



A natural laboratory for $^{40}\text{Ar}/^{39}\text{Ar}$ geochronology: ICDP cores from Lake Van, Turkey

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Pore water samples from ICDP Paleovan cores indicate a limited pore water exchange within Quaternary lake sediments. The core's volcanoclastic sections bear unaltered K-rich ternary feldspar and fresh to altered glass shards of predominantly rhyolitic composition. Whereas applying the $^{40}\text{Ar}/^{39}\text{Ar}$ method on feldspars resulted in ages timing a late-stage crystallization, glass shards had the potential to date the eruption. Volcanic glass is prone to modifications such as hydrous alteration (palagonitization) and devitrification (Cerling et al., 1985). These modifications affect the glass' chemistry and challenge the application of the $^{40}\text{Ar}/^{39}\text{Ar}$ method. Gaining precise radiometric ages from two phases has the potential to strengthen a climate-stratigraphic age-model (Stockhecke et al., 2014), and to significantly increase the temporal resolution on the deposition of the lake sediments. Vice versa the core's previous age model has the ability to question the reliability of $^{40}\text{Ar}/^{39}\text{Ar}$ eruption ages derived from ternary feldspars and glass shards. Multi- and single-grain total fusion on alkali feldspars from six volcanoclastic deposits resulted in Pleistocene ages that are in good agreement with the predicted age model. Feldspar phenocrysts from three ashes in the core's youngest section yielded consistent isochron ages that are significantly older than the model's prediction. Several distinct stratigraphic and paleomagnetic time markers of similar stratigraphic positions contradict to the older radiometric dates (Stockhecke et al., 2014). Partial resorption features of inherited feldspar domains and the involvement of excess ^{40}Ar indicate incomplete degassing of older domains. To evaluate the magmatic history of the different domains EMPA mappings of trace elements that could be interpreted as Ar diffusion couples are currently conducted. Geochronology on Paleovan cores offers unique opportunities to monitor the effect of alteration on the Ar-systematics of volcanic glass shards and identifies a period of incorporation and incomplete degassing of inherited feldspar domains.

References:

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