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Early Pleistocene climate cycles in continental deposits of the Lesser Caucasus of Armenia inferred from palynology, magnetostratigraphy, and 40Ar/39Ar dating

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The Lesser Caucasus in Armenia is an active volcanic and tectonic zone which resulted from the collision of the Arabian and the Eurasian plates since Neogene times. The During Quaternary, Lesser Caucasus was uplifted (0.3 mm/yr; Mitchell and Westaway, 1999) and experienced extensional tectonics times. Large lakes developed in graben structures. The diatomitic sequences of the Shamb paleo-lake (South Armenia) offer a rare opportunity to give new insights of Western Asia paleo-climate. Based on macroflora analysis, Bruch and Gabrielyan (2002) proposed a cooling and drying general climate trend through Pleistocene times in relation with a general uplift of the chain.

Several questions have to be answer for this poorly investigated region. Did the climate record humid glacials and arid interglacials as suggested northward in Kazakhstan? What are the vegetation and climate responses to orbital parameters and to the monsoon? Moreover the lesser Caucasus is known as the entrance way used by the first hominids in Eurasia during Pleistocene time. How was the environment at this time?

We present an integrated palynological, 40Ar/39Ar isotopic and magnetostratigraphic study for the most complete section (Joannin et al., in press). 40Ar/39Ar dating of two volcaniclastic layers provided ages of 1.24 ± 0.03 and 1.16 ± 0.02 Ma. Magnetostratigraphic data show that the entire Shamb section is of reversed polarity which correlates with part of the Matuyama period (1.785-1.070 Ma). Pollen assemblages and macroremains diversity revealed an alternation of glacial and interglacial phases that are compared with climate changes inferred from the global isotopic curve. The Shamb section ranges from approximately 1.300 to 1.080 Ma in age (marine isotopic stages 40 to 31). The vegetation of the Lesser Caucasus developed in a mosaic pattern in a Pleistocene continental, mostly arid climate, similar to the present-day climate. The vegetation changes record a dominant climate response to the obliquity orbital parameter. The influence of precession could not be established from the Shamb data. Pollen and macroflora both indicate that glacial periods were cold and dry and that interglacials were warm with local humidity. The early Pleistocene climatic model for Western Asia is thus similar to the climatic model for the Mediterranean area.

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