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## Climate changes and movement of people in central Asia during the mid-Holocene: a comparative study between archeological evidences and ice core records

### Content

emsp; The Eurasian continent has a long history of movements of people and cultural transformations during the Holocene. Archeological evidences showed that Steppe pastoralists called Yamnaya, which originated in the northern part of the Black Sea, had moved to the Central Asia around 5300 years before present (yr BP). The Yamnaya people had further moved south across Tien Shan Mountains and Pamir Plateau about 3700 yr BP and finally reached India. The timing of their migration is possibly associated with climate change in central Asia.

emsp; Ice cores have been drilled from mountain glaciers in central Asia to reveal the past climate changes. An ice core was drilled in 2007 on Grigoriev Ice Cap (41°58'33"N, 75°54'48"E, 4,563 m a.s.l) in the Tian Shan Mountains, which is located in the region where the archaeological evidence of the movement of people has been found. The ice core was 87 m long from the surface to the bottom bedrock and covered the last 13000 yr BP according to the radiocarbon dating.

emsp; In this study, we focused on the age of the movement of Yamnaya people in central Asia, i.e. 3700 yr BP, and reanalyzed the ice core in the smaller interval to reveal the climate and environmental changes during the period. The age roughly corresponded to the depth from 76.26 to 79.81 m of the ice core. Total of 319 samples cut in 10 mm interval were used for analyses of water stable isotope ratios ( $\delta^{18}\text{O}$  and  $\delta\text{D}$ ). The two depths of the ice core were dated by radiocarbon, 6,026 and 2,835 yr BP at the depths of 76.54 m and 79.53 m, respectively. We applied a time-depth relationship linearly in this part based on the assumption of the constant accumulation and ice deformation.

emsp; Results showed that the periodical climate change in 500–800-year cycles occurred during this period. The amplitude of the change becomes greater after about 5200 yr BP. The age of the migration (3700 yr BP) corresponded to the most intense cooling in this period. Such climate change may have affected the migration of people to the south.

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