Silicon isotopes and biogeochemical processes in Indian estuaries

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Si, a specific nutrient needed by diatoms and its availability relative to other nutrients determines the phytoplankton composition while land use and climate change alters the supply of nutrients in estuarine and coastal ecosystems functioning. For instance, a Si limitation relative to N is indicative of high eutrophication potential. In order to understand the biogeochemical cycling of Si and its supply to coastal ocean, here we present the first study on silicon isotopes ($\delta^{30}Si$) in more than 18 tropical Indian estuaries during dry period. Average $\delta^{30}Si$ is 1.9 ± 0.4 ‰ (n= 58) which is almost 1 ‰ heavier than the world river supply to the ocean estimated so far. Indeed, contrary to a typical weathering control on riverine $\delta^{30}Si$ as generally observed, there is no positive correlation between Dissolved Silicon (DSi) content and $\delta^{30}Si$. More specifically in western estuaries, $\delta^{30}Si$ are lighter (1.2±0.2‰) with negative and positive correlation with DSi and Biogenic Si (BSi), respectively. This cannot be ascribed to diatoms since these variations are not related to diatoms pigments. In contrast, the eastern estuaries have heavier $\delta^{30}Si$ (2.1±0.3‰) with no clear relation with either DSi or BSi contents across the salinity gradient. Interestingly however, there is good correlation between BSi and diatom pigment (r=0.65) that might be indicative of the significant role of diatoms. These first results also show significant relation with land use especially crops & groves coverage as seen by positive correlation with $\delta^{30}Si$, that might be indicative of plant Si uptake, and negative relation with sown area.

We will compare these data with the $\delta^{30}Si$ of monsoon and groundwater samples currently under processing. The results will then be discussed in terms of Si cycle and impact of land use and climate on these contrasted Indian estuaries and how this can affect coastal biogeochemistry and ecosystems