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Ciarletta, D.J., Lorenzo-Trueba, J., and Ashton, A.D., 2019, Mechanism for retreating barriers to autogenically form periodic deposits on continental shelves: Geology, https://doi.org/10.1130/G45519.1

This file contains the following:

Item DR1: field site profiles

Items DR2–DR4: animations of barrier periodic retreat on 1 m/km slope, 2 m/km slope, and 3 m/km slope (click here to download 3 .gif files in one compressed folder)

Item DR5:model sensitivity to input parameters

SUPPLEMENT

S1. Field Site Profiles

For sites that display an apparent periodic pattern of deposition, we determine wavelength by approximating the distance between the midpoints of deposits using the scales provided on profile figures from the corresponding studies. For cross sectional volume, we multiply the length of deposit by the height/thickness stated in the associated study. One potential source of inaccuracy is that cross sections at the New Jersey site (Nordfjord et al., 2009) appear nearly 45 degrees to the cross-shore, and deposit/ravinement lengths have to be estimated from plan view maps. However, we believe our estimates are sufficient to justify an initial exploration and comparison of trends, particularly in terms of volume versus slope and rate of sea level rise.
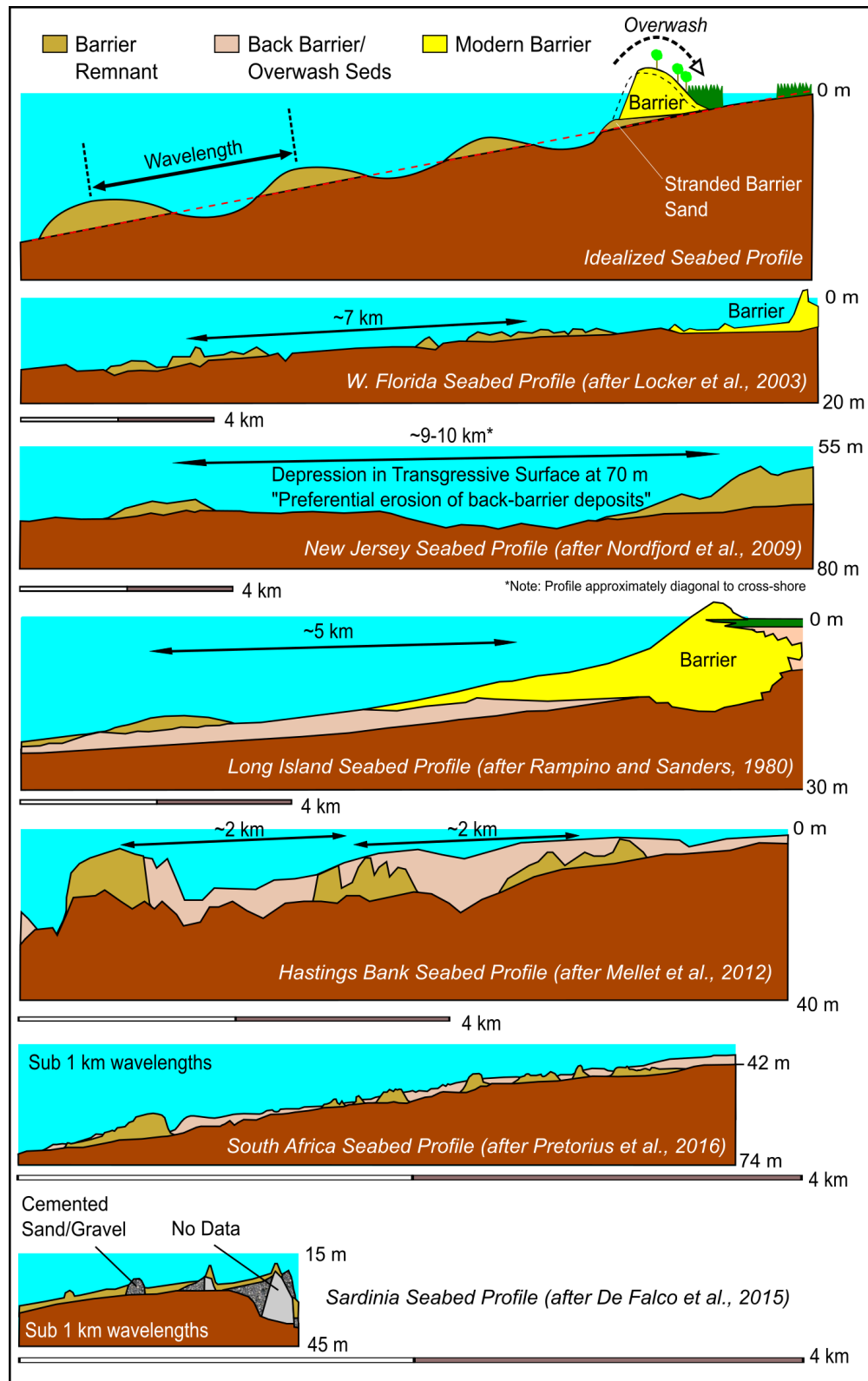
Figure S1-1. Expanded Figure 1. Top Panel: Idealized transgressive barrier sequence with alternating remnant sand bodies and ravinement surfaces. Bottom Panels: West to east profile through Sand Key, West Florida, after Locker et al. (2003). Southeast to northwest profile through the New Jersey outer continental shelf, seaward of the Mid-Shelf Wedge, after Nordfjord et al. (2009). South to north profile of the Long Island inner shelf off Cedar Beach, after Rampino and Sanders (1980). South to north profile of the Hastings Bank, after Mellet et al. (2012). Southeast to northwest profile through the KwaZulu-Natal shelf off Durban, South Africa, after Pretorius et al. (2016). West to east profile through the mouth of the Gulf of Orsitano, Sardinia, after De Falco et al. (2015).

