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Squamish Sleuthing: Origin and behaviour of different types of up-slope migrating bedform trains on the Squamish Delta

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Turbidity currents are important because they can undermine seafloor structural foundations for oil and gas pipelines, break strategically important cable networks, and their deposits form commercially important oil and gas reservoir. An important advancement in our understanding of turbidity currents has been that supercritical flow conditions are common. It is known that upper regime flow and different bedform morphologies associated with such flows exist, but the mechanisms through which these flows and bedforms are produced are not yet fully understood. As shown by Hughes Clarke et al., (2013, 2013), Paull et al., (2010) and others, upstream migrating bedforms are ubiquitous in turbidititic systems, but linking flow to process remains somewhat elusive. The link between flow and process is crucial in outcrop investigations determining the origins of different flow types based on their spatial range and bed morphologies. Numerical models will also benefit from this link as flow parameters form the basis of numerical models.

Advances in technology have improved direct monitoring of the dynamics of turbidity currents, their interaction with the beds, and links between flows and deposits. As a result of the advent and refinement of acoustic technologies, high resolution bathymetric images and real-time flow data can now be collected.

Here we present the analysis of repeat high resolution bathymetric data showing trains of upslope migrating bedforms on the Squamish Delta. The analysis shows that many of the bedform trains extend upslope to distinct failure scars near the delta-lip, but many other bedforms trains start far from the delta lip in mid-slope. As noted by Hughes Clarke et al. (2014) some of the mid-slope bedforms are not associated with a measureable failure scar. This suggests that not all of the bedforms are triggered by failure of the locally steep (40 degree) prograding mouth bar, or by plunging river discharge at the delta lip.

The distances to which supercritical bedforms extend into deep water is still poorly known, and the distances to which these flows extend varies. Further analysis linking run-out distance to event type (i.e. mass wasting or the enigmatic mid-slope events) may offer clues as to how far supercritical bedforms can extend into deeper ocean basins, leading to improved outcrop investigation.