



## River channel's predisposition to ice jams: a geospatial model

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When dynamic breakup occurs on rivers, ice moving downstream may eventually stop at an obstacle when the volume of moving ice exceeds the transport capacity of the river, resulting into an ice jam. The suddenness and unpredictability of these ice jams are a constant danger to local population. Therefore forecasting methods are necessary to provide an early warning to these population.

Nonetheless the morphological and hydrological factors controlling where and how the ice will jam are numerous and complex. Existing studies which exist on this topic are highly site specific. Therefore, the goal of this work is to develop a simplified geospatial model that would estimate the predisposition of any river channel to ice jams. The question here is not to predict when the ice will break up but rather to know where the released ice would be susceptible to jam. This paper presents the developments and preliminary results of the proposed approach.

The initial step was to document the main factors identified in the literature, as potential cause for an ice jam. First, several main factors identified in the literature as potential cause for an ice jam have been selected: presence of an island, narrowing of the channel, sinuosity, presence of a bridge, confluence of rivers and slope break. The second step was to spatially represent, in 2D, the physical characteristics of the channel and to translate these characteristics into potential ice jamming factors. The Chaudiere River, south of Quebec City (Canada), was chosen as a test site. Tools from the GIS-based FRAZIL system have been used to generate these factors from readily available geospatial data and calculate an "ice jam predisposition index" over regular-spaced segments along the entire channel. The resulting map was validated upon historical observations and local knowledge, collected in relationship with the Minister of Public Security.