SUPPLEMENT

S5. Model Sensitivity to Input Parameters

The following plots depict modeled wavelength and volume of deposits produced by autogenic partial overstepping for different environmental input parameters: a) the shoreface response rate K, b) equilibrium barrier width W_e, c) equilibrium barrier height H_e, d) shoreface toe depth D_t, and e) maximum overwash rate $Q_{OW,max}$. Figure S5-1, below, shows the baseline scenario for our study, the input parameters for which can be found in the Appendix. In each output (Figures S5-2 to S5-11), only one parameter is adjusted from the baseline scenario.
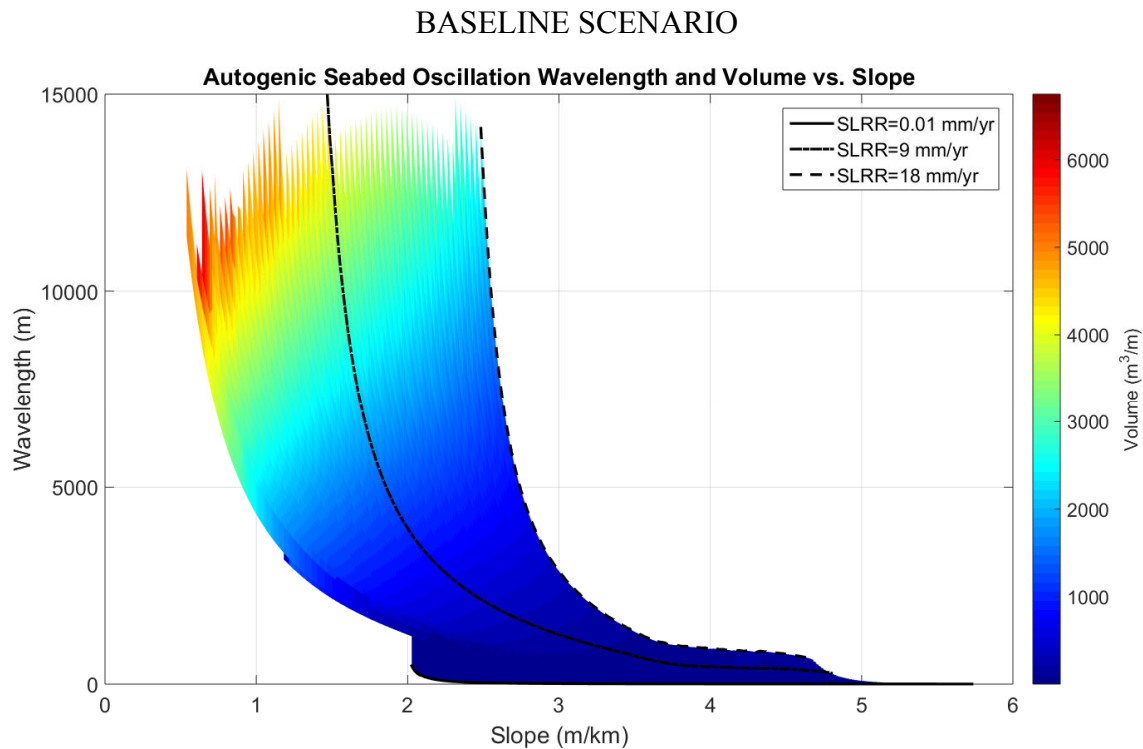
BASELINE SCENARIO

