FINDING OF GRANITIC OLISTOLITHS AND PRE-CRETACEOUS RADIOLARIANS IN THE NORTHWESTERN KANTO MOUNTAINS, GUNMA PREFECTURE, CENTRAL JAPAN

ANDRE GUIDI*, JACQUES CHARVET** and TADASHI SATO***

During field survey in the Manba area, northwestern Kanto Mountains, two granitic olistoliths have been found in the neighbourhood of Mt. Higashi Mikabu and along the Kanna River. Besides, radiolarians from radiolarites conformably covering pillow lavas have been discovered to the east of Mt. Odoke (Fig. 1). These discoveries bear important meaning for structural reinterpretation of the area as it will be stated later.

Location and description of the granitic olistoliths

A. In the vicinity of the Ishigami Pass, along the logging road running south of Mts. Higashi and Nishi Mikabu, a weathered granitic block (L3, in Fig. 1) with outcrop size about 2×2 meters, is embedded in a pale green tuffaceous matrix. The boundary between the massive granitic olistolith and the weakly schistose matrix is sharp and consist of a very slightly sheared zone of matrix about half a centimeter wide. Under microscope the olistolith shows that phenocrysts of quartz with undulose extinction and plagioclase are conspicuous, while the few occurring biotites are weathered to chlorite. Phenocrysts of quartz are surrounded by recrystallized microcrysts of quartz with no undulose extinction. This granitic olistolith occurs in a zone classically considered as the upper part of the Sanbagawa Zone which suffered the San-

bagawa metamorphism (TORIUMI, 1975) and a ductile eastward directed deformation (1st phase) (Fig. 1, GUIDI *et al.*, 1984), as it has been recently established in Shikoku (FAURE, 1983). Boulders found along several rivers south of Mts. Mikabu suggest probable occurrence of other outcrops but they have not been found yet.

B. Along the left bank of the Kanna River at Sakai Town, near the junction with the Funago River, a granitic olistolith (L2, in Fig. 1) of about 70×50 cm in size, is embedded in black pelites and basic lavas (UCHIDA, 1981) which belong to the Middle Jurassic Manba Formation, an olistostrome composed of various blocks in pelitic and tuffaceous matrix (SASHIDA *et al.*, 1982 ; TAKIZAWA, 1982). While at the outcrop, L2 looks white in color and less weathered, studies under thin section showed that it is not very different from the sample L3, that is, phenocrysts of quartz, with or without undulose extinction under cross nicols, are recrystallized on their boundaries. Plagioclases occur but they are less abundant than in the sample L3 and there are only a few biotites which are all weathered to chlorite.

Location and age of radiolarites (L1, in Fig. 1)

To the east of Mt. Odoke, well bedded red radiolarites are conformably covering pillow lavas as shown by the superposition in ascending order of pillow lavas, lava breccias mixed with red massive radiolarites and bedded radiolarites. The whole sequence of radiolarites is about 20 meters thick with some minor faults. The upper part is followed by chert breccia and black pelites. All the sam-

Received April 2, 1984. Accepted September 6, 1984.

* Present address : Institute of Geoscience, University of Tsukuba, Sakura-mura, Ibaraki, 305 Japan.

** Dept. des Sciences de la Terre, Université d'Orléans. 45046 Orléans, France.

*** Institute of Geoscience, University of Tsukuba, Sakura-mura, Ibaraki, 305 Japan.

Fig. 1. Locations of granitic olistoliths and radiolarites (structural outline after GUMI *et al.*, 1984).

L1-Radiolarite. L2-Granitic olistolith at Sakai Town. L3-Granitic olistolith near Ishigami Pass.

a, b, c : Infrastructure affected by the Sanbagawa metamorphism and the eastward directed ductile 1st phase, a-Sanbagawa schists. b-Mikabu green rocks. c-Sedimentary cover of the Mikabu green rocks : c1-Sakahara Formation. c2-Kashiwagi Formation. d-Superficial nappe, Middle Jurassic Olistostrome. e-Large size limestone olistoliths. f-Undifferentiated Cretaceous (Sanchu Graben and Atokura Formation). g-Thrust contact. h-Trend of synmetamorphic lineations, arrows show the sense of shear ; bar, sense unknown.

O : Mt. Odoke, WM : Mt. Nishi Mikabu, EM : Mt. Higashi Mikabu, M : Manba Town, I : Ishigami Pass, K. R : Kanna River, F. R : Funago River. Insert : location of the studied area, I. S. T. L : Itoigawa-Shizuoka Tectonic Line.

ples picked from the radiolarites at about every 2 meters intervals gave radiolarians but no conodonts. A half meter thick green siliceous tuff level, about 70 centimeters above the beginning of the sequence of the bedded radiolarites, did not give any fossil. Though ill preserved, radiolarians (Fig. 2) may indicate a Jurassic age because of great abundance of *Multicyrtoid Nassellaria*. The pillow lavas are well preserved, undeformed and poorly weathered. At a mesoscopic scale they show pale green medium grained core and dark green

fine grained rim, while microscopically there is a great amount of pyroxene and olivine phenocrysts within the plagioclase rich groundmass. This facies is rather similar to the pillow lavas around and west of Mts. Mikabu. Thus we assume that the Jurassic age could be extended to most of these pillow lavas.

