Japanese Activities on Geosciences 2000-2002
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This is a national report of the Japanese activities on geosciences during 2000 to 2002 as part of scientific programs of the Japanese Antarctic Research Expedition (JARE) .

JARE has started a five-year project "SEAL" (Structure and Evolution of East Antarctic Lithosphere) in 1996. Although it was terminated in 2001, the project will be carried on as “SEAL II” for the next five years. The aim of the SEAL project is to obtain better and more realistic models for the origin, formation, and present structure of continental crust of East Antarctic Lithosphere by combing field geology, geomorphology and geomagnetism, geophysical investigations including seismic explosion, *etc*. The followings are the summaries of 2000-2002 activities.

Geological surveys

In SEAL project, the main focus has been targeted on field surveys in the Napier Complex, Enderby Land. Three seasons of geological surveys resulted in publication of detailed geological maps on Mt. Riiser-Larsen (Ishikawa *et al*., 2000) and on Tonagh Island (Osanai *et al*., 2001). Further investigations are now on the way as to study petrological, mineralogical and geochronological aspects including estimetes of peak temperature of ultra-high temperature (UHT) metamorphism (Harley and Motoyoshi, 2000, Hokada, 2001; Tsunogae *et al*., 2002), timing of UHT event by using SHRIMP and CHIME methods (Asami *et al*., 2002; Hokada *et al*., in press), *etc*.

Geological surveys were conducted around Yamato Mountains during October 2000 to January 2001, the Lützow-Holm Bay regions during January to February 2001, and Prince Olav Coast during January 2002, respectively. As each area has been already mapped, detailed sampling for petrological, mineralogical and geochemical research were performed.

Geomagnatic surveys in Enderby Land

Geomagnetic surveys including paleomagnetism, geochronology, electro-magnetism and magnetic anomaly were conducted at Mt.Riiser-Larsen in Enderby Land during December 2000 to February 2001. As the results of this field survey, some 1200 pieces of rock samples were collected for paleomagnetic and geochronological studies. Moreover, magnetotelluric survey was carried out at 4 sites on moraines and 1 site on Richardson Lake, respectively. Magnetic anomaly was measured totally 100km along moraines.

Seismic investigations

Seismic explosion experiment was conducted on the line of 300km on Mizuho Plateau during December 2001 to February 2002. This was the second trial after the first successful trial during December 1999 to February 2000 (Tsutsui *et al*., 2001a, b). The explosion at seven points in the snow hole was carried out and the seismic waves were successfully obtained. A chartered helicopter AS355F2 was used for field support and transportation.

Meteorite search

Meteorite search was conducted around Yamato Mountains during October 2000 and January 2001. Total 3554 pieces of meteorites, including 50 kg of iron meteorite, have been found mostly on bare ice field around Yamato Mountains (Imae *et al*., 2002). Now we have some 17,000 pieces of Antarctic meteorite collections at the National Institute of Polar Research, and they have been allocated at the request from domestic and international meteorite researchers and organizations. In addition, cosmic dust collection was conducted around Syowa Station (Iwata and Imae., 2002). The method was to melt ice to water, they the water was filtered to obtain the residue which may contain cosmic dust.

International collaborative geological survey in Dronning Maud Land

A joint international collaborative geological survey was conducted in Central Dronning Maud Land with Norwegian, German, South African and Japanese geologists during November 2001 to February 2002. They flew from Cape Town to Novolazarevskaya Station directly, and then they started field survey at Troll Station as their base camp.

Planned scientific meeting in Japan

The 22nd Symposium on Antarctic Geosciences will be held on 10-11 October 2002, at the National Institute of Polar Research (NIPR), Tokyo. The details can be obtained at the website: http://geomarine.nipr.ac.jp/~sympo/en/index.htm.

Major pubulications

Asami, M., Suzuki, K. and Grew, E.S. (2002): Chemical Th-U-total Pb dating by electron microprobe analysis of monazite, xenotime and zircon from the Archean Napier Complex, East Antarctica: evidence for ultra-high-temperature metamorphism at 2400 Ma. *Precambrian Research*, **114**, 249-275.

Harley, S.L. and Motoyoshi, Y. (2000): Al zoning in orthopyroxene in a sapphirine quartzite: evidence for >1120 ^{o}C UHT metamorphism in the Napier Complex, Antarctica, and implications for the entropy of sapphirine. *Contributions to Mineralogy and Petrology*, **138**, 293-307.

Hokada, T. (2001): Feldspar thermometry in ultrahigh-temperature metamorphic rocks: evidence of crustal metamorphism attaining ~1100 ^{o}C in the Archaean Napier Complex, East Antarctica. *American Mineralogist*, **86**, 932-938.

Hokada, T., Misawa, K., Shiraishi K. and Suzuki, S. (in press): Mid to Late Archaean (3.3-2.5 Ga)

tonalitic crustal formation and high-grade metamorphism at Mt. Riiser-Larsen, Napier Complex, East Antarctica. *Precambrian Research*.

Imae, N., Iwata, N. and Shimoda, Y. (2002): Search for Antarctic meteorites in the bare ice field around the Yamato Mountains by JARE-41. *Antarctic Meteorite Research*, **15**, 1-24.

Ishikawa, M., Hokada, T., Ishizuka, H., Miura, H., Suzuki, S., Takada, M. and Zwartz, D.P. (2000): Explanatory Text of Geological Map of Mount Riiser-Larsen, Enderby Land, Antarctica. *Antarctic Geological Map Series*, Sheet No. **37**. National Institute of Polar Research.

Iwata, N. and Imae, N. (2002): Antarctic micrometeorite collection at a bare ice region near Syowa Station by JARE-41 in 2000. *Antarctic Meteorite Research*, **15**, 25-37.

Osanai, Y., Toyoshima, T., Owada, M., Tsunogae, T., Hokada, T., Yoshimura, Y., Miyamoto, T., Motoyoshi, Y., Crowe, W.A., Harley, S.L., Kanao, M. and Iwata, M. (2001): Explanatory Text of Geological Map of Tonagh Island, Enderby Land, Antarctica. *Antarctic Geological Map Series*, Sheet No. **38**. National Institute of Polar Research.

Tsunogae, T., Santosh, M., Osanai, Y., Owada, M., Toyoshima, T. and Hokada, T. (2002): Very high-density carbonic fluid inclusions in sapphirine-bearing granulites from Tonagh Island in the Archean Napier Complex, East Antarctica: implications for CO_2 infiltration during ultrahigh-temperature (T>1,100 ^{o}C) metamorphism. *Contributions to Mineralogy and Petrology*, **143**, 279-299.

Tsutsui, T., Murakami, H., Miyamachi, H., Toda, S. and Kanao, M. (2001a): P-wave velocity structure of the ice sheet and the shallow crust beneath the Mizuho traverse route, East Antarctica, from seismic refraction analysis. *Polar Geoscience*, **14**, 195-211.

Tustsui, T., Yamashita, M., Murakami, H., Miyamachi, H., Toda, S. and Kanao, M. (2001b): Reflection profiling and velocity structure beneath Mizuho traverse route, East Antarctica. *Polar Geoscience*, **14**, 212-225.