Figure S5-1: Modeled remnant seabed oscillation wavelength and volume produced by a barrier undergoing periodic retreat under the baseline scenario, with $K=2000$ m^3/m/yr, $W_e=800$ m, $H_e=2$ m, $D_T=15$ m, and $Q_{OW,max}=100$ m^3/m/yr (for other values see Appendix).
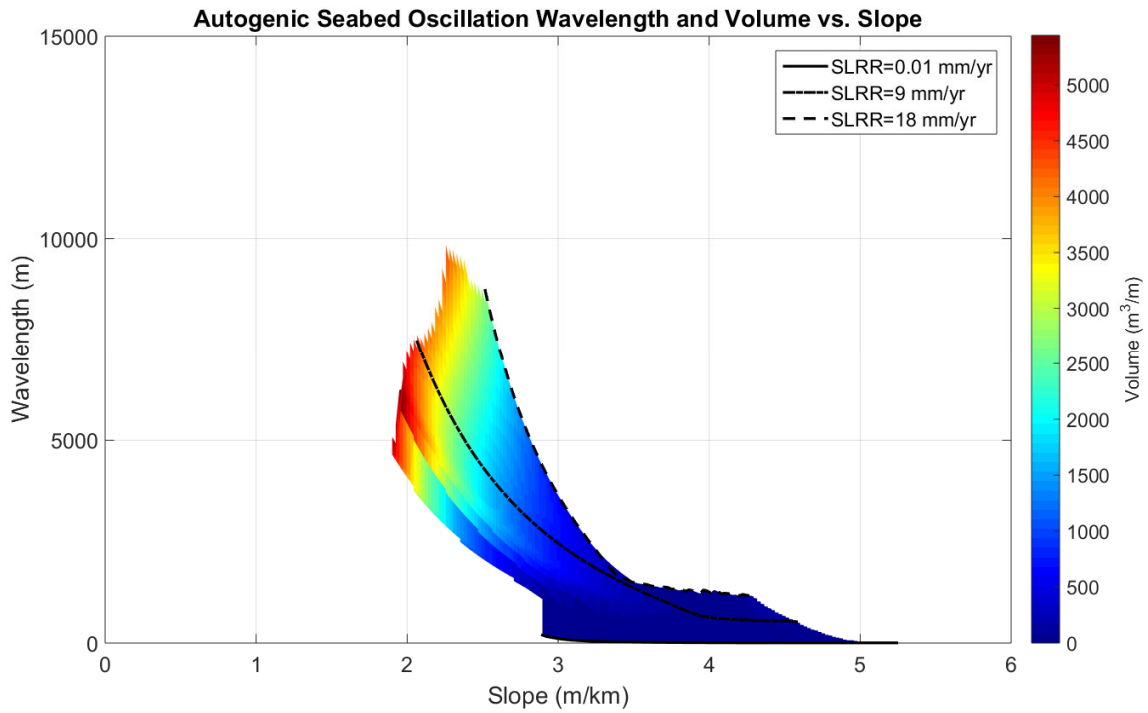
Figure S5-2: Model results for a slower shoreface response rate K=1000 m^3/m/yr. Baseline scenario: K=2000 m^3/m/yr.
