BPT25-03 Room:416 Time:May 2 14:45-15:00

Neodymium isotopic signature for deep/intermediate water formation in the late Cretaceous northwestern Pacific

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The Cretaceous is known to be one of the archetypal greenhouse periods, and intensively studied for evaluating the climate sensitively in the high pCO2 region. The meridional sea surface temperature distribution, secular changes in sea surface and deep water temperatures have also been discussed globally. In addition to the thermal structure, analyses of ocean circulations on the basis of neodymium isotope signatures become more popular especially in the Atlantic Ocean. On the other hand, the ocean circulation in the Pacific Ocean is still uncertain, because of fundamental lack of deep sea sediments in the Pacific. In this study, instead of deep sea sediments, fore arc basin sediments have been utilized for discussing the ocean circulation in the late Cretaceous (late Turonian through early Campanian) northwestern Pacific.

Neodymium isotopic signatures in fish remains obtained from clayey sediments in the Yezo Group show highly radiogenic values of -1 to -2 ϵ-unit. These values are significantly higher than those in the Atlantic and the equatorial Pacific. This result indicates the presence of highly radiogenic intermediate/deep water formation in the northwestern Pacific, because it is expected that the radiogenic neodymium has been delivered from volcanic arcs in the northwestern Pacific. This results is also supported by climate models showing the potential deep water formation in the late Cretaceous northwestern Pacific.

Keywords: Cretaceous, Ocean circulation, Neodymium isotopes, North Pacific, Deep water, Intermediate Water