Submitted Abstract

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Abstract

The assessment of glacial area changes has become very crucial due to variations in glacier retreat or surge, as it helps in understanding the future availability of water. Pertaining to the research region, the spatio-temporal analysis of these changes is rather apparent in Himalayan glaciers, but little is known about them. The current study examines the temporal rate of glacier area change estimations across the entire Indian Union Territory of Ladakh, revealing varied responses of 56 glaciers over the period 1992 to 2020. In order to figure out the changes in the glaciers, we used satellite images from the Landsat series and Google Earth. We estimated the differences in rate of area changes for individual glaciers for five different years, namely, 1992, 2004, 2009, 2014 and 2020. In four time frames, 1992 to 2004, 2004 to 2009, 2009 to 2014, and 2014 to 2020. To do so, we have first manually digitized each glacier for the specified years. As the time intervals were not uniform, we have converted the area change to annual average area change. Then to understand the temporal area change, a non-parametric analysis named the Friedman Test is used. This tells us about the results being equal or not. If the results are unequal, a non-parametric post hoc test (Dunn's test) is automatically run. Ultimately, we found out that in the first two time frames, the rates of area changes are -0.01477 to 0.05011 km2/year and -0.00897 to 0.05812 km2/year, being approximately equal. After that, in the time span of 2009 to 2014, an increasing trend is noticed in the rate of area changes to -0.03467 to 0.15912 km2/year and finally, a drastic increase is seen in the time span of 2014 to 2020 with a range of 0.20921 to 1.69050 km2/year. We observed that the area is varying diversely in the Ladakh region. This tells us how important it is to analyze the temporal area changes in the Ladakh region. We propose that glaciers be monitored on a regular and systematic basis in order to reduce glacial hazards in the Himalayas.