

Glaciers probing 11-year solar cycle

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It has been well known that fluctuations of glaciers (advance/retreat) correspond to solar activities or orbital oscillations in the millennial and centurial time scales. No study has been reported, on the other hand, how an obvious decadal solar activity affects the changes in glaciers. The influence of solar activity on earth's climate has been a matter of debate for a long time. In this study, we examine long-term (three to four decades) records of glacier mass balance, reanalysis air temperatures and sunspot number in order to evaluate the effect of 11-year solar cycle on the earth's surface. Significant correlations between sunspot cycle and annual mass balance of glaciers in the Northern Hemisphere are found only in the Himalayas and Rocky Mountains. Although changes in glaciers are affected not only by changes in summer temperature, but also changes in precipitation, many glaciers have good correlation with summer mean temperatures. Correlation and regression analyses show that significant relations between summer mean temperatures and sunspot cycle distribute in the upper troposphere and touch the earth's surface only at the Himalayas and Rocky Mountains. This suggests that the 11-year solar cycle surely affect the earth's surface through the atmosphere.