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ABSTRACT

Length and surface variations of Chaalati, Adishi and Tviberi glaciers from LIA to the present (Enguri river basin, Georgia, Caucasus)

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Caucasus Mountains, running west-northwest to east-southeast between the Black Sea and the Caspian Sea and separating southwestern Russia from Georgia are covered by glaciers for around 1600 km² (Bedford and Barry, 1994). There is widespread evidence of glacier recession in this region since the end of the Little Ice Age (LIA); (Solomina, 2000), but information concerning the latter stages of the 20th century and beginning of 21th century is limited.

In this study, Landsat Thematic Mapper (TM) is used to map the terminus position and to measure the area of three glaciers in the upper part of the Enguri river basin in 2011. The comparison of this data set with different other sources: Soviet maps from 1965, Freshfield map from 1889 and field work surveys to determinate the maximum extend during the LIA, have permitted a reconstruction of the glaciers fluctuations during the last two centuries. ASTER Digital Elevation Model (version 2) permitted the reconstruction of the actual hypsometric profiles of the glaciers. This specific analysis was useful for understanding and discussing the surface variations differences between different glaciers.

From LIA the glaciers of the Enguri river basin showed a general strong retreat. Every single interval reconstructed in the studied glaciers showed a surface reduction. From LIA to 2011 Tviberi glacier, the largest glacier in Caucasus until 1965, showed the strongest surface contraction (- 16.4 km² - 34,9%) and the strongest terminus linear retreat (- 3.98 km, 42% of the maximum length along the main flow line). Chaalati glacier, with the lowest terminus elevation in Southern Caucasus (1861 m a.s.l.) showed a contraction of 4.4 km² (- 27.1%) and a terminus retreat of (2.16 km). Adishi glacier, the smallest of the three but with the highest theoretical ELA0, showed the smallest surface contraction (- 1.5 km², - 13%), and a linear retreat of 1.15 km.

This study is part of the "On the Trails of the Glaciers" project conceived by Macromicro Association. The field work expedition, carried out during August 2011, supported this study with many high resolution terrain pictures from the exact same geographic position of the ones shoot by the first explorers in the late 19th century. The photographic comparisons were extremely useful to validate the geomorphological surveys done during the expedition and the remote sensing analysis.