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Edge flexural-gravity waves beneath an ice cover on a sloping beach

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Edge waves on ice-covered water are analyzed in the linearized theory for a plane-sloping beach with a straight coastline. These waves propagate along the coast and have an amplitude which decays exponentially away from the shoreline. The problem is examined without making a hydrostatic assumption. The sea water is considered homogeneous, inviscid, irrotational and incompressible. Under these conditions the velocity potential satisfies Laplace's equation everywhere in the fluid. The ice is taken as of uniform thickness, with constant values of Young's modulus, Poisson's ratio, density and compressive stress in the ice. The boundary conditions are such that the normal velocity at the bottom is zero and at the undersurface of the ice the linearized kinematic and dynamic boundary conditions are satisfied. We present explicit solutions for all modes of the edge flexural-gravity waves and the dispersion equation. For zero mode our results are in complete agreement with those of Mollo-Christensen (1983). Influence of the edge waves on ice rideup onshore is discussed.