Insights from the multi climate indexes in the marginal sea of the western Pacific

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In the past decades, except for the global warming, increasing of severe floods and droughts, has caused an increase in famine, disease and economic losses. The situation is especially critical in the tropical-subtropical eastern Asia given the large population of this region. Thus, obtaining a comprehensive knowledge of the climatic dynamics in these areas is urgent. The remarkable change in climate since last glacial interval is the best baseline for evaluating future climate change. High-resolution and multi-climate records in the northern South China Sea provide an excellent record for this purpose. Sea surface temperatures derived from the $U^{K'}_{37}$ exhibit a gradual increase from 17kyr to the mid Holocene, and lack the two-step warming noted for southern high latitudes and the typical abrupt YD cooling in the northern high latitudes. Variability of the long chain *n*-alkanes content is evident in a two-step reduction at 17kyr and 12kyr since the last glacial period, and keeps stabilized in the Holocene. This pattern is similar to that produced by current Antarctic warming and sea level change in the first step, but with the former being more evident. *n*-Alkane Average chain length (ACL), which had been demonstrated to be controlled by the humidity condition in most regions, has decreased gradually since the last glacial interval with a significant decrease at 13ka. This indicates an extreme increase in precipitation during the Bølling warming. Thus, the multi-climate indexes indicate that millennial patterns are superimposed on the overall glacial-interglacial trends with the hydrological dynamics controlled by northern hemisphere influences while terrestrial deposition was more related with southern hemisphere factors. The continual increase in precipitation and temperature until 5kyr implies a tropical influence which is tightly coupled with the ENSO variability as shown by the zonal SST gradient observed since the last deglaciation. The present study indicates the complex of the climate change since the last glaciation and the necessity for multi climate indexes.