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Spatial ice rigidity distribution of Larsen B before its disintegration

A. Khazendar, E. Rignot

Jet Propulsion Laboratory (JPL), Pasadena, California, USA (ala.khazendar@jpl.nasa.gov)

The disintegration of 3250 square kilometers of Larsen B Ice Shelf in the Antarctic Peninsula within 5 weeks in 2002 provided the opportunity to establish a clear connection between the removal of ice shelves and the acceleration of their ice streams. Radar interferometry observations analyzed by *Rignot et al.* [2004] revealed that glaciers flowed up to eight times faster after the collapse of Larsen B, while *Scambos et al.* [2004] detected a lowering of ice stream surfaces by up to 38 m. The significance of these findings is heightened by the fact that neighboring ice streams with intact ice shelves remained largely unchanged. Here, we infer the spatial distribution of ice rigidity (flow law parameter B) of Larsen B before its disintegration. Satellite radar interferometric observations of ice velocity obtained in 1996 and 2000, and in 2004 (of the remaining part of the ice shelf) allow the testing and confirmation of forward models and then the application of an inverse control method to asses the evolution in time of the rigidity distribution of the ice shelf. The implications of the work include providing insight into how the network of rifts that preceded the collapse of Larsen B was related to the distribution of ice rigidity, and, in particular, how these rifts affected ice shelf flow compared to the case of a non-rifted ice shelf; having the potential to use the inferred ice rheology patterns as proxy to predict whether other ice shelves are in the process of collapse; and refining forward numerical modeling by the application of parameter B as a distribution rather than a single averaged value.

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