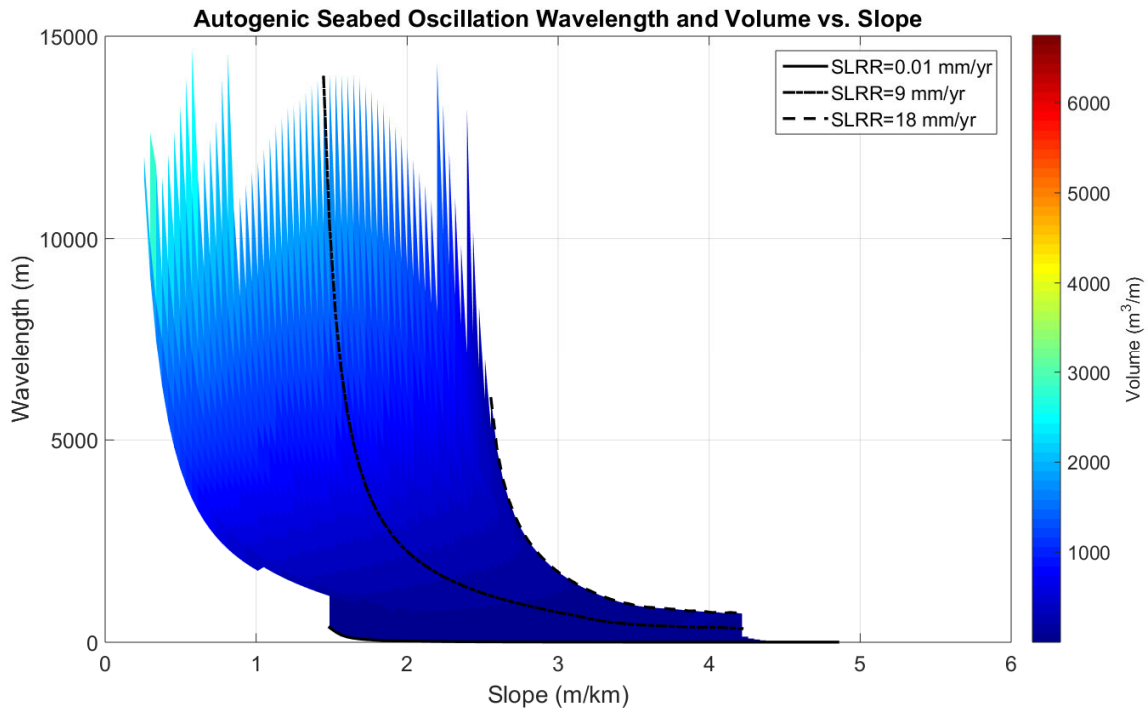
Figure S5-3: Model results for a faster shoreface response rate K=3000 m^3/m/yr. Baseline scenario: K=2000 m^3/m/yr.
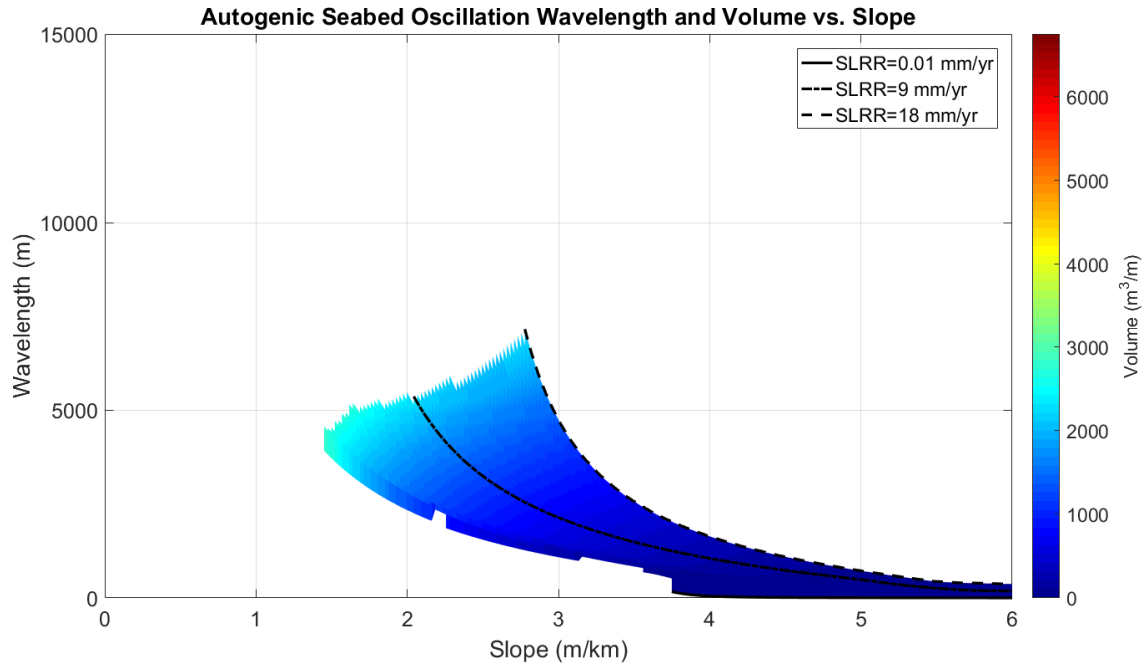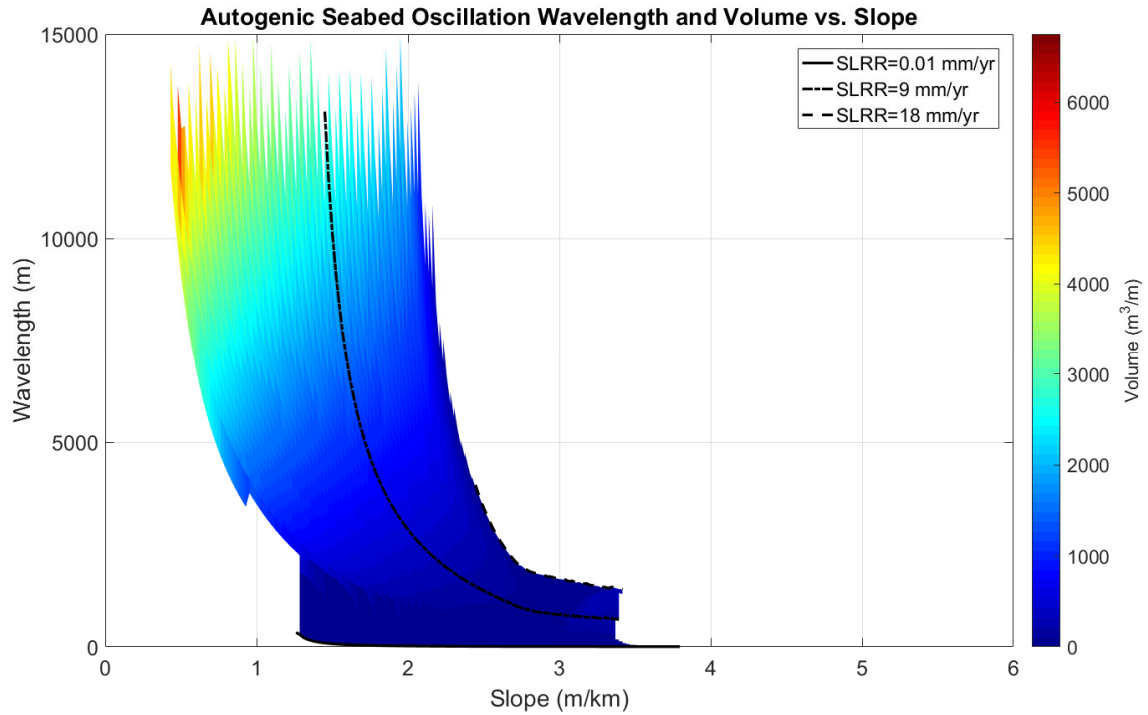
Figure S5-4: Model results for a narrower equilibrium barrier width W_e=400 m. Baseline scenario: W_e=800 m.

