
Journal of Environmental Hydrology

ISSN 1058-3912

Electronic journal of the International Association for Environmental Hydrology

On the World Wide Web at <http://www.hydroweb.com>

JEH Volume 8 (2000), Paper 14, October 2000

Posted October 20, 2000

RESPONSE THEORY FOR ALLUVIAL RIVER ADJUSTMENTS TO ENVIRONMENTAL AND MAN-MADE CHANGES

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ABSTRACT

A response theory is developed for prediction of the direction and magnitude of alluvial river adjustments from one regime to another due to environmental and man-made changes. The theory makes use of the tendency of alluvial channels toward dynamic equilibrium after being disturbed by an extreme event. Various extremal concepts are adopted such as energy dissipation (including its special cases of stream power, unit stream power and energy slope), sediment efficiency, friction factor and Froude number. The regime theory hydraulic exponents, which are usually taken as constants, are derived in a more general fashion where the classical reported values could be obtained. After selecting the function that describes each concept and setting its variation to zero, a equation that represents the response of the river channel is obtained. This response is given in the form of a relation between adjustments or variations between the width, depth, slope, discharge, and channel roughness. Comparisons with field data for ten cases of river response show the success and potential of this approach.

Reference: Hafez, Y.I.; Response Theory for Alluvial River Adjustments to Environmental and Man-made Changes, Journal of Environmental Hydrology, Vol. 8, Paper 14, October 2000.

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