Surface mass balance of Arctic glaciers: past and future trends

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Glaciers and ice caps, one of the main components of the Arctic cryosphere, cover an area of 439 617 km^2 (about half of the world's glaciers and ice caps; Figure 1). These glaciers and ice caps are a major contributor to the eustatic component of global sea level rise, and have impacts on water supplies, water quality, hydroelectric power generation, flood hazards, and ocean circulation patterns. Note that most of the current mass loss from the Arctic glaciers is probably attributable to a change in the surface mass balance. These mass losses are expected to increase in the future, as these glaciers are located in the region of highest predicted air temperature increase during the coming decades. Hence, for better understanding what past and future fluctuations of glacier behavior imply for their atmospheric forcing on multi-decadal scale and impact on sea level rise, there is an urgent need for the assessment of past and future glacier mass balance in the Arctic region. In this study, we attempt to estimate the past and future variations in glacier mass balance using daily near-surface air temperature and precipitation from12 Global Climate Models in combination with a surface mass balance model. Then, the study attempts to analyze the response of Arctic glaciers to climate change, the role of these glaciers in the Arctic climate system, and the contribution of glaciers to global sea level rise. Through such work, we can well understand the Arctic glacier behavior and the role of these glaciers in the Arctic climate system, and fill the major knowledge gaps in quantifying rates of glacier wastage, future trends and its impacts.

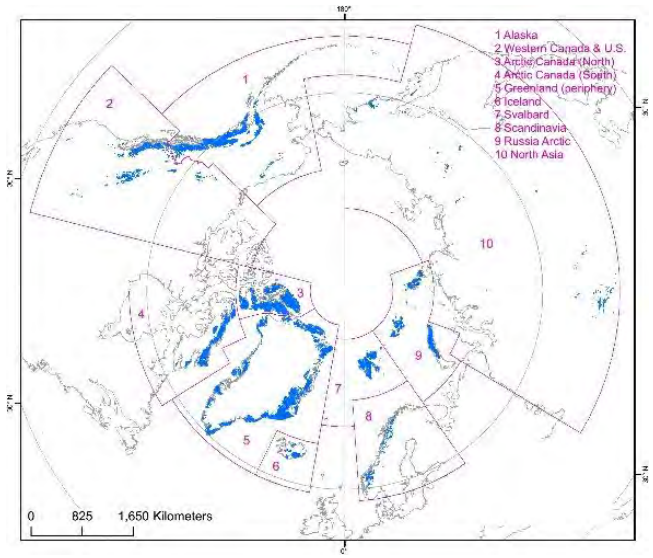

Figure 1 Map of Arctic glaciers and ice caps.

Reference

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