline species. These nutrients have also primary anthropogenic sources including combustion emissions. The global atmospheric N [1], Fe [2] and P [3] cycles have been parameterized in the global 3-D chemical transport model TM4-ECPL, accounting for inorganic and organic forms of these nutrients, for all natural and anthropogenic sources of these nutrients including biomass burning, as well as for the link between the soluble forms of Fe and P atmospheric deposition and atmospheric acidity. The impact of atmospheric acidity on nutrient solubility has been parameterised based on experimental findings and the model results have been evaluated by extensive comparison with available observations.
In the present study we isolate the significant impact of biomass burning emissions on these nutrients deposition by comparing global simulations that consider or neglect biomass burning emissions. The investigated impact integrates changes in the emissions of the nutrients as well as in atmospheric oxidants and acidity and thus in atmospheric processing and secondary sources of these nutrients. The results are presented and thoroughly discussed.

References

[1] Kanakidou M, S. Myriokefalitakis, N. Daskalakis, G. Fanourgakis, A. Nenes, A. Baker, K. Tsigaridis, N. Mihalopoulos, Past, Present and Future Atmospheric Nitrogen Deposition, Journal of the Atmospheric Sciences (JAS-D-15-0278) Vol 73, 2039-2047, 2016.

[2] Myriokefalitakis,S., Daskalakis,N., Mihalopoulos,N., Baker, A.R., Nenes, A., and Kanakidou,M.: Changes in dissolved iron deposition to the oceans driven by human activity: a 3-D global modelling study, Biogeosciences, 12, 3973-3992, 2015.

[3] Myriokefalitakis S., Nenes A., Baker A.R., Mihalopoulos N., Kanakidou M.: Bioavailable atmospheric phosphorous supply to the global ocean: a 3-D global modelling study, Biogeosciences, 13, 6519–6543, 2016.