However, the pillow lavas of the Manba Formation are different from the above by their facies. That is, the pillow structure is well preserved but calcite veins are conspicuous ; they are fine grained on the whole

Fig. 2. Radiolarians from the sample L1.

a : *Syringocapsa* sp., b : *Stichocapsa* ? sp. (Scale bar is 0.1 mm).

at a mesoscopic scale and, microscopically, there are very few pyroxene and olivine phenocrysts in the groundmass rich in small size plagioclase. The color is generally deep green and lavas showing no pillow structure are often red or purple. This type of facies and setting are very similar to that observed in Shikoku around the Sawadani Village, Tokushima Prefecture.

Interpretation

In SW Japan, the occurrence of a crushed granitic rock between the so-called Mikabu Belt and Chichibu Belt have been reported by MASUDA (1977) in the western Shikoku, close to the Kurosegawa Tectonic Zone. However, in the present case both of the granitic olistoliths are unstrained, showing no schistosity, and their setting clearly results from sedimentary process. In fact, along the logging road, west of the Ishigami Pass, various facies are associated with the pillow lavas : granitic olistolith, limestone and greyish chert blocks, undated radiolarite olistolith and sandstone, forming an olistostrome with a tuffaceous and pelitic matrix. GUIDI *et al.* (1984) showed that on both sides of the Ishigami Pass, the microstructures (schistosity, mineral lineation, pressure shadows, pull-apart

structures, elongated radiolarians, etc..) are strongly contrasting. Thus GUIDI *et al.* (1984) considered that west of Ishigami Pass there is an olistostrome which suffered neither the 1st phase ductile deformation nor the Sanbagawa metamorphism because of lacking of schistosity, mineral lineation, and others. There is a structural gap between the Sanbagawa Zone and Mts. Mikabu as well as between the Manba Formation and the underlying Kashiwagi and Sakahara Formations. This olistostrome is in fact the northernmost part of a superficial nappe structure including the Manba and the Kamiyoshida Formation southward (Fig. 1, GUIDI *et al.* 1984). Such superficial nappe structures are now well known in SW Japan, mainly in Shikoku (FAURE & CHARVET, 1983). The granitic olistoliths may have been re-worked within the olistostrome in an oceanic basin close to a continental mass during the early Mesozoic. In the Late Jurassic–Earliest Cretaceous the olistostrome was thrust southward upon the Sanbagawa Zone and its sedimentary cover (GUIDI *et al.* 1984). Because of the weathering, the absolute age of the granitic olistoliths cannot be determined.

Acknowledgments. The authors are indebted to Dr. K. SASHIDA of the Tsukuba

University for the identification of radiolarians. This work was supported by a Scholarship of the French Ministry of Foreign Affairs.

References

- FAURE, M., 1983 : Eastward ductile shear during the early phase in the Sanbagawa belt. *Jour. Geol. Soc. Japan*, **89**, 319–329.
- and CHARVET, J., 1983 : Tangential tectonics in the Chichibu Zone from the example of E. Shikoku. *Proc. Japan Acad.*, **59**, ser. b, 117–120.
- GUIDI, A., CHARVET, J., SATO, T. and TAKIZAWA, S., 1984 : Pre-tangential structures in the Kanto Mountains (SW Japan) : preliminary results. *C. R. Acad. Sci. Paris*, t. **298**, 307–312.
- MASUDA, T., 1977 : Discovery of crushed granitic rock in the Chichibu Terrain at westernmost Shikoku. *Jour. Geol. Soc. Japan*, **83**, 821–822. (J)
- SASHIDA, K., IGO, H., TAKIZAWA, S., HISADA, K., SHIBATA, T., TSUKADA, T. and NISHIMURA, H., 1982 : On the Jurassic radiolarian assemblages in the Kanto district. *News of Osaka Micro-paleontologists*, Special Vol., No. 5, 51–66. (J+E)
- TAKIZAWA, S., 1982 : Tectonic development of the Chichibu terrain in the Kanto Mountains, Japan. *Doctor Thesis, Univ. Tsukuba*. 1–122.
- TORIUMI, M., 1975 : Petrological study of the Sanbagawa metamorphic rocks : The Kanto Mountains, Central Japan. *Bull. Univ. Mus., Univ. Tokyo*, **9**, 1–99.
- UCHIDA, N., 1981 : Major-element petrochemistry of lavas and tuffs from the Sanbagawa and Chichibu terrane, the northern Kanto Mountains, central Japan. *Seikei Ronso*, no 20, 1–138.
- (J+E) : In Japanese with English abstract.
(J) : In Japanese.