EGU22-3246
https://doi.org/10.5194/egusphere-egu22-3246
EGU General Assembly 2022

Pre-breakup drawdown and ice cliff formation on two Larsen B tributaries, 1968-2008

Naomi Ochwat[1,2], Ted Scambos[1], Sarah Child[1], and Mike Willis[1,2]
[1]University of Colorado Boulder, Cooperative Institute for Research in Environmental Sciences, United States of America (naomi.ochwat@colorado.edu)
[2]University of Colorado Boulder, Department of Geology, United States of America (naomi.ochwat@colorado.edu)

The major tributary glaciers of the former Larsen B Ice Shelf have undergone significant changes in the time leading up to, and following, the collapse of the ice shelf in March 2002. Crane and Hektoria-Green-Evans Glaciers (hereafter, Crane; Hektoria) experienced multiple periods of rapid velocity increases and intervening decreases, and dramatic surface lowering and mass loss. Initial results of early (late 1960s) U.S. Navy Trimetrogon aerial image analysis for elevation indicates large elevation losses in the decades prior to the disintegration event. Following the ice shelf collapse, both glaciers developed significant ice cliff fronts, but with markedly different calving styles and ice front heights at different times after the event. Rapid collapse with indications of arcuate listric faulting began at Hektoria almost immediately after ice shelf loss, while Crane also experienced rapid retreat during this time. Maximum elevation of the cliff fronts in the Hektoria collapsed region ranged between 60 and 100 meters. Peak ice cliff height at Crane was approximately 105 m, occurring in late 2004. These cliff heights correspond with periods of very high flow speed, thinning, and rapid ice front retreat that is characteristic with modeled ice cliff failure events. Here we present our analysis of the characteristics that defined the retreat periods. We assess ice velocity changes from optical satellite imagery, hypsometry, and ice cliff front heights from stereo-image DEMs and altimetry data, and use bed topography and bathymetry data. Ice cliff failure that could lead to Marine Ice Cliff Instability (MICI) has never been observed either in situ or through remote sensing. Using the observed dynamics of Crane and Hektoria, we aim to improve our understanding of the parameters that modeling results show as the drivers of ice cliff failure. In doing so, impacts of ice cliff failure on outlet glacier stability in numerical modeling will be better constrained, which will increase predictive sea level rise accuracy.