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Surface exposure dating of Holocene basalt flows and cinder cones in the Kula volcanic field (western Turkey) using cosmogenic ^{3}He and ^{10}Be

Caroline Heineke (1), Samuel Niedermann (2), Ralf Hetzel (1), and Cüneyt Akal (3)

(1) Institut für Geologie und Paläontologie, Westfälische Wilhelms-Universität Münster, Corrensstraße 24, 48149 Münster, Germany (caroline.heineke@uni-muenster.de), (2) Helmholtz-Zentrum Potsdam, Deutsches GeoForschungsZentrum, Telegrafenberg, 14473 Potsdam, Germany (nied@gfz-potsdam.de), (3) Dokuz Eylül University, Engineering Faculty, Department of Geological Engineering, Tinaztepe Campus, Buca, 35160 Izmir, Turkey (cuneyt.akal@deu.edu.tr)

The Kula volcanic field is the youngest volcanic province in western Anatolia and covers an area of about 600 km^2 around the town Kula (Richardson-Bunbury, 1996). Its alkali basalts formed by melting of an isotopically depleted mantle in a region of long-lived continental extension and asthenospheric upwelling (Prelevic et al., 2012). Based on morphological criteria and ^{40}Ar/^{39}Ar dating, four phases of Quaternary activity have been distinguished in the Kula volcanic field (Richardson-Bunbury, 1996; Westaway et al., 2006). The youngest lava flows are thought to be Holocene in age, but so far only one sample from this group was dated by ^{40}Ar/^{39}Ar at 7$\pm$2 ka (Westaway et al., 2006). In this study, we analysed cosmogenic ^{3}He in olivine phenocrysts from three basalt flows and one cinder cone to resolve the Holocene history of volcanic eruptions in more detail. In addition, we applied ^{10}Be exposure dating to two quartz-bearing xenoliths found at the surface of one flow and at the top of one cinder cone. The exposure ages fall in the range between $\sim$500 and $\sim$3000 years, demonstrating that the youngest volcanic activity is Late Holocene in age and therefore distinctly younger than previously envisaged. Our results show that the Late Holocene lava flows are not coeval but formed over a period of a few thousand years. We conclude that surface exposure dating of very young volcanic rocks provides a powerful alternative to ^{40}Ar/^{39}Ar dating.

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