Colloidal size partitioning in estuarine and coastal waters as characterized by flow field-flow fractionation coupled with fluorescence detector

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Flow field-flow fractionation (FlFFF) coupled on-line with UV absorbance and fluorescence detectors was used to examine colloidal size distribution of dissolved organic matter (DOM) in estuarine and coastal waters in the northern Gulf of Mexico (GOM). Laboratory mixing experiments using end-member riverwater and seawater were also conducted to examine dynamic change in colloidal size spectra during estuarine mixing. Chromophores and humic-type fluorophores were found to partition mostly (>75%) in the 1-4 nm size fraction in the colloidal DOM pool. In contrast, the protein-type fluorophores not only partitioned in the nano-colloidal size range, including the 1-4 nm and 3-8nm size ranges, but also had a major presence in the > 20 nm size range (~69% in the Bay St Louis, and ~72% in the Mississippi Bight). The colloidal concentrations all decreased with increasing salinity, while the ratio between protein-type fluorophores and humic-type fluorophores showed a general increasing trend with increasing salinity. These results are consistent with increasing in-situ production for protein-type DOM and removal of humic-like DOM in higher salinity waters. Similar trends were also found in samples from the laboratory mixing experiments. Field samples seemed to exhibit a two-segment mixing between colloidal abundance and salinity, suggesting multiple sources of DOM in the coastal waters outside the Bay of Saint Louis. Also, high values of protein-type and humic-type fluorophore ratio at middle salinity in the bay likely resulted from higher autochthonous sources from phytoplankton in this region. Colloidal size distribution characterized by flow field-flow fractionation provides a useful tool in understanding the biogeochemical cycling pathways of DOM in estuarine and coastal waters.