COMPOSITION AND FLUX OF MICROMETEORITES IN A TRIASSIC DEEP-SEA DEPOSIT FROM JAPAN

T. Onoue[1], T. Haranosono[1], and T. Nakamura[2]. [1]Department of Earth and Environmental Sciences, Kagoshima University, Kagoshima 890-0065, Japan. E-mail: onoue@sci.kagoshima-u.ac.jp. [2]Department of Earth and Planetary Material Sciences, Tohoku University, Miyagi 980-8578, Japan.

Introduction: Micrometeorites have been collected in the ice sheets of Greenland and Antarctica and in Cenozoic deep-sea sediments in the Pacific Ocean. Melted particles known as "cosmic spherules" have been reported from sedimentary rocks representing Paleogene carbonates and Jurassic hardgrounds [1]. Although ancient micrometeorites found in sedimentary rocks are of key interest as a historical record of meteoroid populations in the Solar System, they are rare and prone to severe chemical weathering. We report the recovery of well-preserved micrometeorites in pelagic chert from Japan, more than 240 million years old.

Sample and Methods: Micrometeorites were extracted from samples of Middle Triassic chert from the Shakumasan Group in western Kyushu, Southwest Japan. Samples were mechanically crushed and passed through a 250 µm mesh sieve until more than 3 g of the fine fraction was collected. After sieving and ultrasonic cleaning, magnetic components were separated using the method for liquid-suspended particles [2] with a magnetic field strength of approximately 500 mT.

Results and Discussion: Analysis of 356 g of siliceous claystone in 75 samples from the Middle Triassic chert succession yielded 152 cosmic spherules and 2 coarse-grained unmelted micrometeorites. The collection of cosmic spherules comprised 93% iron-type (I-type) spherules, 4% stony-type (S-type) spherules, and 3% glassy-type (G-type) spherules. An extraterrestrial origin is indicated by the presence of metallic iron and nickel in I-type spherules, the chondritic proportions of Mg, Al, Si, and Fe, and the characteristic mineral assemblages in S-type spherules. Likewise, an extraterrestrial origin for the unmelted micrometeorites is indicated by their chondritic compositions and mineral assemblages, containing olivine and low-Ca pyroxene.

Based on the spherule abundance and accumulation rate of the Middle Triassic chert, we calculated the accretion rate of I-type spherules to the Earth during the Anisian Stage of the Middle Triassic. If the flux of spherules was constant over the Earth, the estimated accretion rate for Anisian I-type spherules smaller than 125 µm is 760 ± 140 t yr^{-1}. Analysis of the accretion rate for cosmic spherules also reveals an enhanced flux of small spherules (10–45 µm) for a 0.7-Myr period in the late Anisian. Spherules from the late Anisian chert are apparently smaller than those in the South Pole Water Well (SPWW) and deep-sea sediments (DSS) [3]. We infer that the size difference between the Anisian and SPWW–DSS spherules reflects the different entry velocities of cometary and asteroidal particles. Cometary dust flux varies with time, due to both stochastic fluctuations in the number and size of comets entering the inner Solar System and the occurrence of comet showers. High accretion rates of small cosmic spherules in the late Anisian could be explained by a short-term increase in the passage of comets through the inner Solar System.

References: [1] Taylor S. and Brownlee D. E. 1991. *Meteoritics* 26:203-211. [2] Mutch T. A. and Garrison R. E. 1967. *Journal of Sedimentary Petrology* 37:1139-1146. [3] Taylor S. et al. 2000. *Meteoritics & Planetary Science* 35: 651-666.