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Earth Surface Dynamics Discussions

Interactive comment on "Controls on the distribution of cosmogenic ^{10}Be across shore platforms" *by* Martin D. Hurst et al.

M. Dickson (Referee)

m.dickson@auckland.ac.nz

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This is a welcome addition to a rather slowly emerging literature on the application of cosmogenic dating to inform rocky shore evolution studies. The proposed model usefully extends the work described by Regard et al. (2012) and includes I think the majority of the factors required. In doing so, the paper highlights that the use of this method to determine erosion rates on rocky shores, while conceptually simple, in practice is rather more complex. Nevertheless, the lack of quantitative measurements of rates of change has been a long-standing limitation in our field, so efforts in the direction of this paper are welcome.

Below are some comments that the authors might wish to consider during any revision. Please note that these comments integrate thoughts from Hironori Mat-

sumoto who is currently making further developments to a rocky shore profile evolution model (Matsumoto, H., Dickson, M. E., and Kench, P. S.: An exploratory numerical model of rocky shore profile evolution, Geomorphology, 268, 98–109, doi:10.1016/j.geomorph.2016.05.017, 2016.)

Can you clarify how the model considers platform slope? Does it calculate the cliff toe position with a fixed platform geometry, similar to previous tide-less models (Sunamura, 1975)? Perhaps not, because later, in section 5.5, there is reference to the gradient of the shore platform decreasing through time, as the platform widens. There is also reference to the emergence of a 'stepped' platform - what is the reason for this? Ultimately it is a little unclear how exactly the geometry is handled. The text states that the model is similar to the existing models of Trenhaile (2000), Walkden and hall (2005), and Matsumoto et al (2016), which all consider tide and vertical components. It would be useful to expand and clarify similarities and differences in that regard.

Did the authors consider prospects for using the model to test/discuss factors that affect 10Be concentrations on other types of shore platform geometry beyond the sloping (type-A) platform investigated? The paper refers to type-B platforms, raising the question as to whether the model adds any new knowledge of likely differences in concentrations across different possible platform geometries.

The model considers topographic shielding in the case of a constant cliff height. A further exploration of interest would be to consider a slowly increasing cliff height. What comes to mind is the example of progressive cliffing into hillslopes rounded over long glacial periods. This could introduce further complications for 10Be concentrations, because erosion into cliffs of increasing height might progressively increase beach thickness (5.4.1)... assuming no gradient in alongshore sediment flux. The number of potential model scenarios can quickly increase, but it would be interesting to have a somewhat expanded discussion of this factor.

There is some interesting discussion on the implications of platform downwear, but I

agree with the other reviewer that this aspect of the modelling could be improved - he makes a number of points to consider in that regard which I have not expanded on here.

In concluding, is it possible to tabulate or summarise somehow the relative sensitivities of the different factors?

Minor points: - Please double check that you have the exponent written correctly in equation 5 (i.e. '+' hw(t))? - Please double check the wording of the last sentence on p7 (upper / lower?) - two "and"s p4 line 28 - Clarify what is meant by significant (para 8, line 16) - Mis-spelling of fund[e]mentally - Grammar problem para 9 line 24 - no full stop before Failure p15 l12 - Choi2012 p16

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