The stratigraphy and age of the Plio-Pleistocene Konso Formation in the southern Main Ethiopian rift, East Africa

Shigehiro Katoh [1], Shinji Nagaoka [2], WoldeGabriel Giday [3], Renne Paul R. [4], Beyene Yonas [5], Gen Suwa [6]

[1] Hyogo Museum, [2] Dep.Geography,Fac.Education,Nagasaki University, [3] Los Alamos National Laboratory, [4] Berkeley Geochronology Center, [5] Dep.Archaelogy and Anthropology,C.R.C.C.H.,Ministry of Information and Culture, [6] Univ. Mus., Univ. Tokyo

The Plio-Pleistocene sediments(Konso Formation) are widely exposed at the Konso area in the southern Main Ethiopian rift. It is mainly composed of lacustrine clay with fluvial silt, sand, and gravel beds, and contains more than 30 tephra layers. The formation has yielded abundant vertebrate fossils including remains of A.boisei and H.erectus, and rich Acheulean archaelogical occurrences. We established the tephrostratigraphy of the formation and dated seven major tuffs by the single-crystal 40Ar/39Ar method. Two major tuffs of the formation are correlated with the Chari and KBS Tuffs of the Omo-Turkana basin along the Kenyan and Ethiopian border from the comparisons of major element compositions of volcanic glass shards and of the radiometric dates among these tuffs.

The Plio-Pleistocene Konso Formation is more than 200 m thick, and is widely exposed in the Konso area at the southernmost part of the Main Ethiopian rift, East Africa. The formation has yielded abundant vertebrate fossils including remains of Australopithecus boisei and Homo erectus, and rich Acheulean archaeological occurrences. The Konso Formation is divided into the Sorobo, Turoha, Kayle, and Karat Members, in ascending stratigraphic order. Each member is mainly composed of dark brown or dark gray clay of lacustrine origin, suggesting dominance of lake environments. Most of the fossils and artifacts derive from whitish gray or brown silt, sand, and gravel beds intermittently exposed between the lacustrine sediments. These beds appear to have been deposited in an emerging marginal floodplain following repeated recession of the paleo-lake.

The formation contains more than 30 tephra layers. Extensive field research has revealed the relative stratigraphy of most of these tephra layers. Inner-basin tephra correlation has been established based on the relative stratigraphy and lithologic characterization of the tephra layers, and on the major element compositions of discrete glass shards. Seven major tuffs were dated by the single-crystal 40Ar/39Ar method. These radiometric dates are consistent with the established tephrostratigraphy, and provide chronostratigraphic resolution regarding stratigraphic relationships which had not been clarified from field evidence. The age and depositional history of the Konso Formation reveal rifting, subsidence, and sedimentation in the Ganjuli graben of the southern Main Ethiopian rift to have occurred in the Konso area between 1.9 and 1.4Ma.

Although rifting in the southern Main Ethiopian rift started in the Middle Miocene, the Konso Formation sedimentary rocks were deposited on an erosional surface during the Plio-Pleistocene. The adjacent rift margins and shoulders are made up of Eocene and Oligocene basaltic and silicic rocks. In contrast, active faulting with associated volcanism during the Pleistocene is known to have been confined to the middle part of the graben between Lakes Abaya and Chamo and to the Segen basin is likely to have resulted in the erosion and exposure of the fossiliferous Konso Formation.

The Konso tephra layers include two major tuffs, respectively equivalent to the Chari and KBS Tuffs of the Omo-Turkana basin along the Kenyan and Ethiopian border. This regional tephra correlation enables time-controlled comparisons of faunal and archaeological remains between the Konso area and the Omo-Turkana basin.