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Dynamic Characterization of Planform Dynamics of Meandering Channels

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ABSTRACT

Meandering rivers tend to evolve along the floodplain at different migration rates during its evolution. These rivers tend to reach a dynamic equilibrium condition that provides dominant wavelengths, amplitudes, and other planform characteristics, those properties depend on flow and sediment discharge, geologic conditions of the valley, and other variables such as soil properties, vegetation among others. These physiographic features are achieved through erosion of margins in the concave curves and deposition of solid material in the convex areas, processes that lead to the development of lateral (and longitudinal) migration of the river course describing a sort of swept across the floodplain producing oxbow lakes at certain temporal and spatial frequencies (again based on the dynamic equilibrium concept, a range of frequencies are expected for each river). An important range of hydraulic engineering problems and scientific unknowns require an appropriate description of these morphological processes.

Currently, remote sensing techniques (satellite images of high resolution) provides an economical means to address the problem in a first level of approximation, and move towards the quantification of geometric variables that characterize the type of meandering channel. Despite the large number of studies examining the geomorphological variables of meandering channels, most of them are based on static classification and characterization of meandering rivers. This presentation outlines a dynamic classification and characterization of meandering rivers where temporal variability is shown to be important to understand the behavior of these channels. We have developed a MATLAB-based toolbox to perform the characterization of several meandering rivers around the world, especially in the Amazon basin. We have used Wavelet analysis, filtering techniques and other mathematical tools to describe the equilibrium conditions of meandering rivers and their interaction with the geology.

KEY WORDS: software; meandering channels; geomorphology; migration rates; restoration.