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Interactive comment on "Bioavailable atmospheric phosphorous supply to the global ocean: a 3-D global modelling study" *by* Stelios Myriokefalitakis et al.

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Comments from Srinivas Bikkina Manuscript: Bioavailable atmospheric phosphorous supply to the global ocean: a 3-D global modelling study by Myriokefalitakis et al., (2016).

This article reviews the current state of knowledge on the total and dissolved phosphorous emissions to the atmosphere and their relevance to biogeochemical impact on carbon by providing more bioavailable phosphorous through air-sea deposition. The article also highlights the need for considering the impact of bioavailable phosphorous emissions from anthropogenic sources and acid processing of mineral dust in a changing climate scenario. Authors have reviewed the existing field based and model pre-

dicted atmospheric PInorg (dissolved pool of inorganic phosphorous) deposition over the Atlantic and Pacific Oceans. However, no information is provided on the available data and observations made over the Northern Indian Ocean (Arabian Sea and Bay of Bengal) [Srinivas and Sarin, 2012; Srinivas and Sarin, 2013; Srinivas and Sarin, 2015].

Studies from Northern Indian Ocean have reported an order of magnitude difference in the atmospheric abundance of PInorg between Bay of Bengal (1.1$\pm$0.3 nmol m-3) and the Arabian Sea (0.3$\pm$0.1 nmol m-3) [Srinivas and Sarin, 2012]. Air mass back trajectories and characteristic elemental ratios of Ca/Al and Fe/Al (an index of mineral dust) suggest the source of PInorg from Arabian, Iranian and Thar Deserts. A significant ($p < 0.05$) linear relationship of PInorg with nss-Ca2+ and nss-SO42- over the Bay of Bengal provides evidence for acid processing of mineral dust (dissolution of apatite). This linear relationship between PInorg and nss-Ca2+ is not significant over the Arabian Sea [Srinivas and Sarin, 2012].

Several studies have documented dominance of anthropogenic sources over the BoB [Kumar et al., 2008; Srinivas et al., 2011]. We also computed dust derived aerosol phosphorous (Pdust, estimated by assuming P/Al ratio in the upper continental crust (0.008) and measured Al concentration and anthropogenic water-soluble inorganic phosphorous (Panth = PInorg – Pdust) contribution over the Northern Indian Ocean. A comparison of air-sea deposition of PInorg over the Northern Indian Ocean (0.035 Tg-P yr-1) is of comparable magnitude with the riverine supply [Srinivas and Sarin, 2013] and model based deposition flux (0.045 Tg-P yr-1) by Okin et al. [2011]. These calculations suggest predominance of anthropogenic sources (biomass burning emissions and fertilizers) over the Bay of Bengal (Panth: $\sim$75%) and contribution from mineral dust over the Arabian Sea (Pdust: $\sim$70%) [Srinivas and Sarin, 2012]. These results highlight the importance of atmospheric source in influencing the biogeochemical cycle of phosphorus in the Northern Indian Ocean.

The article by Myriokefalitakis et al., (2016) published as discussion paper in Biogeosciences may consider these results from the northern Indian Ocean.

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http://www.biogeosciences-discuss.net/bg-2016-215/bg-2016-215-SC1-supplement.pdf

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