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Vortices and Morphodynamics Aspects at Bridge pier Scour Processes

A. Bateman

M. Fernández

D. Velasco

V. Medina

Polytechnic University of Catalonia

allen.bateman@upc.es

The description that will be detailed here concerns the observation of the scour happened at squared bridge piers in clear water conditions. In many articles you will be able to read about local scour at bridge piers for example in articles as that of Bruce Melville (1997) or in (1999), they are specially interesting because they are dedicated to a systematic study of the phenomenon of the temporal evolution of the local scour in bridge piers, in these articles the cylindrical piers are detailed. Also the study of Franzetti (1994) is relevant. In this topic there is a recent doctoral thesis that I have found in Internet that deals with the modelling of temporal evolution of bridge piers, which coincides enough with the form but not with the essence of the present study, this thesis has been presented in the University of Florida by William Miller (2003). Anyway, this thesis presents a detailed discussion on how the horse-shoe vortex act in the base of the pier bridge scouring the bed. In fact the same path of the particles has been observed in the square piers that we have used for the present article. The aim of the present article, in addition to the detailed temporal evolution of the scour data, it deals on the discussion of the formulation of a morphodynamic model about the local scour, based on the power of the horse-shoe vortex and the mass conservation of the sediment. Use simple concepts of energy dissipation of the vortex. It results in two differential ordinary system equations that can be solved by means of simple numerical methods as Runge -Kutta. Some aspects on chaotic behaviour of the scour

collapses will be analyzed.