

Freezing Spray and Ice Accretion on Vessels

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Vessel icing threatens the stability of vessels that operate in high-latitude waters. The accumulation of ice on vessels depends on meteorological conditions and vessel design. To obtain a forecast, meteorological data is input into either the Overland or Modified Stallabrass algorithms which calculate the amount of icing that will occur. The ice coverage in the Arctic region has changed significantly since algorithms were developed in the 1980s. The goal of the National Weather Service (NWS) and Meteorological Service of Canada (MSC) is to create a cohesive model that determines the icing rate throughout the North American region. A comprehensive overview of vessel icing algorithms that compared their strengths and weaknesses was conducted to lead to the eventual revision and development of a new algorithm. Specifically, ongoing efforts to obtain new observation data from vessels in the North American region will be used to recalibrate the algorithms by relating the model's output to the severity of icing described by the observations from vessels. After relating the new observational data, a different Overland predictor value can be derived from the simplified heat balance of ice surface $L_i \rho_i \frac{dH_i}{dt} + C_w (T_w - T_f) \rho_w \frac{dH_w}{dt}$ [1]. A constant value, w_0 for the liquid water content equation, $R_w = w_0 * 10^{-3} * H_s * \exp\left(-\frac{z}{1.8}\right)$, in the Modified Stallabrass algorithm can be calculated with updated data [2]. Current observational data applied to the algorithms will reflect the meteorological conditions in the Arctic. Progress made in the understanding of the meteorological conditions and associated augmentations necessary to the development of accurate icing predictions for vessel safety will be reported.

[1] Overland, J. E., 1990: Prediction of vessel icing for near-freezing temperatures, *Wea. Forecasting*, 5, 62 – 77

[2] Henry, N. L., 1995: Forecasting vessel icing due to freezing spray in Canadian east coast vessels Part I: Model Physics. Environment Canada: Newfoundland Weather Center, 43 pp.