Geophysical Research Abstracts
Vol. 16, EGU2014-14920, 2014
EGU General Assembly 2014

Antidunes: new insights on processes and deposits

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This talk presents :1) a brief review of the development of our understanding of antidune processes and deposits; 2) results from the author's current collaborative studies, and; 3) points out key issues to be addressed in future research on upper-regime bedforms and sedimentary structures.
Antidunes deposits may be overlooked or incorrectly interpretated in the sedimentary record. In alongstream direction, their preserved sedimentary structures resemble dune trough-cross stratification while accros-stream sections show mostly planar beds. Antidune strata can be structureless, and hence similar to some chute-and-pool, or hydraulic-jumps deposits. Moreover, recognition of antidune stratification in nature may also be hampered by the spatial limitation of exposures compared to the scale of the formative bedforms. However, antidune signature presents internal distinctive stratal and textural features that were revealed by experimental investigation and observation in modern fluvial deposits.
The main results come from the comparative image analysis of video records and photographs of sediment samples (sediment peels) from flume experiments with upper-stage, open-flow conditions. These results brough new insights on antidune migration processes and deposition /erosion sequences, allowing to revise the traditional model typically presented in texbooks. Differences do occur between deposition/erosion patterns of 'progresive' antidunes (not all antidunes break) and breaking antidunes, resulting in the (potential) preservation of spatially-limited strata with boundaries that define a sort of polygone within the overall deposits, and that can show 'clusters' of gravel (antidune signature may then be more apparent in sand-and-gravel sediment than in well-sorted sand). This specific sedimentary feature was obverved in modern deposits from a dryland river (where antidune can occur during flash floods).
Otherwise, limited experimental data on submarine, super-critical , high sediment-concentration currents suggests that depositional processes would be similar to those of progressive antidunes (more research is required to develop a depositional model).
Future research, in open-flows or submarine currents, should consider the role of sediment concentration, sedimentation rate, mixed sediment size and/or density on antidune processes and deposits, and on their 3-D characteristics (the use of CT-Scan for non-medical purpose would be appropriate for conducting such investigation).