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Changes in ^{230}Th -normalized flux of biogenic components recorded in the south Chilean margin over the past 1.3 kyrs.

Miho Fukuda[1*], Naomi Harada[2], Miyako Sato[2], C. B. Lange[3], Naokazu Ahagon[2], S. Pantoja[3], Hajime Kawakami[2], Isao Motoyama[4]

[1]Earth Evolution Sciences, Univ. Tsukuba, [2]JAMSTEC, [3]University of Conception, [4]Yamagata Univ.

The atmospheric partial pressure of CO_2 ($_pCO_2$), was quite low, 180 ppm during the last glacial maximum (19,000 - 23,000 years ago) and rapidly increased to 280 ppm during the last deglacation (Monnin et al., 2001). The causes of large fluctuation of $_pCO_2$ during the deglaciation has been debated. We would like to understand how much biological pump had contributed to the atmospheric $_pCO_2$ reduction throughout the deglaciation, because its evaluation is still insufficient. The biological pump efficiency changes depending on nutrient concentration, light condition, and phytoplankton assemblages and nutrient, light and phytoplankton assemblages are various in regions. In order to evaluate the biological pump, more data related with the past primary production from many regions are required. The aims of this study is to understand the temporal changes of export fluxes of biogenic materials during the last deglaciation and Holocene, at off Chile, where active biological productivity occurs at present.

We used the sediment core collected near the mouth of Strait of Magellan, Pacific side (52 ^{o} S, 74^o W; water depth ; 560 m). We measured relative content of biogenic components, total organic carbon (TOC), total nitrogen (TN) and biogenic opal (Opal), which are commonly utilized as proxies for productivity, recorded in a sediment core (PC3) covering the past 13,000 years. Thorium-230 (^{230}Th) concentration, which is an insoluble natural radionuclide born to decay of dissolved Uranium- 234 (^{234}U), was also analyzed. When ^{230}Th was born in the sea water, it is promptly scavenged by adsorption on settling particles with a short residence time (= - 40 years). The ^{230}Th-normalization method is based on the assumption that the flux of scavenged ^{230}Th reaching the seafloor is known and equal to the rate of ^{230}Th production from the decay of ^{234}U in the overlying water column. Furthermore, ^{230}Th input associated with terrigenous materials can be corrected by ^{232}Th concentration. Thus, it is useful to estimate quantitatively export flux in the region such as coastal area (Francois et al., 2007). By using the characteristics of ^{230}Th, biogenic components fluxes normalized by ^{230}Th concentration was utilized to understand the changes in biological pump in this study.

The ^{230}Th -normalized flux of TOC ranged from 5.0 to 45 mg cm^{-2} kyr^{-1} during 13,000 cal. yr BP. The average of TOC flux was 31 mg cm^{-2} kyr^{-1} during the Younger Dryas (YD; 12,900 - 11,500 cal years BP) and 24 mg cm^{-2} kyr^{-1} during the Holocene. The ^{230}Th -normalized flux of TN ranged from 0.6 to 5.0 mg cm^{-2} kyr^{-1}. The average of TN flux was 3.8 mg cm^{-2} kyr^{-1} during the YD and 2.8 mg cm^{-2} kyr^{-1} during the Holocene. The ^{230}Th -normalized fluxes of TOC and TN during the YD was 30% and 40% higher than those during the Holocene, respectively. The ^{230}Th -normalized fluxes of biogenic opal ranged from 7.9 to 165 mg cm^{-2} kyr^{-1} during 13,000 cal. yr BP and average of opal flux was 103 mg cm^{-2} kyr^{-1} and 60 % higher during the YD than 63 mg cm^{-2} kyr^{-1} during the Holocene. Both of TOC and TN fluxes vary associated with changes in marine productivity (Suess, 1980) and biogenic opal flux is also a proxy of relative strength of upwelling. High values of TOC, TN, and biogenic opal during the YD suggest relatively high marine productivity and biological pump due to enhanced upwelling rather than that during the Holocene.

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