

SCG064-P03

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## Alluvial cyclic steps produced with oscillatory discharge in a deltaic setting: Flume experiments

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Upper regime bedforms associated with spatially-periodic hydraulic jumps are called cyclic steps. Cyclic steps in natural alluvial rivers have intrinsically low preservation potential and are hardly recognizable in cross section. This is partly because a particular hydraulic condition allowing cyclic steps to develop hardly lasts in alluvial rivers for a significantly long period (e.g. 100 years). Any original deposit produced by cyclic steps would not escape significant modification or complete destruction under a new, different hydraulic condition that does not allow cyclic steps to develop. What if a pair of different hydraulic conditions (one suitable for cyclic steps; the other not allowing cyclic steps) is alternately provided to the river? And, what features are recorded in a stratigraphic section of the deposit? These questions have been examined using a series of flume experiments in which alluvial cyclic steps were produced on the topset surface of a Gilbert-type delta. During all runs, supply rate of sediment (0.1mm and 0.25mm quartz sand of a particular mixture ratio) was kept constant, whereas upstream water discharge was changed periodically/alternately between two particular magnitudes, between  $Qw1$  and  $Qw2$ , or between  $Qw2$  and  $Qw3$  ( $Qw1$ : low discharge to prevent cyclic steps;  $Qw2$  and  $Qw3$ : intermediate and high discharges to develop cyclic steps). The results of the experiments indicate: (1) with  $Qw2$  and  $Qw3$ , characteristic forest bedding takes place synchronously with a hydraulic jump departing the river mouth, (2) periodical/alternate changes in discharge give rise to periodic changes in foreset bedding structure, (3) it takes a few minutes for bedform to become stable under new discharge, and (4) when water discharge is changed more frequently than this transient time, bedforms existing are all of transient state associated with no or obscure synchronism of foreset bedding with hydraulic jump, and thus (5) stratigraphic preservation of cyclic steps and related deposits depends in part on transient time of the bedform.

Keywords: cyclic steps, flume experiment, alluvial river, delta, discharge, stratigraphic sign