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The volcano sedimentary sequence in the Upper Awash valley (Ethiopia): a type case of volcanoclastic sedimentation in a peripheral rift environment

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The Upper Awash valley runs across a volcano-sedimentary sequence dated from Late Miocene to about 500 my ago. The volcano sedimentary sequence in the Upper Awash valley developed within a closed basin at the western margin of the Main Ethiopian Rift branch and was affected by tephra sedimentation from nearby sources but also from volcanoes from the rift floor, and local fissural/dome eruptions. Dynamic interaction between rift tectonics, volcanic activity, tephra erosion and redeposition created a complex sedimentary environment constituting an exceptional fossil trap. In the area of Melka Kunture, the sediments host numerous fossils and archeological remains of Early-Middle Pleistocene (Oldowan and Acheulean) and Upper Pleistocene age. This is one of the most relevant African locations for researching human evolution.

The valley sequence formed after deposition of the large ignimbrite sheet of the Munesa tuff, within a paleo fluvial system which developed within lateral rift faults. Sedimentation rates significantly decreased after 500 my ago, probably due to decline of the volcanic activity in the area.

The basin stratigraphy consists of a composite sequence of primary (fall and flow) volcanic facies interbedded with reworked sediments emplaced in a low energy floodplain environment. The sequence is dominated by the deposit of one large pyroclastic density current (Kella Tuff) which is a main marker layer dated at 1.2 My. Deposition of the Kella Tuff had deep impact on the area leading to a complete reorganization of the drainage system and river channel migration and development of a disconformity in the southern Melka Kunture area.

Stratigraphic correlation is based on the interpretation of the basin history and evolution and has a crucial relevance not only for the reconstruction of the paleoenvironment but also for the interpretation of the paleontological and archeological data.