Figure S5-5: Model results for a wider equilibrium barrier width W_e=1200 m. Baseline scenario: W_e=800 m.
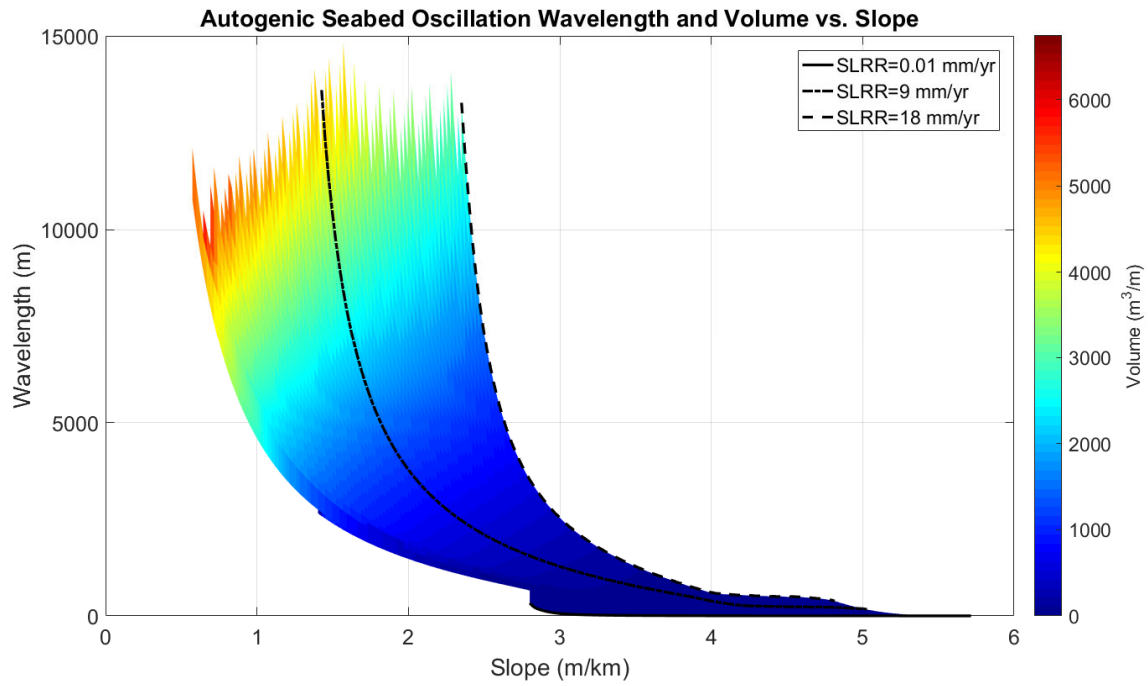
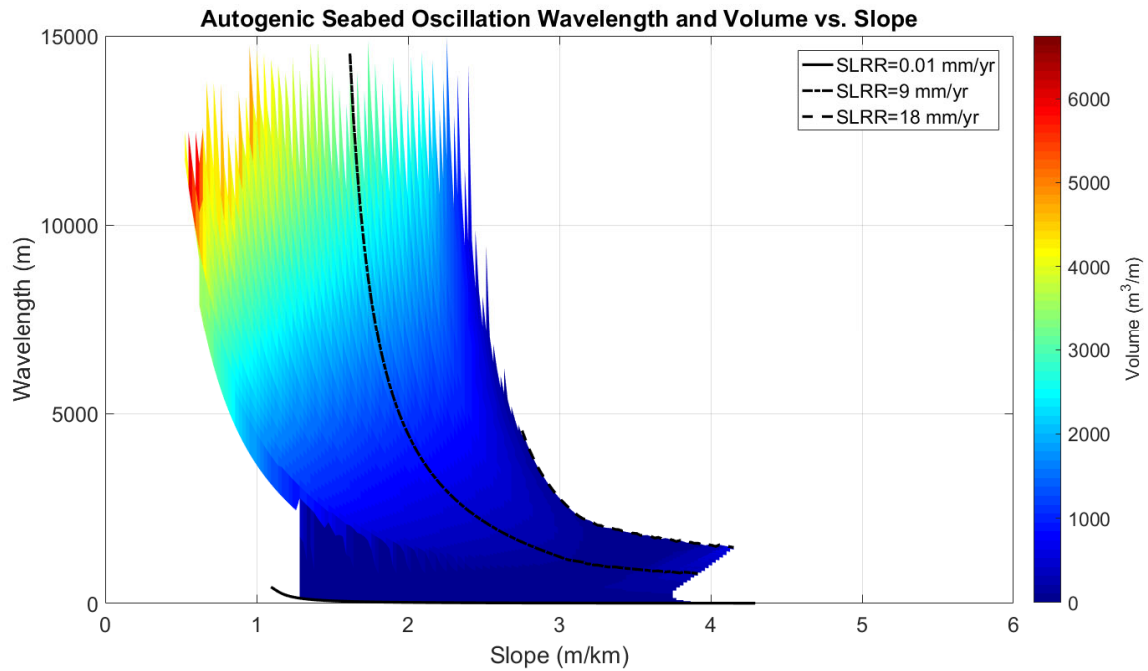Figure S5-6: Model results for a shorter equilibrium barrier height H_e=1 m. Baseline scenario: H_e=2 m.

