Subaqueous Landslides, Mass Transport Deposits, and Other Catastrophic Units: 16 Years of Observations, Readings, Reviewing, and Inconclusive Statements Regarding O&G Relevance

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ABSTRACT

There is a wide range of terms that have been used during the last few decades to describe and categorize what we usually refer to as mass transport deposits (or complexes). The abundance of terminology has also caused some confusion in terms of the genetic connotation of these units within the broader context of gravity-induced deposits and processes. Mass transport deposits are nothing more than subaqueous landslides, but it is important to keep in mind that a broader subset of deposits and processes fall into this category including slides, slumps, and debris flows and that these units can co-occur as part of the same depositional event. Subaqueous landslides are not turbidites and this is an important differentiation; however, their occurrence can be closely related, and this might have implications in terms of reservoir presence and quality as well as reservoir/seal pairing.

The occurrence of subaqueous landslides is not constrained to continental margins or the marine realm, these units are also common within lacustrine environments, shelfal delta fronts, and within volcanic margins including mid-oceanic ridges. Subaqueous landslides can also be associated with carbonate margins where they are commonly referred to as carbonate breccias. Artificial discipline boundaries have prevented us from studying carbonate and siliciclastic subaqueous landslides as part of the same set of processes and therefore we still do not fully understand the influence of rheology in the development of these units. Subaerial landslides transitioning into lakes, fjords, and coastal areas in general are also closely interlinked with the dynamic of subaqueous landslide events and their occurrence can have devastating anthropogenic consequences. Again, interdisciplinary boundaries within the geosciences have prevented us from better understanding these processes.

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Interest in the study of subaqueous landslides spans a wide range of sub-disciplines that include earth-scientists studying the link between climate change and gas hydrate dissociation, planetary geologists using subaqueous landslides as potential terrestrial analogs, petroleum geologists evaluating the seal/reservoir capacity of ancient submarine landslides (aka. mass transport deposits), and engineers evaluating their geotechnical risks and tsunamigenic potential. There is still a lot of work to do to bring these disciplines together so that we can make tangible progress in the understanding of recurrence periods of subaqueous landslides, their pattern of distribution in space and time, the true nature of triggering mechanisms and how different tectonic regimes and environmental factors can affect their timing.

In this presentation, Lorena will share her personal insights and experiences after 16 years of studying subaqueous landslides using public data and after closely engaging with a broad community of international researchers working on different aspects of subaqueous landslides within the context of project IGCP–640 S4SLIDE (Significance of Modern and Ancient Subaqueous Slope and Landslides). This project is part of an initiative by the International Geoscience Program (IGCP) and UNESCO.