

SCG064-P07

Room:Convention Hall

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## Bedform under complex oscillatory flow

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Some types of patterned three-dimensional ripples have been reported from modern and geological shallow-marine environments. Laboratory experiments have shown that ripples with polygonal crest line develop under circular oscillatory flow, which is induced by oblique-standing waves (e.g., Silvester, 1972; Jan and Lin, 1998), and it has been considered that patterned three-dimensional ripples may develop under horizontally two-dimensional complex oscillatory flow by interference waves. However, partially because of limitation of experimental equipments, relationship between patterned three-dimensional ripples and their formative conditions has not been well revealed. Based on these backgrounds, this study examined bedforms under two-dimensional oscillatory flow with complex trajectory through an analogue laboratory experiment. This study employed a newly developed two-directional oscillatory bed, which generates two-dimensional oscillation by combining two one-dimensional sinusoidal oscillations perpendicular to each other. The phase lag between two oscillations, and the period and amplitude of each oscillation are controlled by computer program. By using two-directional oscillatory bed, a circular tray filled with sediment was oscillated in still water within a circular tank in order to simulate relative motion between sand bed and oscillatory flow. The sediment tray is 100 cm in diameter and 2.5 cm in depth, and edge of the tray is taped off to hinder turbulence. The diameter and depth of water tank is 180 cm, and 60 cm, respectively. The experiment was conducted using fine sand with grain diameter of 0.2 mm. The oscillatory period was  $< 3$  s, and amplitude was  $< 7$  cm. Three typical bedforms were observed in the experiment: (1) ripples with polygonal crest line (RPCL), (2) ladder-back ripples (LBP), and (3) two-dimensional ripples. The major and minor crests of LBR were perpendicular to oscillations. Patterned three-dimensional ripples formed when the mobility number of each oscillatory component exceeds 2, i.e., the threshold value for ripple formation from a bed with a perturbation. TPCL formed when the ratio, smaller period/larger one, of two oscillations ranged from 0.8 to 1.0. LBR occurred when the ratio of periods was less than 0.8. The size of bedforms was depended on the amplitude of oscillatory components. Ripple spacing between major and minor crests of LBR was 1/3 of corresponding oscillatory amplitude. The mean width of polygonal cells of RPCL under circular oscillation was 1/6 of amplitudes.

### References

Silvester, R., 1972, Proceedings of the Institution of Civil Engineers, 51, 123-131.

Jan C.-D., Lin M.-C., 1998, Journal of Waterway, Port, Coastal, and Ocean Engineering, 124, 295-302.

Keywords: experiment, three-dimensional ripples, two-dimensional oscillation, two-directional oscillatory bed