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A new approach for dating Quaternary volcanism by TL: The example of the Eifel Volcanic Field, Germany

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Middle to Upper Pleistocene and Holocene volcanic eruptions are difficult to date by Ar/Ar techniques when K-rich minerals such as sanidines are not present, as is the case in mafic and some intermediate rocks. However, these may contain phlogopite crystals suitable for Ar/Ar dating. Direct luminescence dating of volcanic feldspar is hampered by a poorly understood phenomenon of long-term signal instability called “anomalous fading” which, however, is apparently not present in quartz.

To circumvent the fading problem involved in luminescence dating of volcanic rocks lacking quartz we sampled quartz-bearing crustal xenoliths from the Quaternary West and the East Eifel Volcanic Fields. Sufficient heating for zeroing of the acquired geological TL during eruption is sometimes but not always visible in the field and among others depends on the size of the xenolith. Quartz grains were extracted from the xenoliths by crushing, density separation and etching in HF or H2SiF6. The orange-red TL emission from quartz is known to have a very high saturation dose and was therefore employed using a new “lexsyg” luminescence reader equipped with a special detection unit for measuring this orange-red TL emission. Additionally, the existing data base of Ar/Ar dating results is increased by a series of new laser ablation step heating Ar/Ar dating results from samples extracted from identical volcanic eruptions. These can serve as verification of the luminescence dating attempts.

Some first preliminary TL dating results in the range up to ca. 500 ka will be presented and discussed. Apparently, some TL ages from quartz extracts underestimate the Ar/Ar ages significantly. Possible explanations of age underestimates will be presented for discussion.