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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 is an active volcanic and tectonic belt which resulted from the collision of the Arabian and the Eurasian plates since Neogene times. During the Quaternary, the Lesser Caucasus was uplifted and experienced extensional tectonics associated with large lakes development in graben structures. In this active background, and, in the context of evolving climate states (i.e. climate cycles) during Pleistocene time, the Lesser Caucasus can provide crucial insight into exploring direct environment (i.e. vegetation landscape and climate) of first hominids that entered Eurasia. Thus, in this poorly investigated region, one must question whether the vegetation recorded the particular climate scheme of humid glacials and arid interglacials as suggested northward in Kazakhstan. What are the vegetation and climate responses to orbital parameters in the Caucasus?
In Southern Armenia, the diatomitic sequences of the Shamb paleo-lake offer a rare opportunity to give new insights of Western Asia vegetation-inferred paleo-climate. Prior to the present study, macroflora analysis only gave evidence of a cooling and drying general climate trend through Pleistocene times in relation with a general uplift of the chain. We, therefore, investigate pollen-inferred climate changes of the most complete Shamb section (Joannin et al., 2010). 40Ar/39Ar dating of two volcaniclastic layers provided ages of 1.24 $\pm$ 0.03 and 1.16 $\pm$ 0.02 Ma (2[U+F020][U+F073][U+F029]. 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- and macroremains-inferred glacial and interglacial phases are compared with climate changes inferred from the global (LR04) oxygen isotope record. The Shamb section ranges from approximately 1.30 to 1.08 Ma (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. The vegetation changes record a dominant climate response to the obliquity orbital parameter and the influence of precession could not be established. Pollen and macroflora both indicate that glacial periods were cold and dry and that interglacials were warm with local humidity. The early Pleistocene Western Asia climatic model is thus similar to Mediterranean climatic model.
Joannin, S., Cornée, J.J., Münch, P., Fornari, M., Vasiliev, J., Krijgsman, W., Nahapetyan, S., Gabrielyan, Y., Ollivier, V., Roiron, P., Chataigner, C. 2010. Early Pleistocene climatic cycles in continental deposits of the Lesser Caucasus of Armenia inferred from palynology, magnetostratigraphy, and 40Ar/39Ar dating. Earth and Planetary Science Letters. 291, 149-158.