10b History of cliff retreat : theory and example from the English Channel

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What if coastal cliffs recession rates could be measured 60 times further in time than with classical methods? Coastal cliff evolution prediction for the next century would then not be so much of a stretch. In this work, we present a new method based on measurements and modelling of ^{10}Be concentration transect across present-day shore platforms to establish the recession rate of coastal cliff for the last ca. 6000 years. The numerical model predicts the shape of ^{10}Be concentration transects to be expected as a function of a given cliff recession rate, vertical coastal platform down-wearing rate and assumed time of sea level reestablishment to present-day level since deglaciation. Two independent transect features serve to fit long-term recession rate model to field observations: a major ^{10}Be concentration drop is predicted where the cliff was abandoned for ca. 100k years, during the glacial period, and a characteristic dome shape directly related to the recession rate of the cliff.

A retreating cliff site from the English Channel coast of France at Mesnil Val serves as a demonstrator of this method. Retreat rates were too fast to pinpoint the predicted glacial cliff position but ^{10}Be concentrations sampled across the shore platform nevertheless indicate that the cliff retreat rate since the mid-late Holocene is comprised between 10-30 cm/yr, with a preferred value at 25 ± 5 cm, which turns out to be fully coherent with a 30-years-long assessment.