Figure S5-7: Model results for a taller equilibrium barrier height H_e=4 m. Baseline scenario: H_e=2 m.
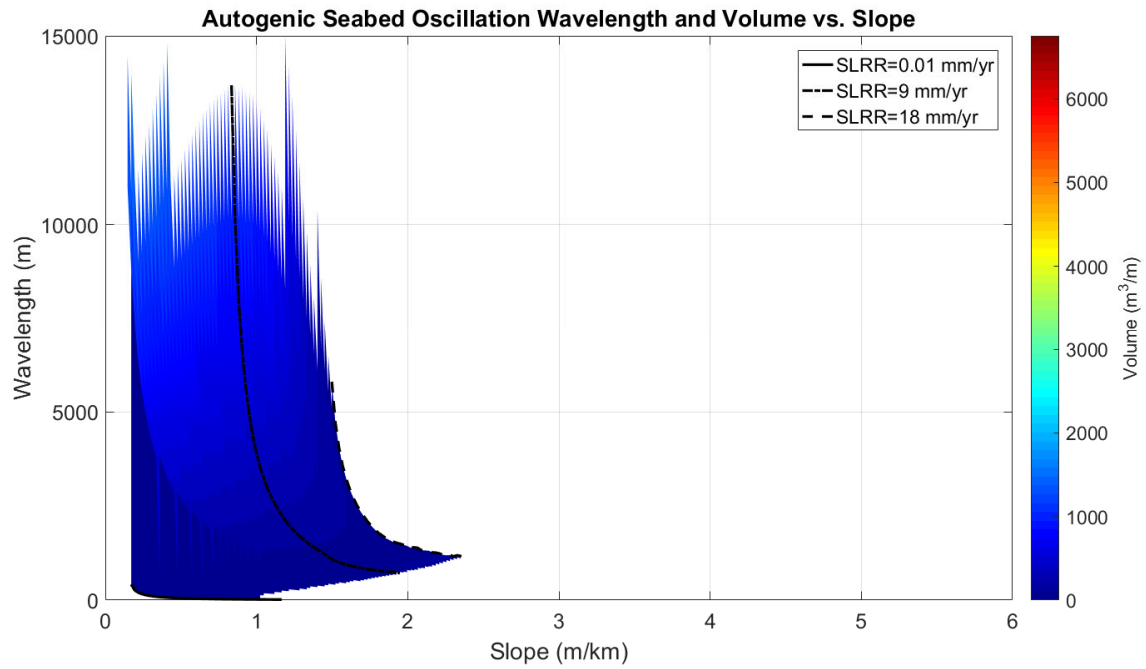
Figure S5-8: Model results for a shallower shoreface toe depth D_t=7.5 m. Baseline scenario: D_t=15 m.

