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Subinertial Variability in Four Southeast Greenland Fjords in Realistic Numerical Simulations

Renske Gelderloos[1], Thomas Haine[2], and Mattia Almansi[3]
[1]Delft University of Technology, Netherlands (r.gelderloos@tudelft.nl)
[2]Johns Hopkins University, USA
[3]B-Open Solutions s.r.l., Italy

Natural variability at subinertial frequencies (time scale of several days) plays an important role in the interaction between Greenland's fjords, the continental shelf, and shelf-break exchange with the deep basins. In this study we identified the nature and driving mechanisms of this variability in four fjords in Southeast Greenland, in three high-resolution numerical simulations. We find two dominant frequency ranges in along-fjord velocity, volume transport of Atlantic Water, and along-fjord heat transport: one around 2–4 days and one around 10 days. The higher frequency is most prominent in the two smaller fjords (Sermilik Fjord and Kangerdlugssuaq Fjord), while the lower frequency peak dominates in the larger fjords (Scoresby Sund and King Oscar Fjord). The cross-fjord structure of variability patterns is determined by the fjord's dynamic width, while the vertical structure is determined by the stratification in the fjord. The dominant frequency range is a function of stratification and fjord length, through the travel time of resonant internal Kelvin waves. We find that the subinertial variability is the imprint of Coastal Trapped Waves, which manifest as Rossby-type waves on the continental shelf and as internal Kelvin-type waves inside the fjords. Between 50% and 80% of the variability in the fjord is directly forced by Coastal Trapped Waves propagating in from the shelf, with an additional role played by alongshore wind forcing on the shelf.

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