Synchroneity of the Bølling warming in the South China Sea (SCS) and Greenland: Implications for the regional diversity of deglacial warming, SCS reservoir ages, and the timing of MWP 1a

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Two high resolution alkenone (U^{K}_{37}) sea surface temperature (SST) records from the southern South China Sea (SCS; sites 18252-3 and 18287-2) display an abrupt warming of >1 °C at the end of the last glacial period. According to AMS radiocarbon dates, the midpoint of this warming step occurred at 14,570 cal. ka, suggesting synchroneity (within the recognized uncertainties of absolute chronologies) of the Bølling warming in the SCS and Greenland (GISP2 ice core record).

By comparing these SST records from the SCS to other available low-latitude SST records, we explore the regional variability in the timing and pattern of deglacial warming in the tropics and subtropics in the context of deglacial changes of ocean circulation.

Furthermore, we use an inferred synchroneity of the Bølling warming within the SCS to assess the regional variability of reservoir ages within this semi-enclosed basin. Thus, a rapid warming during the last deglaciation in the northern SCS (site 17940-2) is AMS ^{14}C dated at 15,970 +285/-260 years, suggesting locally increased reservoir ages of up to 1,400 years.

The rapid SST increase during the Bølling warming in the northern SCS (site 17940-2) is paralleled by a similarly abrupt decrease in the input of terrigenous organic matter to this site, as indicated by the concentration of an organic biomarker, n-nonacosane. We speculate that the rapid decrease in terrigenous sediment input to the northern SCS is caused by the extremly rapid inundation of the shelf during meltwater pulse (MWP) 1a. This correspondence, in turn, would imply a synchroneity of the Bølling warming and MWP 1a.

Early Proterozoic continental growth in the Gyeonggi and Ryeongnam massifs, Korea

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Introduction

The Precambrian protolith of much of East Asia is: the North China Block, the South China Block, the Nangrim, Gyeonggi, Ryeongnam Blocks of Korea, and the Hida belt of Japan. Korea is a tectonic assemblage of three Precambrian micro-continents, two mobile belts, and one volcanoclastic basin. The Gyeonggi massif is dominated by Mesozoic felsic plutons which intrude the Precambrian gneisses and Paleozoic sedimentary rocks and in turn are overlain by Cretaceous rocks. The Ryeongnam massif is similar but has fewer paragneisses and more orthogneisses. Gyeonggi and Ryeongnam massifs are separated by the Ogcheon belt, which is a fold and thrust belt involving Precambrian to Jurassic rocks.

U-Pb Geochronology

The Gyeonggi and Ryeongnam terrains are essentially granitic terrains. They are composed of Precambrian ortho- and para-gneisses and Mesozoic felsic plutons. The Early Proterozoic plutonic activity that is manifested as orthogneisses can be grouped into 4 events: 2357-2342 Ma, 2120-2113 Ma, 1963-1890 Ma, and 1868-1826 Ma (Turek and Kim, 1996; Kim et al., 1999; Chang et al., 2002). The oldest plutons 2357-2342 Ma are in the Ryeongnam massif, rocks older than that are 2417-2413 Ma and are found in the Gyeonggi massif, but they are paragneisses. A peak period of plutonism can be identified as 1963-1918 Ma, in both massifs.

Conclusions

Proterozoic plutonic activity (2357-1826 Ma) contributed to the growth of the two massifs. They appear to have very similar plutonic and metamorphic history and hence were either joined together or physically close to each other in Early Proterozoic. Age correlations with China and Japan have been made (Chang et al., 2002). Ryeongnam and Gyeonggi massifs, in terms of ages, are comparable to the South China block rather than to the North China block.

References

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