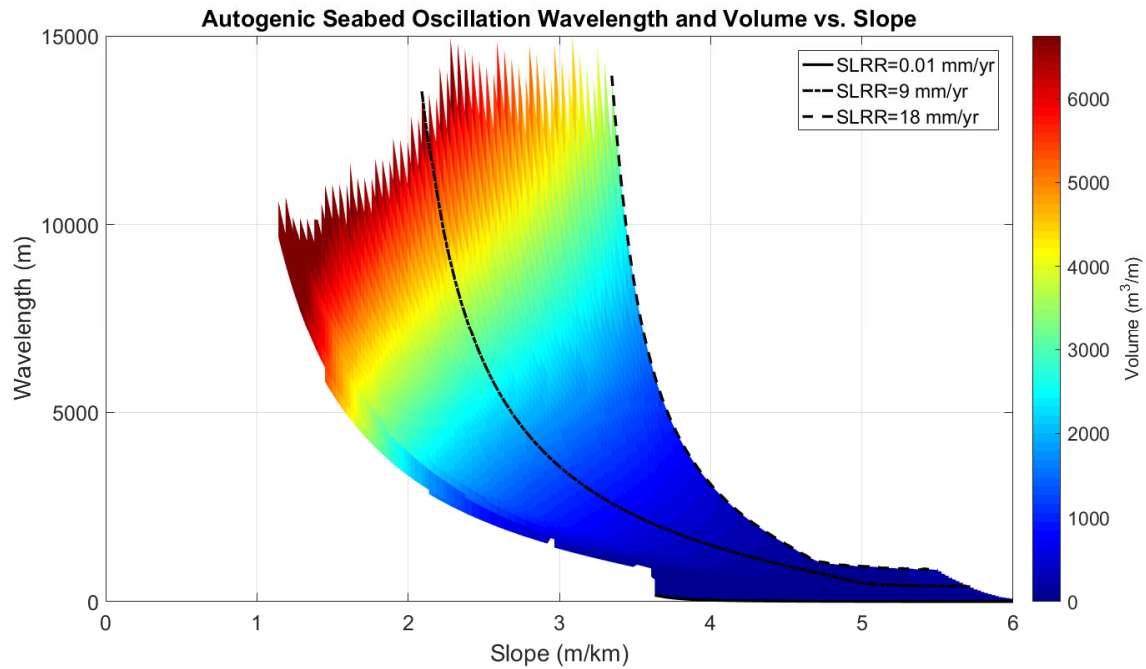Figure S5-9: Model results for a deeper shoreface toe depth D_t=22.5 m. Baseline scenario: D_t=15 m.

