

## Glacial and periglacial landscape in Turkey: from the flood to anthropic geomorphology

Azzoni R.S.<sup>1\*</sup>, Sarıkaya M.A.<sup>2</sup>, Pelfini M.<sup>1</sup>, Pezzotta A.<sup>1</sup>, Bollati I.M.<sup>1</sup> & Zerboni A.<sup>1</sup>

<sup>1</sup>Dipartimento di Scienze della Terra “A. Desio”, Università degli Studi di Milano, Milan, Italy.

<sup>2</sup>Eurasia Institute of Earth Sciences, Istanbul, Technical University, Istanbul, Turkey.

Corresponding author e-mail: [robertosergio.azzoni@unimi.it](mailto:robertosergio.azzoni@unimi.it)

*Keywords:* glacial geomorphology, remote sensing, Mediterranean glaciation, Anatolia, volcanic geomorphology.

Considering the accelerating glaciers retreat observed worldwide, the knowledge of the state of glaciation and the dynamics of deglaciation is fundamental to understand the effect of climate change. The circum-Mediterranean glaciated areas are among the most sensitive parts of the Planet rapidly reacting to ongoing glacier melting. The Turkish glaciers inventory finalized in 2020, based on high-resolution satellite images (Pleiades, Google Earth™ and SPOT images) allowed the identification of 51 active glaciers covering 12.29 km<sup>2</sup>. Turkish glaciation is characterized by small glaciers or glacierets partly debris-covered located in small cirques and valleys. Geodiversity of glacial landforms and related proglacial areas are very significant and explained with two iconic examples: the Mt. Ararat and the Cilo Mountain range. As a single site, more than 60% of the Turkish glacierized area is located on Mount Ararat (where an ice cap and 4 small outlet glaciers cover an area of 7.37 km<sup>2</sup>. On Mount Ararat, we digitized outlines for 1990, 1994, 2000 and 2016: in a 26 years interval (1990-2016), the glacier shows a retreat of 2.99 km<sup>2</sup>, equal to 29% of the initial value, showing a reduction rate dramatically higher than the main glacierized mountain ranges of the world. Therein, in-situ geomorphological investigation and remote-sensing analyses also reconstructed a dramatic lahar event occurred in the Ahora Gorge in 1840. In the same area, we identified and described a glacier originates after this catastrophe, and never mapped before. Moreover, we realized a geomorphological map on Cilo Mountain range, another representative glaciated sector of Turkey for illustrating the main landforms related to the paraglacial transformation affecting the proglacial area. Finally, we investigate the glacier evolution and the periglacial features of Mount Erciyes (Cappadocia) where the glacial landscape has changed rapidly due to the ongoing climate change and to the strong anthropic: this massif is the largest ski resort of Turkey and the development of ski slopes affects the hydrology and subsequently alters the geomorphic processes of the area.