Evaluating the lability of organic matter from individual sources by carbon isotope signature of amino acids in the estuary

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To better understand the behavior of estuarine labile organic matter, stable carbon isotope values of amino acids were investigated from the particles and sediment collected along a salinity transect in the Pearl River Estuary in the winter of 2016. Variation in amino acids $\delta^{13}C$ values was observed from the upstream stations to those adjacent to the shelf. A varied isotopic difference between amino acids and bulk organic carbon was found across the salinity transect, suggesting a mismatch in the carbon source between labile organic matter and the rest of bulk OM with a particular consideration of refractory terrestrial OM input to the estuary. A microbial degradation incubation provides further evidence that the changing isotope values in bulk organic carbon during phytoplankton decomposition mainly result from the change in relative abundance of amino acids and other organic components, rather than the isotopic changes in amino acids themselves.

With an assumption of constant isotope difference between amino acids and other organic components from the same carbon source, a liability model was established to differentiate the relative contributions of three major portions of estuarine organic carbon: 1) amino acids and 2) other organic carbon originated from the estuarine phytoplankton as well as 3) terrestrial organic carbon. The model suggests a highly variable terrestrial OM contribution to the studied estuary. The model also manages to evaluate the changing lability of organic matter from the estuarine phytoplankton growth without the terrestrial OM interference.