THE UNIVERSITY OF CHICAGO

Computational and Applied Mathematics & Statistics Student Seminar

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Band Gaps in Arctic Ice Shelves with Periodic Surface Rolls

Monday, March 27, 2023
12:30 PM
Jones Laboratory,
Jones 226

ABSTRACT

The Ward Hunt and Milne ice shelves, remnants of the former Ellesmere Ice Shelf, feature an unusual roll morphology whose origin is unknown. Using numerical models, we show that the vibrational modes of such ice shelves contain band gaps in the frequency domain, demonstrating that these ice shelves prevent ambient ocean waves of relevant frequencies from flexing and breaking the ice. We speculate that this wave scattering principle is the reason that the roll morphology eventually became the dominant characteristic of ice shelves in this region. Based on these findings, we propose a new mechanism for ice shelf formation that depends on the rolls to stabilize the ice shelf as it grows. We ultimately argue that this long-term preference for roll morphology will be relevant to the breakup of the ice shelf, and that the gradual loss of surface rolls will become a tipping point for ice shelf instability.