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Optimal detection and quantification of channel variability along braided river: the Hurunui's case (New Zealand).

M. Thomas (1), C. Delacourt (1), P. Davy (2), L. Moulin (2) and D. Lague (2)

(1) UMR 6538 Domaines Oceaniques, University of Brest, CNRS, France, (2) UMR 6118 Geosciences Rennes, University of Rennes 1, CNRS, France

Braiding is one of the most striking and complex instability in geomorphology, whose physical understanding still remains an issue. Quantifying braided river geometry, its spatial variability (or best the temporal changes) are basic requirements to gain understanding. This requires a detailed characterization of channels and mid-channel bars. The study focuses on the Hurunui River located in the Canterbury plain of the southern island of New Zealand. It presents few anthropic influences and well-defined transitory regimes between straight and braided forms. A relevant analysis of braiding requires both a resolution small enough to have a proper description of the channel-and-bar organization, and a large spatial coverage to undertake sound statistics of along-stream variations. Remote sensing is useful if not indispensable thanks to synoptic perception. High resolution images, which are now widely available, make possible the detection of the very fine structure of braided rivers. The counterpart of high resolution is however a decrease of swath. A compromise has to be found between synoptic coverage and spatial resolution. The aim of this work is to estimate the most appropriated spatial resolution for studying braided rivers. IKONOS and ASTER images have been selected because of the contrast between their spatial resolution (1 m and 15 m, respectively) and swath (11x11 and 60x60 km2, respectively). An algorithm has been developed to automate object detection and statistical treatment. First a maximum likelihood classification has been performed on each image in order to distinguish between water, naked sediment, and vegetated ground. Channels and bars are then automatically identified, and some of their geometrical properties (width, length,etc.)

are calculated for each point of a reference coordinate line that runs in the middle of the river valley. In addition to trivial parameters such as the number of channels, their width, lenght, we try to estimate flow in each channel by using some classical empirical formula calibrated with in-situ measurements. We also attempt at calculating parameters that are meaningful for the underlying physical processes. As an example, we define the effective river width Weff, which is the width that an equivalent single channel would have to ensure the same erosion and sediment transport as the multiple-channel river. We evaluate the impact of changing the spatial resolution of images by comparing the parameters derived from the form recognition. Up to 5 m of resolution, there is no significant lost of information for most of parameters. Above most of the descriptors of the braided network appear severely biased by resolution effects. Thus images with an original resolution of 5 m (as Spot-5) and a large swath (60x60 km for Spot 5) appears to be the best compromise to study a braided structure such as that of the Hurunui river.