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Coastal processes alter the speciation of black carbon between dissolved and particulate phases

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Black carbon (BC) is a highly refractory class of condensed aromatic molecules generated through the thermal alteration of organic matter. Two distinct pools of dissolved BC have been identified in recent years: riverine, which is modern, more condensed, with lower $\delta^{13}C$ values, and marine, which is aged 4,000-20,000 years, less condensed, and with greater $\delta^{13}C$ values, however the cause of this speciation remains a matter of speculation. While some have suggested the two pools may be decoupled, the influence of coastal processes such as adsorption, flocculation, and sedimentation remains entirely unknown. To investigate these controls, we combined a natural organic matter standard (SR-NOM II) with four separate clay standards, representing kaolinite, smectite, illite, and chlorite, at salinities 0, 1, and 10 ppt. For both particulate and dissolved phases, BC concentrations and condensation degree were analyzed using the benzenepolycarboxylic acid method. Preliminary finding suggest that not only do flocculation and adsorption of organic matter result in increased BC concentrations in the particulate phase, they also primarily affect the more condensed fractions, causing dissolved BC to present a more marine signature. Moreover, the shift of dissolved organic matter to the particulate phase was significantly enhanced by the combined influence of adsorption and flocculation, and primarily targeted more aromatic, terrestrial markers as indicated by optical absorbance. Compound-specific stable carbon isotopes of BC in both phases will also be presented. Overall, our findings indicate that coastal processes have a profound impact on the speciation of riverine BC upon export to the ocean and therefore may account for a substantially larger portion of marine dissolved BC than previously thought.