Segmentation and characterisation of underwater dunes of the Northern Traverse of the Saint-Lawrence River

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The identification of underwater dunes represents an important role in the study of the seafloor morphology. In this context, the segmentation and characterization of these sedimentary structures allow a better understanding of the dynamism of the seafloor, since the presence of the dunes is related to different environmental conditions. We propose an object-based method dedicated to the segmentation and characterization of underwater dunes on the fluvio-marine context. Our method relies on a conceptual model in which dunes can be identified from a DBM (Digital Bathymetric Model) by their salient features (i.e. crest line, stoss trough, lee trough). These features are extracted using a morphometric analysis of the seafloor and mathematical morphology operations. Then, the crest lines are matched with their corresponding stoss and lee trough to form the dunes. Once segmented, the dunes can be characterized by a series of morphological descriptors, such as their width, height, orientation, etc. This computation is achieved considering the dune object itself and its salient features. The fields where the dunes are located as well as the spatial distribution of the dunes on the seafloor are also characterized by our method. The segmentation of the dunes from the DBM has a performance rate of approximatively 92% of well segmented dunes and more than 1230 dunes were used to validate the characterization method. Figure 1 shows an overview of our proposed method.

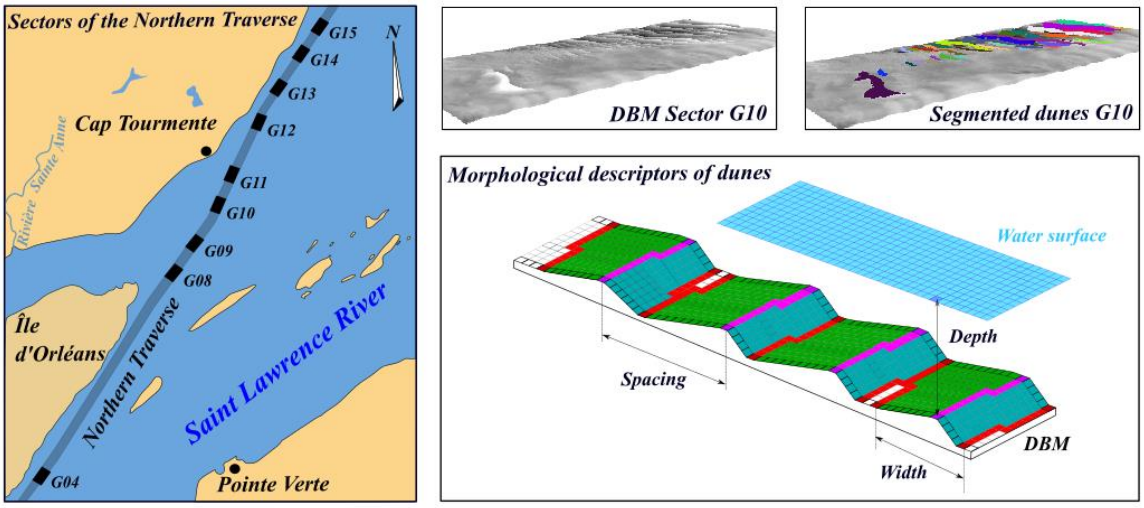

Figure 1 - Overview of the proposed method. On the left, the sectors of the Northern Traverse of the Saint-Lawrence River. On the top, the DBM of the sector G10 of the Northern Traverse and the segmented dunes form this sector. On the bottom, the schematized descriptors of the dunes (i.e. depth and width) and the field (i.e. spacing). In red, the stoss and lee troughs of the dunes, in magenta the crest line, in green the stoss site and in blue the lee side of the dunes.