

“Chibanian” and Geologic Ages

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Geologic ages are mainly divided by changes of fossil flora and/or climatic cycles. A geologic age used to be defined by a type section of a sedimentary formation which represents the most typical characteristics like fossil flora indicating that geologic age. However, this scheme was not able to define the age when the geologic age started. To solve this problem, a scheme to have a type section for the boundary of two geologic ages was proposed in 1976 as to define the initiation age of the later geologic age. A type section in this scheme is called as “GSSP: Global boundary Stratotype Section and Point”. For the whole Earth’s history, 115 geologic ages have been defined, however, GSSPs are able to be set up only for the last ca. 600 Ma, after the Ediacaran period, whose geologic formations yield fossils of organisms. Currently, 68 GSSPs have been ratified by IUGS (International Union of Geological Sciences).

Because a GSSP is the best section representing the initiation boundary of a geologic age, a GSSP has a role to be a reference section to define the boundary horizon in some other section elsewhere in the world. Even if a geologic section in somewhere only contains a limited kind of fossils, the GSSP needs to provide data for the same kind of fossils with that section to facilitate for stratigraphic correlations. Consequently, a GSSP has to be a marine formation yielding many kinds of fossils and providing various methods for stratigraphy as much as possible. Moreover, a site for the GSSP has to be guaranteed a feasibility for future studies and sampling.

“Chibanian” is proposed as name for the Middle Pleistocene, and the Chiba section is proposed as the GSSP defining the Early-Middle Pleistocene boundary. The initiation of Pleistocene, ca. 2.6 Ma, is defined as the period for the initiation of the Northern Hemisphere Glaciation (NHG). During that period, the Earth’s climate cycle has changed from 20 kyr to 41 kyr and the amplitude has gradually become larger. After that period, during between 1.2 and 0.5 Ma, the climate cycle has changed again from 41 kyr to 100 kyr and the amplitude became much larger. This second change, called sometimes as MPT (Mid Pleistocene Transition), has been utilized as the basis to divide Early and Middle Pleistocene. However, the change is so gradual which is not suitable to define an exact boundary. Since this reason, the Matuyama-Brunhes boundary (MBB), which is the last geomagnetic reversal in the Earth’s history, has been used as “a marker horizon” to define the Early-Middle Pleistocene boundary. Consequently, the GSSP for the Early-Middle Pleistocene boundary has to provide a high quality geomagnetic record to be able to indicate clearly the MBB horizon in the geologic section where the GSSP is set up. Since the actual point for the GSSP, represented as a “Golden Spike”, should be on a distinctive layer in the section, the Byk-E tephra bed laying just below the MBB has been proposed as the GSSP in the Chiba section. Two other Italian GSSP candidates also proposed tephra beds as the GSSPs.

During the last summer in 2017, the Working Group for the GSSP selected the Chiba section to send up the the upper committees in IUGS, because of that magnetic signals, micropaleontological data and other proxies for paleoclimate from the Chiba section were judged to be better than other Italian sections. In this lecture, I will present some new data from the Chiba section and explain about the geologic meanings.

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