Geochemical map of Aichi Prefecture, central part of Japan – Major elements

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Geochemical and Cosmochemical Laboratory, Nagoya University, has started a geochemical mapping in 1994, in order to make a geo-environmental assessment of Aichi Prefecture, central part of Japan. About 1500 stream sediments smaller than 180μm were collected during last 10 years until April, 2003. These samples were dried, pulverized by an agate ball-mill, and analysed for major element compositions by XRF. Ignition loss was also measured by the gravimetric method.

The analyses suggest that the stream sediments from areas with sedimentary rock basement are more enriched in SiO_2 than those from areas with granitic basement. The X-ray diffraction suggests that the SiO_2 enrichment is caused by quartz [1]. This can be ascribed to the wide distribution of SiO_2-rich sedimentary rocks such as bedded cherts in their hinterland, the Mino Terrane. Samples from the area in the granitic basement are characterized by enrichment of Na, K, and Ca. The relative abundance of these elements, however, differs in the respective granitic bodies. This difference reflects the difference of abundance and chemical composition of plagioclase and potassium feldspar in stream sediments. A large granitic body named Inagawa-granite distributes widely in the mapping area. According to the geological and petrologial studies, the Inagawa granite is subdivided into I ~ IV types [2]. However, another subdivision has emerged from the Ca-K-Na diagram based on chemical composition of stream sediments. This suggests that the major elements examined here reflect natural geo-environment and geochemical map may be useful as a supporting data for geological mapping.

References

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Precession-controlled changes in alkenone sea surface temperature in Core MD01-2421 off central Japan, NW Pacific, during the last 145,000 years

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Mid-latitude NW Pacific has the subarctic boundary between the subtropical Kuroshio and subarctic Oyahio. A giant piston core MD01-2421 (45.82m long) was taken from off coast of the central Japan (36°02'N, 141°47'E, 2246 meter deep) during IMAGES VII-WEPAMA Leg 2 in 2001. The site is located in the mixing zone of Kuroshio and Oyashio waters.

Alkenone $U^{K'}_{37}$-derived SST changed from 13°C to 23°C over the last 145 kyrs. The lowest SST (6°C lower than late Holocene) was observed during the later half of the MIS-2 (1.2-1.8ka), while the highest SST (4°C higher than late Holocene) occurred in MIS-5e (119-127ka). The SST profile is similar to that derived from nannofossils (Aizawa et al., submitted) with some small differences. The maxima of alkenone SST appeared at about 23-kyr intervals. Compared with SPECMAP oxygen isotopic profile, SSTs around MIS-2/3 and -3/4 boundaries were characteristically high.

Early studies roughly reconstructed that the subarctic boundary shifted southward during the last glacial and northwards during the last interglacial (Moore et al., 1980; Thompson and Shackleton, 1980). Our study generated a higher-resolution SST record that shows a significant cooling between 11 and 18 ka prior to the last glacial termination. This indicates the southward displacement of the subarctic boundary in the later half of MIS-2 prior to the last glacial termination. The 6°C decrease of SST during late MIS-2 suggests the southward shift of the subarctic boundary by about 4°, assuming the latitudinal SST gradient was same as the present one.

The comparison with alkenone SST records in California margin showed a precession-controlled anti-phase SST variation between Japan and California margins. The periods with low SST in Japan margin were the periods with high SST in California margin (e.g., late MIS-2 and latest MIS-6), and the reverse was also true (e.g., MIS-2/3 and MIS-3/4 boundaries). This east-west seesaw-like change is attributed to the long-term change of tropical El Niño-Southern Oscillation (ENSO) behavior predicted by Zebiak-Cane ENSO model. The SST of mid-latitude NW Pacific has been influenced by precession-controlled climatic dynamics in the tropical Pacific through atmospheric teleconnections.