

Rapid Thinning of Jakobshavn Isbrae, the Largest Glacier in Greenland during 2009-15

Xianwei Wang (1) and David Holland (2)

(1) Center for Global Sea Level Change, New York University Abu Dhabi, ABU DHABI, United Arab Emirates (wangxianwei0304@163.com), (2) Courant Institute of Mathematical Sciences, New York University, New York, United States (dmh4@nyu.edu)

Jakobshavn Isbrae (JI), the largest and fastest flowing glacier in Greenland is undergoing rapid thinning in recent years. In this study, we employ laser altimetry data from Operation IceBridge Airborne Topographic Mapper (OI-ATM) to detect a six-year (2009-15) elevation-change rate of JI. A method to calculate grid elevation using OI-ATM Level 2 data and to calculate elevation-change rate using near repeat OI-ATM measurements is introduced. The uncertainty of grid elevation data using our method is approximately 0.04 m. The six-year-average elevation-change rate of JI between 2009 and 2015 over regions with ice velocity ≥ 300 m/a was about -4.8 ± 0.1 m/a, with maximum thinning rate of -19.2 m/a near the terminus of the main trunk. Compared with previously reported elevation-change rates from earlier periods, JI has now reached a new high thinning record. Annual elevation-change rate over JI during 2009-15 is calculated as well and the six annual elevation-change rates of JI varied significantly. For instance, modest thickening close to terminus of JI occurred during 2010-11, with maximum thickening rate of 3.8 m/a. Rapid thinning of JI occurred during 2012-13, with maximum thinning rate of -40.3 m/a. More observation data is required to understand the different behaviour of JI in recent years.

The relation of thinning to bedrock topography over JI is analysed and relatively less thinning above bedrock peak has been found, especially after rapid speedup in summer 2012. The relatively less thinning above bedrock peak indicates more braking effect after sudden speedup of a glacier.