Late Jurassic ocean anoxic event: Evidence from voluminous sulfide deposition and preservation in the Panthalassa Ocean

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Basement rock of the Japanese Island is mainly composed of accretionary complexes since Paleozoic periods. There are several types of ore deposits such as Besshi-type sulfide deposit, Mn carbonate deposit in the bedded chert succession and Mn oxide deposit on seamount basalt, which were derived from seafloor mineralization and are now observed on land. Constituent minerals of Besshi-type sulfide and Mn carbonate deposits are stable under the reducing condition, whereas Mn oxides precipitated contrastingly under the oxic condition. Since the distribution of these three types of deposits is curiously uneven in the Japanese accretionary complexes [1], the redox history of the Panthalassa Ocean might be unraveled based on their depositional ages.

The historically productive copper-bearing Besshi-type sulfide deposits in the Japanese accretionary complex were formed as volcanogenic massive sulfide deposits on the deep-sea floor of the Panthalassa Ocean. Here we report that eleven typical Besshi-type deposits yielded Re-Os isochron ages around 150 Ma (148.4 ± 1.4 Ma from the composite isochron) in Late Jurassic time [2] [3]. This date coincides with the lowest marine $^{87}Sr/^{86}Sr$ ratio and highest atmospheric CO_2 concentration of the past 300 million years. We infer that intense mid-ocean ridge hydrothermal and volcanic activity in the Late Jurassic produced huge sulfide deposits and large emissions of CO_2 gas, leading to global warming and a stratified Panthalassa Ocean with anoxic deep seas that favored preservation of sulfides in the pelagic environment. The emergence of ocean anoxia triggered by seafloor volcanism is also consistent with a positive $\delta^{13}C$ excursion and widespread deposition of petroleum source rocks and black shales.

[1] Sato, K. and Kase, K. (1996) *Island Arc*, **5,** 216-228. [2] Nozaki, T. et al. (2010) *Geochim. Cosmochim. Acta,* **74,** 4322-4331. [3] Nozaki, T. et al. (2013) *Sci. Rep.*, **3,** 1889, doi: 10.1038/srep01889.