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Bergy bit and growler melt deterioration

S. B. Savage¹, G. B. Crocker², M. Sayed³ and T. Carrieres⁴

Abstract

The Canadian Ice Service, Environment Canada, is currently developing an operational iceberg forecasting model; the present work forms part of that effort. While existing models predict iceberg drift and deterioration, the new model will account for calving that produces smaller ice pieces and subsequently track the drift and melt of the calved pieces. Bergy bits and growlers, which we consider here to be ice pieces in the size range from 3 to 20 m, can cause large forces upon impact with offshore structures. The probability of encountering these bergy bits and growlers is of significant interest to marine transportation and offshore resource development. Calving due to wave-induced erosion at the waterline of a floating iceberg can produce many thousands of small ice pieces having a wide distribution of sizes. These small ice pieces then melt as individual entities and eventually disappear. Since the calving events occur periodically, there is a continual supply of small ice pieces in the neighborhood of the parent iceberg. The focus of the present paper is on the evolution of the size-frequency distribution function for the calved ice pieces. It makes use of the initial distribution function following the calving event discussed by Savage et al. (2000). Dimensional analysis, laboratory tests, and field observations are applied to obtain simple correlations and devise a melt law for the smaller ice pieces. This melt law is then used to determine the temporal evolution of the small ice piece size-frequency distribution function.

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