

Monitoring an Ice Sheet's Pulse: A Monthly Time Series of Dynamic Ice Loss from Greenland Using Satellite Optical and Radar Imagery

Michalea King (1,2), Ian Howat (1,2), Seongsu Jeong (2), MyoungJong Noh (2), Bert Wouters (3), Brice Noel (3), and Michiel van den Broeke (3)

(1) Ohio State University, Earth Sciences, United States (michaleaking@gmail.com), (2) Byrd Polar and Climate Research Center, United States, (3) Institute for Marine and Atmospheric Research Utrecht, Utrecht University, The Netherlands

Ice mass loss from the Greenland Ice Sheet (GrIS) is a dominant source of present-day sea level rise. Mass is lost, in large part, due to solid ice discharge from marine-terminating outlet glaciers. Previous work has documented accelerations in the discharge flux of many outlet glaciers over the past two decades. Less is known, however, of the seasonal and sub-seasonal glacial discharge patterns that are extensive through time and space. This research documents changes in speed and velocity of a large glacier inventory (approximately 190 major glaciers wider than 1 km) by assimilating satellite optical imagery, radar data products, and modeled data. These data are used to derive continuous time series of solid ice discharge for every major glacier in Greenland over the 2000-2016 period. Combined, these records provide a single cumulative time series of the total dynamic ice loss of the GrIS, and reveal a marked seasonality superimposed on long-term trends. Here, we describe how the seasonality of the ice sheet has evolved over time, and identify patterns of regional variability. These data will allow us to identify regions of the ice sheet most vulnerable to change, and better understand how seasonal variability in ice flux contributes to overall glacier mass-balance, and the health of the ice sheet going forward.