Controls on the surface sediment $CaCO_3$ content in the tropical Atlantic regions

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As a prime indicator of the marine carbonate system saturation state variations, sedimentary calcium carbonate content ($CaCO_3$) in deep sea has been widely used in studying past changes in marine carbon cycles associated with climate change. However, the indication effect of sediment core-top $CaCO_3$ content in paleoceanography will be impaired by the dilution imposed by lithogenic material, including riverine discharge and dust deposition. Therefore, it becomes a major challenge in oceanographic research to distinguish the influence from changes in lithogenic input and the marine carbonate chemistry on oceanic sedimentary $CaCO_3$ distributions. A compilation of sedimentary $CaCO_3$ data in the tropical Atlantic Ocean was re-analyzed in this study using a recently developed carbonate dynamics model[1], we are able to examine ruling mechanisms of the carbonate system in five ocean basins (Guiana, Cape Verde, Guinea, Angola, Brazil) which follow the same oceanic carbonate saturation or compensation law but with distinct inter-basin conditions. Five ocean basins exhibit distinctive mechanisms with respect to the distribution of calcium carbonate in surface sediments. Carbonate chemistry is slightly different in Angola Basin and Guinea Basin with relatively smaller concentration of carbonate ion, whereas it is rather similar in other four basins. Lithogenic input and ocean productivity regulate the $CaCO_3$ content and carbonate compensation depth to a varying degree. The overall North tropical Atlantic is generally diluted by dust from Sahara Desert and displayed a distance function. Sedimentary $CaCO_3$ contents in ocean basins with riverine input (e.g. Angola Basin with Congo River) are greatly diluted. Ocean productivity is supposed to vary in Guiana Basin and Brazil Basin, which is responsible for the different compensation depths. This work contributes to an systematic understanding of the marine carbonate system.

[1] Luo et al. (2018) EPSL **492**, 112-120.