



The potential of Pleistocene volcanism for constraining the palaeo-environmental history of the Arabian peninsula: 40Ar/39Ar dating of Al Wahbah maar crater, Harrat Kishb, Saudi Arabia.

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The Arabian peninsula is a critical region for early human migration out of Africa. Pleistocene climatic conditions have fluctuated between wet and dry extremes several times and have had a profound effect on environment and, likely, the development of human populations in the region. However, absolute chronological constraints on regional environmental and climatic changes are poor. The western margin of the Arabian peninsula is covered by 180,000 km² of Cenozoic to Recent lava flows and related volcanic rocks that record palaeo-climatic conditions. Precise dating of these volcanic rocks has the potential to refine the climatic- environmental evolution of the region.

We report a detailed geological and geochronological study of Al Wahbah maar crater (\sim 2.2 km diameter, \sim 250 m deep) in Harrat Kishb, Saudi Arabia. It formed during a phreatomagmatic explosion that dissected a scoria cone on the northern wall of the crater that exposes a dolerite plug that was intruded immediately prior to crater formation. Pillow lavas at the base of the cone demonstrate that the phreatomagmatic eruption occurred during interaction between magma and a shallow lake or river, rather than groundwater. The 40Ar/39Ar age of dolerite plug (1.147 ± 0.004 Ma) reflects the time that Al Wahbah maar crater formed. More importantly it puts a firm date on the presence of abundant surface water. This study provides constraints on the timing of humid climatic conditions in the region and suggests that the Quaternary basaltic volcanism that stretches the length of the western side of the Arabian peninsula may prove to be useful for establishing the timing of palaeoclimatic changes.