^{230}Th-normalized fluxes of biogenic components from the central-southernmost Chilean margin during the last deglaciation and the Holocene

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Background and abstract

Throughout geologic time, variations in carbon fixation by photosynthesis have been associated with climate changes. During glacial periods, strengthened productivity and an efficient biological pump in the North Pacific, equatorial Pacific, and Southern Oceans may have contributed to low pCO_2 [1-4]. However, there is still some controversy as to whether marine productivity was high everywhere during glacial periods, and whether intensification (or weakening) of marine productivity contributed to a decrease (or increase) of atmospheric pCO_2 during the last deglaciation. Resolving this controversy requires more data from many regions regarding temporal changes in past export fluxes of biogenic materials.

Thorium 230 (^{230}Th) normalized fluxes of biogenic components from sediment cores collected at 36ºS off central Chilean covering the past 22 kilo years (ka) (PC-1) and at 52ºS near the mouth of Strait of Magellan, Pacific side over the past 13 ka (PC-3). The ^{230}Th-normalized fluxes of TOC at the PC-1 site was relatively low between 22 and 15 calendar ka (cal ka), and a substantial increase was observed after ~13 cal kyr BP. The ^{230}Th-normalized flux of TOC at the PC-3 site was relatively low from 13 to 6 cal kyr BP, thereafter increased during the late Holocene. Our ^{230}Th normalized fluxes suggested that biological pump would not have fully worked throughout 22–14 kyr BP and the early Holocene in the central–south Chilean and from 13 to 6 kyr BP at southern most Patagonia. Therefore, biological pump in the eastern South Pacific including this study area, may have not contributed to low pCO_2 during the last glacial and deglacial periods, and intensification of marine productivity occurred after 6 kyr BP at southern most Patagonia. We will also present the ^{230}Th-normalized fluxes of biogenic components recorded in the sediment core collected from the Drake Passage.

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Origin of the jadeite-quartzite from Yorii area, the Kanto Mountains, Japan

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The petrological, chemical, and isotopic characteristics for the jadeite-quartzite in the serpentinite mélanges [1] from Yorii, Kanto Mountains, Japan have been examined in order to study the tectonic link between jadeite-quartzite and the Jurassic accretionary complex in Japan. The mineral assemblage of the jadeite-quartzite is mainly of jadeite, albite, and quartz, with minor aegirine-augite, zircon, and titanite. Mineral texture shows that the jadeite-quartzite has recorded the reaction: albite = jadeite + quartz. Zircon crystals exhibit two distinct characteristics (Type I and II), based on their morphology and REE abundance. Type I zircon is prismatic, and has REE pattern similar to that of the magmatic zircon, but with higher total REE contents. Thus, Type I zircon is considered to be formed with the influence of fluid. In contrast, Type II zircon is porous and with REE pattern of typical hydrothermal origin. The U-Pb age for both types of the zircon is 162.2±0.6 Ma (MSWD=1.4), and at this time, Japan was still a part of the eastern margin of the Asian continent. In the Jurassic, the Pacific oceanic plate subducted and formed a Jurassic accretionary complex, the Mino-Tanba-Chichibu complex, in Japan. The age suggests that the jadeite-quartzite was formed in a deep subduction zone contemporaneous to the formation of the Jurassic accretionary complex near the trench. Whole rock elemental data show that the jadeite-quartzite contains high concentrations of Zr and Nb and low LILE (large ion lithophile elements) contents. This indicates that the jadeite-quartzite may have acquired the HFSE (high field strength element) before the fluid moved up to the mantle wedge. Typical arc volcanic rocks are depleted in HFSE. Therefore, the high HFSE found in the jadeite-bearing rock is consistent with the fluid was stripped with HFSE before it got involved in the formation of arc magma. Although the occurrence of the jadeite-bearing rock is rare, it could be quite abundant in the subducted slab. [1] Hirajima (1983) *J. Japan. Assoc. Min. Petr. Econ. Geol.* **78**, 77-83.