

## **Estimation of river ice-cover thickness using extreme learning machine and least squares support vector machine.**

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Freshwater ice (e.g. lake and river) is a sensitive indicator of global climate. It has a direct impact on ice jamming which results in flooding of large areas, reduction of hydroelectric power at generating stations, impediment of navigation, damage to human structure, environment, and ecology. Solving these problems require extensive information on lake and river ice condition (ice thickness, date of freeze-up and breakup, etc.). In northern regions, like Canada, the collection of information on freshwater ice is often challenging due to the site-specific nature of these processes. Thus, meteorological variables such as water level, solar radiation, air temperature, and accumulated freezing degree days, which are widely accessible, were used as predictors for river ice-cover thickness estimation. Extreme learning machine and least squares support vector machine are tested for estimation accuracy in the Athabasca River, Alberta, Canada. The proposed models showed promising performance in river ice-cover thickness estimation.