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Portfolio Paper

Grain Sorting on Sand Ripples in Heterogeneous Sediments

Voropayev, S. I.*[1, 2], Balasubramanian, S.*[1] and Fernando, H. J. S.*[1]
*1 Arizona State University, Tempe, AZ 85287-9809, USA. E-mail: s.voropayev@asu.edu
*2 Institute of Oceanology, Russian Academy of Sciences, Moscow, 117851, Russia.
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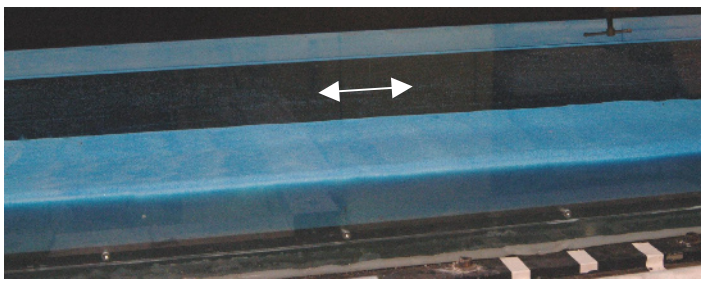

Fig. 1. Initially flat sand mixture (oblique view) in a water channel. Arrows show the oscillatory flow directions. Frame width is 100 cm.

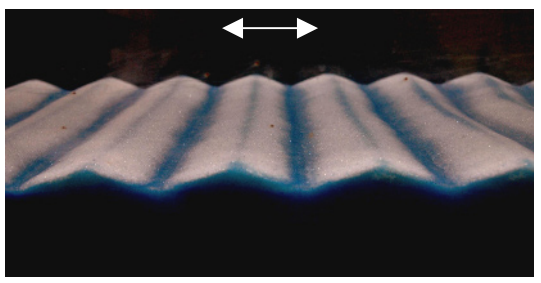

Fig. 2. Typical sediment segregation pattern in established ripples, side view. Fine grains (blue) are mostly seen on the ripple troughs with very narrow strips on the tops of the ripple crests; coarse grains (brown) are seen mostly on the ripple crests. Frame width is 45 cm.

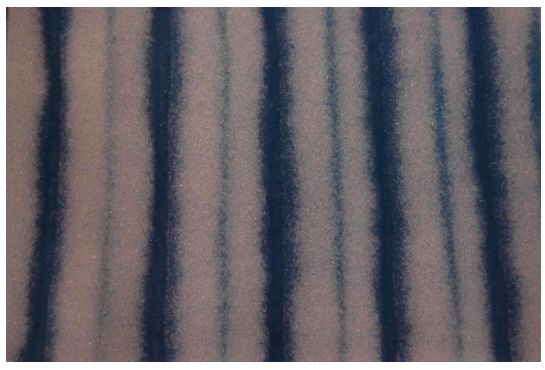

Fig. 3. As Fig. 2, but top view.

Sand ripples are commonly observed coastal benthic features that form under the action of waves/currents. In most previous studies of ripple dynamics homogeneous sand was used (see, e.g., Testik et al., 2005 and references herein)(1). In nature, sands are mostly heterogeneous. In the figures above we give an example of typical grain sorting as observed in a bimodal sand mixture under steady oscillatory flow in a water channel. The mixture consists of 34 % of fine sand (d = 0.3 mm, blue) and 66 % of course sand (d = 0.6 mm, brown). Initially flat (Fig. 1), sand mixture is subject to oscillatory flow (from left to right). With time, established ripples are formed (Figs. 2 and 3) with typical sediment segregation pattern: fine grains (blue) are mostly seen on the ripple troughs with very narrow strips on the tops of the crests; coarse grains (brown) are seen mostly on the ripple crests.

References: (1) Testik, F. Y. et al., Physics of Fluids, 17 (2005), 072104.