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Development of Adygine glacier complex (glacier and proglacial lakes) and its link to outburst hazard

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Mountain glacier retreat has a well-known impact on life of local population - besides anxiety over water supply for agriculture, industry, or households, it has proved to have a direct influence on glacier hazard occurrence. The paper focuses on lake outburst hazard specifically, and aims to describe the previous and future development of Adygine glacier complex and identify its relationship to the hazard. The observed glacier is situated in the Northern Tien Shan, with an area of 4 km2 in northern exposition at an elevation range of 3,500-4,200 m a.s.l. The study glacier ranks in the group of small-sized glaciers, therefore we expect it to respond faster to changes of the climate compared to larger ones. Below the glacier there is a three-level cascade of proglacial lakes at different stages of development. The site has been observed sporadically since 1960s, however, closer study has been carried out since 2007. Past development of the glacier-lake complex is analyzed by combination of satellite imagery interpretations and on-site measurements (geodetic and bathymetric survey). A glacier mass balance model is used to simulate future development of the glacier resulting from climate scenarios. We used the simulated future glacier extent and the glacier base topography provided by GPR survey to assess potential for future lake formation. This enables us to assess the outburst hazard for the three selected lakes with an outlook for possible/probable hazard changes linked to further complex succession/progression (originating from climate change scenarios). Considering the proximity of the capital Bishkek, spreading settlements, and increased demand for tourism-related infrastructure within the main valley, it is of high importance to identify the present and possible future hazards that have a potential to affect this region.