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Climate control on submarine landslides: How certain can we be?

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Submarine landslides are the main contributor to the oceans' sediment budgets, can cause damaging tsunamis and pose a major threat to any kind of offshore construction. They can occur on very shallow slope angles (< 2°), which are almost always stable on land. We are yet to monitor one of these low gradient slope failures, and mechanisms that can initiate submarine landslides remain highly speculative.

Changes in environmental conditions such as transitions between ice- and greenhouse worlds as well as corresponding sea level changes are believed to affect slope stability. Based on geotechnical models and field data we discuss how climate and sea level changes may and may not affect submarine slope stability.

Understanding any correlation of the timing of submarine landslides and climate changes would help to narrow down the large number of hypotheses that are suggested to explain submarine slope failure, as well as aiding in the evaluation of future hazard. In order to relate the temporal distribution of submarine slides to global climate robust dating is essential. Climate archives document past temperatures with almost annual resolution and jumps of up to 3°C within 100 years are recorded. But how precise are the ages that are obtained for submarine landslides? Taking the Storegga slide as an example, the number of age measurements necessary to obtain a reliable age is assessed. We then critically review the quality and reliability of the available ages for a number of other open continental slope slides. Our results indicate that caution must be taken in correlating landslide occurrence with global temperatures.