Water mass structure along 47°N in the North Pacific: Rare earth elements influenced by marginal seas

JING ZHANG[1]*, L.-L. BAI[2], M.S. NAHAR[3], M. HONDA[4] AND N. HARADA[4]

[1]Graduate School of Science and Engineering for Science, University of Toyama, 3190 Gofuku, Toyama, 930-8555 Japan (*correspondence: jzhang@sci.u-toyama.ac.jp)
[2](d0470305@ems.u-toyama.ac.jp)
[3](msnahar@yahoo.com)
[4]JAMSTEC, 2-15 Natsushima, Yokosuka, Kanagawa, 237-0061 Japan (hondam@jamstec.go.jp, haradan@jamstec.go.jp)

The northern North Pacific is along a decreasing gradient of atmospheric input of Asian dust from west to east. It is almost entirely within the Subarctic High Nutrient Low Chlorophyll region between the Western and the Eastern Subarctic Gyre, and it is influenced by the surrounding marginal seas. The three purposes of this study are 1) to measure the influence of Rare Earth Elements (REEs) from the surrounding marginal seas, 2) to clarify the detailed REE distributions via NPIW/NPDW eastward flow though the Northwest Pacific Seamount Chain, and 3) to clarify water mass structure in the northern North Pacific.

The R/V Mirai (JAMSTEC) carried out the zonal section expedition MR05-04 along 47°N in the North Pacific 13 September - 27 October 2005. Several time-series stations, e.g. KNOT (44°N, 155°E), K1 (51°N, 165°E) and K2 (47°N, 160°E) were included on the western side in this cruise. CTD observations were conducted at all stations, and vertical sampling of REEs and other on-board routine analyses were carried out at 12 selected stations. High precision REE measurements with low volume seawater samples (~200 ml) were successfully made in this study by connecting an ICP-MS (ELEMENT2) with a desolving micro-concentric nebulizer-ARIDUS. The measurement precision (relative standard deviation) for surface seawaters (n=10) was 4~5% for La and Pr and 0.3~3% for the other REEs.

The REE distributions clearly show the influence of the surrounding marginal seas, the Sea of Japan, the Bering Sea, and especially the influence of the Dense Shelf Water formed during sea ice production in the Sea of Okhotsk. The REE patterns characterize the northward North Pacific Deep Water (NPDW), and illustrate the distinctive NPIW/NPDW eastward flow though the Northwest Pacific Seamount Chain.

Isotope geochemistry of the Weishancheng stratabound Au-Ag ore belt, Tongbai county, China

JING ZHANG[1]* AND Y.-J. CHEN[2]

[1]China University of Geosciences, Beijing 100083, China (*correspondence: zhangjing@cugb.edu.cn)
[2]Peking University, Beijing 100871, China (yjchen@pku.edu.cn)

The Weishancheng gold-silver-dominated polymetallic ore belt is located in the northern Tongbai Mountains, which is part of the Central China Orogen, and consists of the Yindongpo large gold, Poshan superlarge silver and Yindongling large silver polymetallic deposits and some small ore occurrences. The ore bodies are hosted in the Neoproterozoic Waitoushan Formation, which consists of mica schist, mica-quartz schist, leptynite, plagioclase-amphibole schist, marble and was folded into the Heqianzhuang anticline.

The $\delta^{18}O_{quartz}$ values of 22 samples range from +8.6‰ to +16.2‰, with a mean value of +13.0‰, and the corresponding $\delta^{18}O_{H2O}$ values vary between -0.3‰ and +10.8‰, with an average value of +5.40‰. The δD_{H2O} values have a range of -125.4‰ ~ -65.0‰ with an average value of -96.1‰. The $\delta^{13}C_{CO2}$ values of ore-forming fluids are -9.2‰ ~ +6.7‰ and averaged -3.2‰, and the $\delta^{13}C$ values of carbonate strata from the Waitoushan Formation vary between +1.9‰ and +2.9‰. The sulfur isotope analysis on 50 samples (pyrite, galena and sphalerite) shows two peaks: +1.00‰ ~ +4.00‰ and -8.00‰ ~ -12.00‰. Ore minerals have lead ratio ranges of $^{206}Pb/^{204}Pb$ = 16.7529 ~ 17.2163, $^{207}Pb/^{204}Pb$ = 15.4166 ~ 15.6380 and $^{208}Pb/^{204}Pb$ = 38.2502 ~ 39.0500. The K-Ar and ^{40}Ar-^{39}Ar chronology results show that the metallogenesis took place during 100 ~ 140Ma.

The H-O-C isotopic system of the fluid inclusions indicates that the fluids in the early and middle stages were sourced from the metamorphic devolatilization of the ore-hosted strata, while in the late stage much meteoric water entered the fluid system. The C-S-Pb isotope geochemistry suggests that the metallogenic materials came from the Waitoushan Formation. The metallogenesis took place under a tectonic setting changed from orogenic compression to extension, little after the intensive activity of continent-continent collision of Qinling Orogen. The Weishancheng gold-silver ore belt belongs to a typical stratabound orogenic-type metallogenic system in terms of their ore-forming fluid, metal source and geologic characteristics.

This work is supported by the 973-project (2006CB 403506, 2006CB403508) and NSFC (No. 40502012).