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New insights from direct monitoring of turbidity currents; and a proposal for co-ordinating international efforts at a series of global "turbidity current test sites"

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Turbidity currents, and other types of submarine sediment density flow, arguably redistribute more sediment across the surface of the Earth than any other flow process. It is now over 60 years since the seminal publication of Kuenen and Migliorini (1950) in which they made the link between sequences of graded bedding and turbidity currents. The deposits of submarine sediment density flows have been described in numerous locations worldwide, and this might lead to the view that these flows are well understood. However, it is sobering to note quite how few direct measurements we have from these submarine flows in action. Sediment concentration is the critical parameter controlling such flows, yet it has never been measured directly for flows that reach and build submarine fans. How then do we know what type of flow to model in flume tanks, or which assumptions to use to formulate numerical simulations or analytical models?

It is proposed here that international efforts are needed for an initiative to monitor active turbidity currents at a series of 'test sites' where flows occur frequently. The flows evolve significantly, such that source to sink data are needed. We also need to directly monitor flows in different settings with variable triggering factors and flow path morphologies because their character can vary significantly. Such work should integrate numerical and physical modelling with the collection of field observations in order to understand the significance of field observations. Such an international initiative also needs to include coring of deposits to link flow processes to deposit character, because in most global locations flow behaviour must be inferred from deposits alone. Collection of seismic datasets is also crucial for understanding the larger-scale evolution and resulting architecture of these systems, and to link with studies of subsurface reservoirs. Test site datasets should thus include a wide range of data types, not just from direct flow monitoring.

This 'test site' initiative may be timely and feasible, due to recent technological advances in monitoring sensors, moorings and autonomous data recovery. This will be illustrated here by seminal field datasets recent collected by colleagues from the Squamish River Delta, Bute Inlet, Monterey Canyon, Congo Canyon and offshore SE Taiwan. This talk will conclude with some suggestions for appropriate test sites and collaborative approaches to future data collection. The initial phase of this proposal has been funded by the UK research councils, and input is sought into the design of the broader test site initiative.

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