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Holocene hydrological and sea surface temperature changes in northern coast of the South China Sea

Mong-Sin Wu [a], Yongqiang Zong [a,*], Ka-Man Mok [a], Ka-Ming Cheung [a], Haixian Xiong [b], Guangqing Huang [b]

[a] Department of Earth Sciences, The University of Hong Kong, Hong Kong SAR, China
[b] Guangzhou Institute of Geography, Guangzhou, China

* Corresponding author. Tel.: +852 39174815; Fax: +852 25176912.
E-mail address: yqzong@hku.hk (Y. Zong)

ABSTRACT

In order to reconstruct the Holocene environmental history of a coastal site in the northern South China Sea, this study analysed the organic carbon isotope ratios ($\delta^{13}C_{org}$) and alkenone unsaturation ratios ($U^{K'}_{37}$) from a 36.5 m-long sediment core drilled at seabed in the mouth region of the Pearl River estuary and generated a coupled hydrological and temperature record. This record reveals changes of monsoon-induced sediment discharge and sea surface temperature of the Holocene in four stages. In Stage I, the site was under fluvial conditions prior to postglacial marine transgression. Stage II saw an increase of sea surface temperature from c. 23.0 °C to 27.0 °C, associated with a strengthened summer monsoon from c. 10,350 to 8900 cal. years BP. This was also a period of rapid sea-level rise and marine transgression, during which the sea inundated the palaeo-incised channel, i.e. the lower part of the T-shape accommodation space created by the rising sea. In these 1500 years, fluvial discharge was strong and concentrated within the channel, and the high sedimentation rate (11.8 mm/yr) was very close to the rate of sea-level rise. In the subsequent 2000 years (Stage III) sea level continued to rise and the sea flooded the broad seabed above the palaeo-incised channel, resulted in fluvial discharge spreading thinly across the wide accommodation space and a much reduced sedimentation rate (1.8 mm/yr). Sea surface temperature in this stage reached 27.3 °C initially, but dropped sharply to 26.1 °C towards c. 8200 cal. years BP. The final stage covers the last 7000 years, and the site was under a stable sea level. Sedimentation in this stage varied a little, but averaged at 1.8 mm/yr. While fluvial discharge and sea surface temperature didn't change much, two short periods of hydrological and temperature change were observed, which are related to the climatic cooling events of c. 4200 cal. years ago and the Little Ice Age.

Keywords:
Alkenones biomarker, organic carbon isotopes, sea surface temperature, fluvial discharge, Western North Pacific region