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# Automated Monitoring of River Ice Processes using Shore-based Imagery

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## Abstract

River hydraulics is drastically influenced by the presence of river ice, which inevitably occurs in cold regions. Terrestrial monitoring of river ice, using a time-lapse camera system on the Lower Nelson River, northern Manitoba, Canada, was conducted for a comprehensive study of the effects of river ice cover on hydraulic characteristics. An automated image processing algorithm was developed to analyze the time series of terrestrial images. The presented image processing algorithm consists of five main steps: preprocessing, image registration, geo-rectification, target detection and final quantitative river ice cover calculations. The developed algorithm was able to detect and quantify important river ice cover characteristics such as the percentage of area covered by ice, the location of the leading edge, and the speed of border ice growth and recession. Potentially, these observations may be used to improve the ice formation and break-up algorithms in river ice models.

**Key words:** river ice, terrestrial photogrammetry, shore-based imagery

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