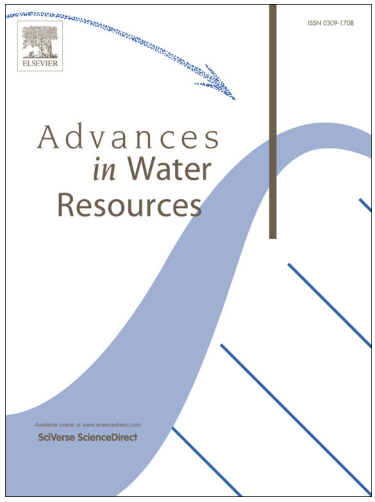

Numerical investigation of chaotic advection past a groyne based on laboratory flow experiment

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PII: S0309-1708(14)00113-4
DOI: http://dx.doi.org/10.1016/j.advwatres.2014.06.004
Reference: ADWR 2221

To appear in: *Advances in Water Resources*

Received Date: 26 July 2013
Revised Date: 14 May 2014
Accepted Date: 2 June 2014

Please cite this article as: Zsugyel, M., Tél, T., Józsa, J., Numerical investigation of chaotic advection past a groyne based on laboratory flow experiment, *Advances in Water Resources* (2014), doi: http://dx.doi.org/10.1016/j.advwatres.2014.06.004

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A laboratory flow past a groyne with complex hydrodynamics was investigated using surface Particle Tracking Velocimetry (PTV) technique for detecting chaotic features in fluvial mixing processes. In the reconstructed velocity field particles were deployed and tracked numerically in a Lagrangian way. Calculating some appropriate parameters (e. g. flushing times, finite-size Lyapunov exponent) originating from chaos theory, we are able to give a more detailed picture on surface mixing driven by aperiodic flows than traditional approaches, including the separation of sub-regions characterized by sharply different mixing efficiency.

1 INTRODUCTION

Groynes are cross-wise built river training works for narrowing the river. The decrease of the cross-sectional area results in enhancing velocity, hence sediment deposition is less effective at the particular river reach. A very detailed study on the effects of groynes can be found e.g. in [1]. Although the main reason for building groynes is generally to maintain the navigation routes, other implications are also essential.

Material exchange processes in the vicinity of groynes are crucial for ecological habitats since the developed flow structure and resultant mixing might be advantageous for the fish, plankton species, and other organisms living in water. Since nutrients can be accumulated in the recirculation area, this