Inter-annual Mass Variability of Antarctic Ice Sheet and Gulf of Alaska Glaciers and their Relevance to Pacific Decadal Oscillation

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Recent studies from GRACE (Gravity Recovery and Climate Experiment) suggest that the ice mass variations of Antarctic Ice Sheet (AIS) and Gulf of Alaska (GOA) glaciers have inter-annual variability. In this study, we first investigate how those changes could be explained by two meteorological parameters: precipitation and temperature. For AIS, the change of cumulative precipitation from ERA-interim reanalysis is very close to the ice mass variation derived from GRACE, as previous researches already showed. For GOA glaciers region, the ice mass variation is simulated by a simple model using snow precipitation and surface temperature obtained from ERA-Interim. As this model reveals, the ice mass variation is greatly dependent on temperature. We further examine the influence of Pacific Decadal Oscillation (PDO) on Antarctic precipitation and the temperature change in GOA. As a result, a decadal or an inter-annual variability of ice mass change in both regions is directly or indirectly related to PDO. If the relations here stated prove to be true, they will probably serve to predict the ice mass variations of the two regions for the near future.

Keywords: Antarctica, Gulf of Alaska Glaciers, Ice Mass Change, Pacific Decadal Oscillation

