CERAMAH TEKNIK TECHNICAL TALK

Inertia and Entrainment: Two Factors that Differentiate Subaqueous from Subaerial Sediment Transport Regimes on Complex Margins

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Dr. Stefan M. Luthi, the professor in production geology and head of the section Applied Geology at the Delft University of Technology gave a technical talk to the students of University of Malaya and members of the Geological Society of Malaysia on Thursday, 20 September 2012. The talk was attended by about 50 faculty, students and industry professionals. A native of Switzerland, Dr. Luthi received his M.Sc. in 1974 and Ph.D. in 1978 at the ETH Zurich. His specializations are reservoir characterization using new geophysical technologies, sedimentology, petrophysics, and reservoir management. He wrote over 50 papers in scientific journals and one textbook. He currently supervises several postgraduate projects and is involved in numerous research projects nationally and internationally. He is a member of many international societies such as the AAPG, EGU, SPWLA and EAGE.

Abstract: Complicated physiography on basin margins, where diaprism and/or faulting disturb an equilibrium profile, create a topographic template with abrupt changes in gradients and local depressions such as minibasins. In subaerial settings, sediment transport by rivers is strongly influenced by the geomorphology, with their courses usually following the maximum gradient. This behavior cannot be readily extrapolated to subaqueous settings, because the physics of subaqueous sediment-laden flows differ significantly from their subaerial counterparts. A comparison between subaerial and subaqueous flows on complex basin margins relies on general physical considerations, laboratory experiments and numerical flow simulation. Subaqueous flows on sufficiently steep margins differ from subaerial flows in that they 1) grow and dilute by entrainment of ambient fluid, and 2) have a much lower density contrast to the ambient fluid. Consequently, subaqueous flows are "lighter" than subaerial flows, but possess a significant momentum due to the generally large volume of the sediment-fluid mixture involved. The inertia and "lightness" cause them to respond sluggishly to topographic changes, with parts of flows able to cross obstacles, a behaviour that rivers do not exhibit. Entrainment causes the flows to increase in height with distance, resulting in lateral spillover and flow stripping in confined areas. These effects are demonstrated with numerical flow simulations on relay ramps and minibasins.

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