Terrestrial organic carbon burial efficiency in China marginal sea sediments based on bulk and biomarker ^{13}C and ^{14}C

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Understanding the burial efficiency and mechanistic controls of terrestrial organic carbon (OC_{terr}) is important for the global carbon cycling. However, lack of systematic studies of the specific composition and ages of OC_{terr} hinders our knowledge of the mechanistic controls on burial efficiency. In this study, we examined bulk and molecular carbon isotopic compositions ($\delta^{13}C$ and $\Delta^{14}C$) of OC as well as sediment surface area to investigate the source and burial of OC in surface sediments of the Bohai Sea and Yellow Sea (BS-YS). The sedimentary OC age (1170 to 5330 yr) was much older than the depositional ages, which implied the widespread distribution of pre-aged OC in the BS-YS. A binary mixing model based on bulk $\delta^{13}C$ and $\Delta^{14}C$ values showed that percentage of terrestrial OC (OC_{terr}%) and fossil OC (OC_{fossil}%) ranged from 10 to 95% (ave., 51 ± 13%) and from 18 to 69% (ave., 30 ± 7%) respectively, both with higher values occurring in the estuaries. The ternary mixing model based on $\delta^{13}C$ and $\Delta^{14}C$ values of total OC and specific *n*-fatty acids suggested that modern OC was 31-61% ($f_{M,\ ave.}$, 45 ± 10%), pre-aged soil OC was 29-49% ($f_{S,\ ave.}$, 40 ± 6%) and fossil OC was 4-31% ($f_{F,\ ave.}$, 15 ± 7%). Combined with surface area normalized OC loadings, we found that the burial efficiency of OC_{terr} (~87%) was lower than that of OC_{fossil} (>100%) in the BS-YS, but it was much higher than burial efficiency of OC_{terr} in the East China Sea (25%) and global continental margin sediments (22%). However by using the ternary mixing model, the burial efficiency of pre-aged OC (>100%) was higher than that of fossil OC (~70%), which indicated that bulk $\Delta^{14}C$ would overestimate the fossil OC inputs. Overall, the burial efficiency of terrestrial OC and non-modern OC was both high in the BS-YS sediments under the influence of Yellow River inputs. This biomarker isotopic approach provides key insights into the controlling mechanisms for the high burial efficiencies of OC_{terr} in the China marginal seas.