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Integrating MODIS albedo and LST products within a lake ice model

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Snow and ice albedo are important factors in the determination of the surface energy budget and lake ice phenology. To better understand lake ice phenology and the effect a changing climate has on it, the Canadian Lake Ice Model (CLIMo) was developed to simulate ice growth and ice characteristics. The improvement of surface albedo parameterization is an important step for improving lake ice models such as CLIMo. Albedo is known to affect the timing of lake ice break-up dates.

To test the albedo parameterization of CLIMo, forcing meteorological data was collected for Back Bay located in Great Slave Lake near Yellowknife, Northwest Territories, Canada (2002-2009). The albedo parameterization used by CLIMo was compared with three MODIS albedo products: MCD43A3, MOD10A1, and MYD10A1. These products were then each integrated into CLIMo and effectively replaced the albedo parameterization. Results show that CLIMo performs very well when compared with the first day of open water, observed by the MOD10A1 daily snow albedo product, having a mean absolute error of approximately 7 days without the albedo products integrated into the lake ice model and approximately 6 days with the albedo products integrated in. Surface temperature is also an important factor for the determination of lake ice break-up dates since it is used in lake ice albedo parameterization schemes. The MODIS land surface temperature (LST) product is currently being evaluated against CLIMo results at Back Bay and Hay River (Great Slave Lake) Deline (Great Bear Lake), Northwest Territories, Canada. Results comparing both MODIS-derived albedo and LST with those simulated with CLIMo, as well as the impact of integrating MODIS albedo/LST in CLIMo will be presented.