Geochronology and Correlation of Sediments in the southern Afar Depression, Ethiopia

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Basins in the Afar Depression are high priority for investigation because they uniquely capture and expose the on-land expression of active continental breakup. This project will construct a temporally constrained stratigraphic framework for the eastern Hadar Basin (Geraru) in southern Afar by dating and chemically analyzing tephra deposits.

The Hadar Basin preserves a thick sequence of sediments and volcanic deposits from the Plio-Pleistocene that contain a detailed record of basin response to extension-related forcing, as well as an exceptional record of fossils and artifacts of early humans. However, basin investigations lack well-constrained sedimentological data spanning the transition from the lacustrine Hadar Formation (3.8-2.9 Ma) to the coarser fluvial Busidima Formation (2.7-0.16 Ma). This transition is important because it is associated with a change in basin structure, and because it may be associated with key evolutionary changes in hominins and other fauna. Field relationships and one $^{40}Ar/^{39}Ar$ date (2.814 ± 0.017 Ma) suggest that sediments at Geraru record that time period (2.9-2.7 Ma).

Feldspar crystals from 9 tephras will be dated using the $^{40}Ar/^{39}Ar$ technique and the chemical composition of glass shards from 20 tephras will be quantified using Electron Microprobe analysis. Establishing a temporally constrained stratigraphic framework at Geraru will provide constraints on local deposition rates and the timing of regional tectonic and volcanic events affecting local basin configuration. This framework will also contribute to understanding past environments in East Africa and how they varied with time – variations that may have significantly influenced faunal populations, including early humans.