Abstract

Organic $\delta^{13}C$ and C/N analyses of estuarine deposits provide proxies for changes in the source of organic matter, which can be driven by fluctuations in relative sea level, river discharge, and catchment disturbance. Here we present the results of a comprehensive vegetation and sediment $\delta^{13}C$ and C/N survey of Welwich Marsh (outer Humber Estuary, UK), together with high-resolution $\delta^{13}C$ and C/N analyses of Holocene cores collected nine years previously from the Humber Estuary and the Lincolnshire Marshes, Eastern England, UK. The contemporary intertidal $\delta^{13}C$ and C/N dataset shows a gradual increase in surface sediment $\delta^{13}C$ with decreasing marsh height and suggests that $\delta^{13}C$ is controlled by the degree of tidal inundation and thus reflects organic matter source. However, sediment C/N ratios are less sensitive to tidal changes and the recent introduction of C_4 salt-marsh species complicates the contemporary analogue. The Holocene $\delta^{13}C$ and C/N records are in general agreement with existing microfossil data and provide additional palaeoenvironmental information. This includes support for an estuary-wide expansion of marine conditions from c. 3.3 ka cal. yr BP, followed by a contraction of marine conditions after c. 2.7 ka cal. yr BP, and evidence for an increase in delivery of terrigenous organic matter to the inner estuary in the late Holocene. Bulk organic $\delta^{13}C$ and C/N analysis is shown to be a reliable and independent indicator of coastal environmental change and is therefore a complementary technique to the more commonly used microfossil approach. However, this study also shows that in some circumstances the technique may be compromised when applied to sediments from cores that have been stored for a period of time.