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Climatic belt dynamics on a tropical mountain under strong anthropogenic and zoogenic impact: Mt Tsebet (3946 m a.s.l.) in East Africa

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The links between decreasing size and volume of the glaciers in East Africa's tropical mountains and the position of climatic belts on the one hand and global warming on the other have led to various interpretations on the occurrence of global warming and its magnitude and impacts in this part of the world. Here, we investigate the existence of temperature changes in East Africa and their impacts in high mountain regions by analyzing the position of climatically determined vegetation belts on Mt. Tsebet (12°52'N, 39°30'E, 3946 m a.s.l.) in northern Ethiopia between 1986 and 2010. This 27 km^2 massif, which was first surveyed and photographed in 1868, was chosen as a study area because, unlike Simien Mountains or Bale Mts. (Ethiopia), the antropogenic and zoogenic impact on the environment has not been reduced through time. By choosing Tsebet, we avoided areas that have become recently protected (such as the above-mentioned national parks); there, trees that newly grow more upslope might be ascribed to the protected status. In protected areas, the position of upper cropland limits may be controlled by regulations that prevent farmers from expanding farmlands upslope, even if climatic and topographic conditions would allow doing so. On Tsebet, where direct human and zoogenic impact exists up to the highest elevations, we will establish the position of two temperature-linked vegetation limits (i.e. Erica arborea and Hordeum vulgare or barley) in 1986, 1994 and 2010, through fieldwork (February 2010) and aerial photo interpretation. Changes in population density in the villages around Mt. Tsebet will be analysed through house counting on aerial photographs. The fieldwork will include a stay in mountain villages, during which interviews will be done on dates and reasons for shifting of the cultivation limit.
The results will be analysed through geostatistical methods and will provide a better understanding of the magnitude of air temperature and possibly precipitation changes in this region and of the interaction between climate forcing and direct human intervention in densely populated tropical mountains.