Development of a seamless multisource Topographic and Bathymetric Digital Elevation Model using a methodology adapted for hydrodynamic modelling of the St. Lawrence River.

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Flooding is a major concern with potential for significant risks to public safety as well as a negative economic and social impact. To develop a hydrodynamic model to map and assess flooding risks, a single elevation model is a critical component. The wide availability of multisource remotely sensed data facilitates the creation of a Topo Bathymetric Digital Elevation Model (TBDEM). However, it can be very challenging to create a seamless high resolution elevation model suited for inundation mapping due to discrepancies between remotely sensed topographic and bathymetric data caused by temporal changes, differing horizontal and vertical reference systems, resolution, incertitude, and coverage area. This study presents a methodology that expands on previous studies focused on low resolution coastal mapping by resolving spatial and temporal differences from multisource data sets while maintaining the integrity of the channel morphology and the near shore environment. This is achieved by applying a novel fusion methodology that is best suited for the data source. A least cost method is applied to the topographic data sources and a feathering method for bathymetric data, while as for the intermediate region transects are used to interpolate between missing data to ensure the integrity of the shoreline. Finally Empirical Bayesian Krigging applied to the entire dataset helps produce a seamless surface accompanied with an error surface to analyse the incertitude at each point of the model. Airborne Lidar data as well as Multibeam bathymetry data from the upper section of the St. Lawrence River in Quebec, Canada were combined using the methodology proposed. The TBDEM produced in this study is a better representation than previous models and minimizes the error in the data points, however this TBDEM's ability to perform better than previous models in hydrodynamic simulations will be tested in future studies using previously recorded flood events.

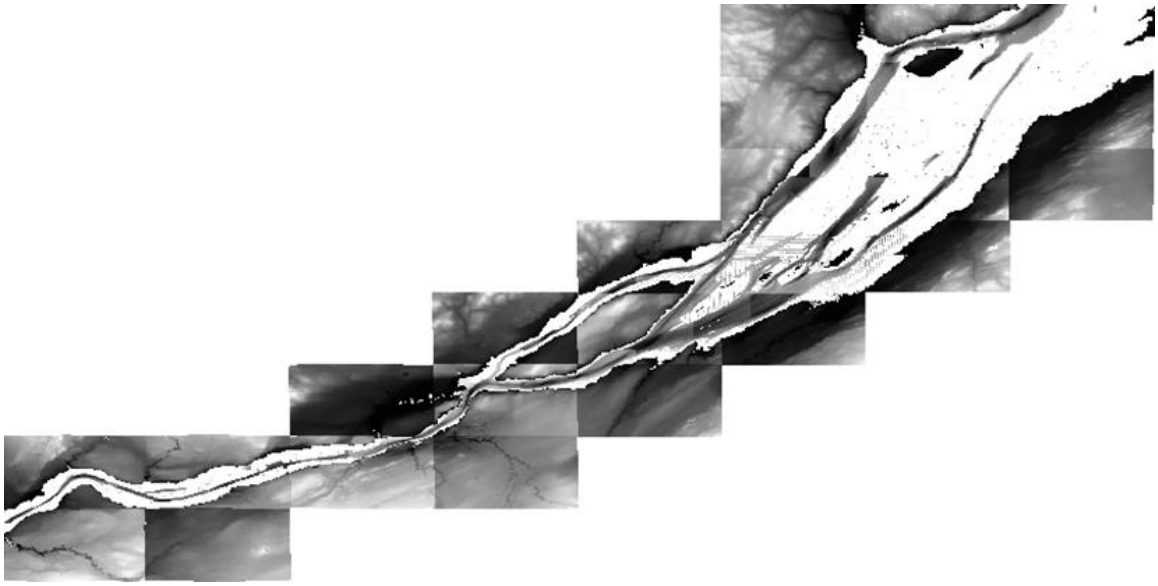

Figure 1: Multisource, multiresolution TBDEM of the upper section of the St. Lawrence River.