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## >> SYNTHESIZE MOUNTAINS OF KNOWLEDGE <<

## Submitted Abstract

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## Abstract

Fedchenko Glacier, located in the central Pamir in Tajikistan, is the longest glacier in Asia. Due to its prominent location and its large size, it attracted scientific interest over the course of the twentieth and twenty first centuries, providing thus a rare legacy of historical data in Central Asia. In this study, we investigate a series of topographic data from 1928 to 2019. We use topographic maps collected during historical expeditions in 1928 and 1958. We take advantage of modern satellite data, such as KH-9 spy satellite (1980), SPOT5 (2010) and Pléiades (2017 and 2019). We also rely on ICESat campaign of 2003 and numerous GNSS surveys conducted in 2009, 2015, 2016 and 2019, which ensures a proper co-registration of the satellite data.

We calculate a mean rate of elevation change of -0.40 m/yr for 1928-2019, with a maximum thinning at the lowermost locations (approaching -0.90 m/yr). Despite this long-term thinning trend, we observe large contrasts between the sub-periods. The thinning rate of the tongue doubled for two sub-periods (1958-1980 and 2010-2017) compared to the long-term average. The ERA5 reanalysis (1950-2020) and the Fedchenko meteorological station records (1936-1991) reveal a dry anomaly in 1958-1980, followed by a wet anomaly in 1980-2010, which might have compensated for the temperature increase and thus mitigated mass losses. This wet anomaly could be an important feature of the "Pamir-Karakoram" anomaly, characterized by limited glacier mass losses in this region during the early twenty-first century. Our work contributes to better constrain the decadal glacier thickness changes, with unprecedented temporal resolution. This opens the way for more sophisticated approaches that link the glacier response to climate variability over decades.

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