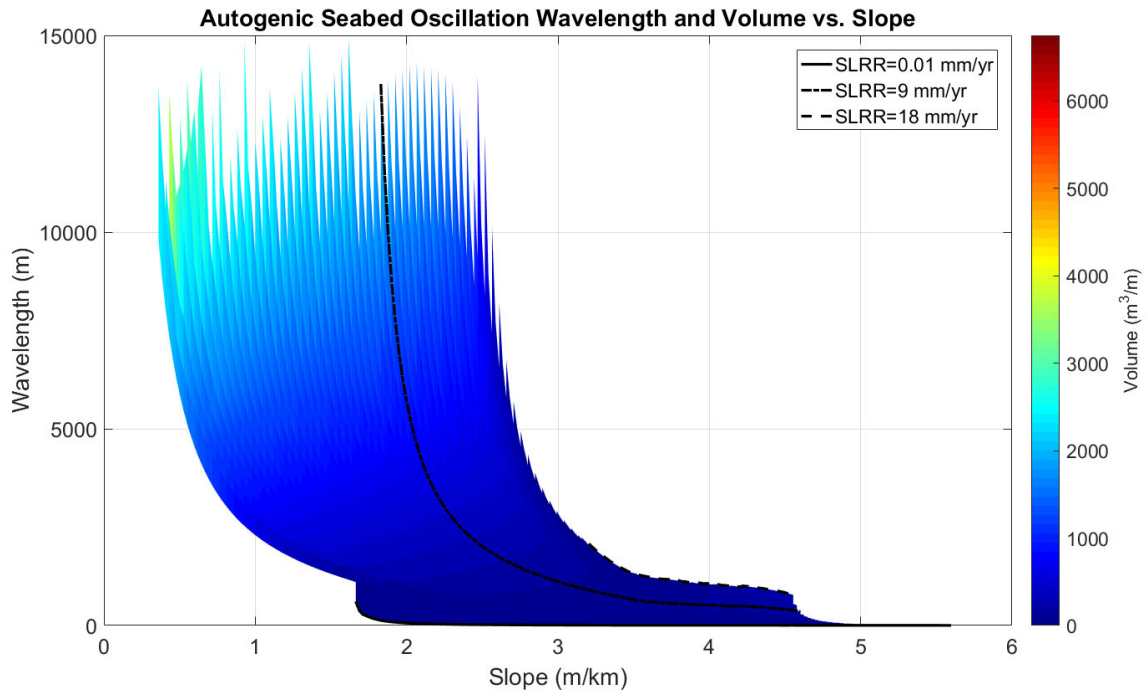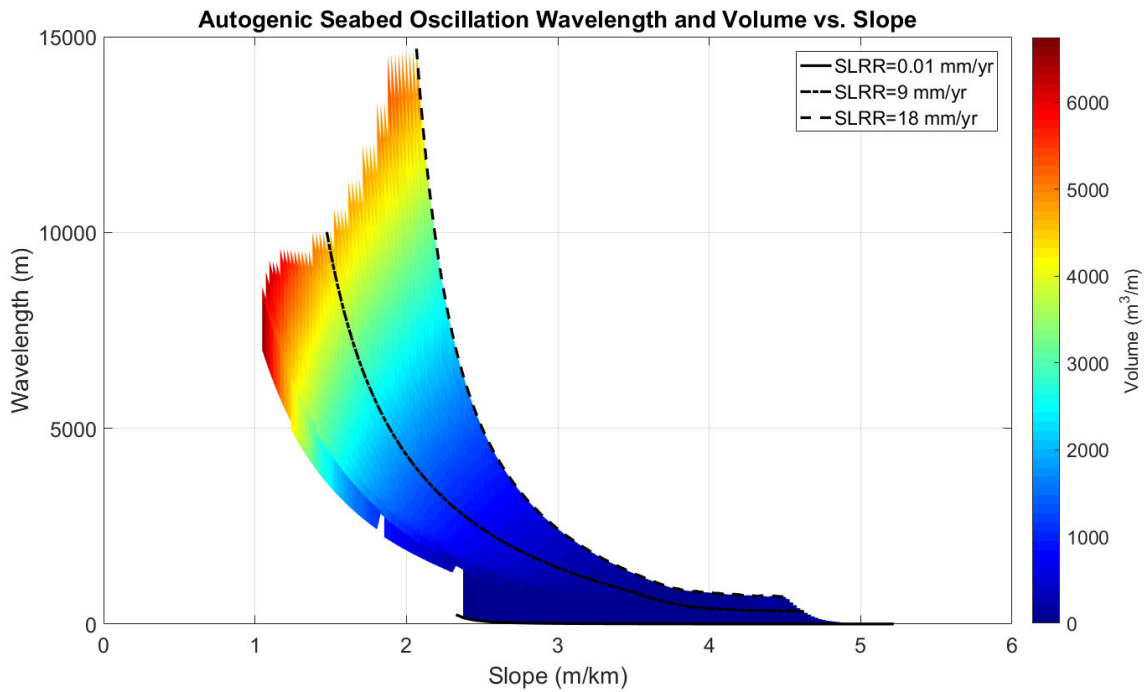Figure S5-10: Model results for a decreased maximum overwash rate $Q_{OW,max}$=75 m^3/m/yr. Baseline scenario: $Q_{OW,max}$=100 m^3/m/yr.

Figure S5-11: Model results for an increased maximum overwash rate $Q_{OW,max}$=125 m^3/m/yr. Baseline scenario: $Q_{OW,max}$=100 m^3/m/yr.