

Quaternary activity of the Erciyes fault southeast of the Kayseri basin, Turkey

*Koji Okumura¹, Yuichi S. Hayakawa², Ryoichi Contain³

1. Graduate School of Letters, Hiroshima University, 2. Center for Spatial Information Science, The University of Tokyo, 3. Notre Dame Seishin University

The Erciyes fault in southeast of the Kayseri basin is one of the most significant Quaternary faults in Central Anatolia, together with the Eceemis fault and the Tuz Golu fault. Emre et al. (2011: New active fault maps of Turkey, Kayseri sheet) mapped about 100 km long strands of the Erciyes fault with its 30 km long southwestern section run across the center of the Erciyes volcano. A M 7+ earthquake from the fault might be a big threat for the 1.5 million people in Kayseri basin, but little has been known about its Quaternary activity and the reality of the fault traces on the volcanic edifice. We have studied Plio-Pleistocene ignimbrites and Quaternary sediments in southeast of the Kayseri basin and recognized significant dip-slip separation in the central portion east of Kayseri city and Quaternary left-lateral (?) strike-slip activities in the northeastern portion of the fault as they are mapped by Emre et al. (2011). Along with field observations, we applied a high-definition topographic mapping approach using a small unmanned aerial vehicle (sUAV) and structure-from-motion (SfM) multi-view stereo photogrammetry. This enabled us to generate topographic data with a resolution of centimeters for a range of hundreds of meters, which were used to identify small topographic features such as scarps on the land surface. The Valibabatepe (or the Incesu) ignimbrite dated as 2.52 ± 0.49 Ma (Aydar et al., 2012) or 2.6 to 3.0 Ma (Le Penne et al., 2005) is a very distinctive extremely densely welded thin (~5 m) and hard ignimbrite layer capping the plateaus around western Kayseri basin. At Gesi Guney, 18 km ENE of Kayseri city center, the Incesu ignimbrite is distributed both on the 1340 m a.s.l. plateau and on the 1250--1270 m a.s.l. upland below the plateau. The ~70 m high scarp clearly demonstrates the Quaternary activity of the Erciyes fault. At the base of the scarp, talus deposits are juxtaposed with bedrock ignimbrite with an apparently NW dipping normal fault. An alluvial fan formed by a gully cutting into the Incesu plateau is also deformed by the fault. Around Gunesli, 25 km northeast of Kayseri city center, a fluvial gravel and sand layer that postdates the Valibabatepe ignimbrite is distributed along the foot of upland consists of pyroclastic flows older than the Valibabatepe ignimbrite. The fluvial gravel and sand layer, together with underlying pyroclastic flow deposits and an overlying pumice fall layer, is truncated by a swarm of vertical faults and dragged into the fault zone. The fault zone structure indicates the faults are strike-slip faults. These faults are located about 100 m inside the upland there is no offset topography on top of the faults. The ages of the faulted tephra layers are not known yet, but it is clear that significant strike-slip fault movement occurred during Quaternary after the Valibabatepe ignimbrite.

Keywords: active fault, pyroclastic flow deposits, Kayseri