REVIEWER 1

Dear Editor, dear Authors,

In this short and clear contribution, Bossis and colleagues introduce a new method to quantify rates of coastal cliff retreat on a previously elusive timescale of kyr. To fill this important gap in coastal studies, the authors collect fresh colluvium at the base of quartz bearing cliffs and scarps and measure their 10Be concentration to back calculate a rate of denudation. This method is adapted from a similar approach that helps constrain the rate of lateral erosion in rivers. Three sites are used to test the method and the results conform to reasoned expectations. There are no independent confirmation of the rates but that reflects the novelty of the approach. I had reviewed an earlier version of this text submitted to another journal and my initial comments are all addressed. The current manuscript focuses on the method and its potential, and does so with clarity. I have minor comments that mostly concern readability. I believe the manuscript to be very close to publication.

Response: We would like to thank Luca Malatesta for his constructive comments and suggestions.

Note that I am not a specialist in cosmogenic nuclides and cannot comment on specific details of the methodology.

I address the authors directly for my comments.

I think that the authors should cite and comment the interesting of Swirad and Young (2022, Geomorphology https://doi.org/10.1016/j.geomorph.2022.108318) where the relative contribution of waves and precipitation for cliff erosion is discussed based on repeat lidar surveys. It is valuable as an example of Lidar constraints but more importantly helps understand where and why erosion can occur on coastal scarps.

Thank you, we added this citation.

Formulations and rigor of language.

Throughout the text, there are a few elements of language that veer on the poetic and figurative and do not provide clear-cut information. Below you will find examples and it would be good to screen the manuscript for more.

l. 28: “does little” What is the issue? If “little” what is the little amount that is done?

We reworded as “does not integrate for all the stochastic nature”.

l. 134: “budding vegetation” it is my understanding that when referring to vegetation, budding keeps its literal sense (developing buds) and not the figurative one that the authors were presumably targeting. “budding vegetation composed of” can be removed.

OK.

l. 148-149: to rise rapidly at a decreasing rate is an odd phrasing.

We reworded as " sea level rose rapidly just after the last glacial maximum, and then at a decreasing rate".

Discussion of the low erosion rates

I was confused reading the last four paragraphs of the discussion. It should be explaining the reason behind "surprisingly low erosion rates" (l. 198). But I don't see which sites you refer to. The previous paragraph was about particularly high rates of erosion. And the before that, the slower rates in Peru do not seem surprising as they fit your expectations and you explain them already. Is it just a theoretical discussion or am I missing the link with a field site?

It's true that we were a little elliptical. We wanted to emphasize that all the cliff recession values known to date are in the order of millimeters to meters per year. These are values that correspond to modern speeds and to some average speeds over the last few thousand years. We therefore expected to find faster retreat rates, or even no measurable concentration of 10Be. In these 4 paragraphs we therefore consider all the hypotheses that could lead to an underestimation of the retreating rates. We have added this sentence at the beginning of these 4 paragraphs:

"As we have obtained coastal erosion values that are slower than those documented worldwide (Premaillon et al., 2018), we discuss in the following several biases that could lead to an underestimation of retreat rates in our study."

Terminology: recession, retreat, erosion

You are using the term "recession" throughout the manuscript. Is that different from the more commonly used "retreat"? I am more familiar with retreat, or simply erosion. Is recession specific to coastal cliffs? Would it be simpler to stick to retreat for all cliffs?

OK we changed for retreat all along the text.

Line by line comments:

l. 7 "[…] erosion rates, AND the geomorphic and climatic […]"

Done.

l. 9 I think that "colluvium" is not used as a countable object: "from vegetated colluvium"

Done.

l. 16, 38 "wave action" not "waves action"

Done.

l. 28 Do you mean "account for" instead of "integrate for"? Alternatively drop the "for"

Done.

l. 38 “rocks resistant to wave erosion”. All rocks are “resistant” to erosion. It is a matter of how much.

OK we added “more resistant”.

l. 46 “less dissected” I can't see any river on your pictures. "less" or “not"?

OK “not”.

l. 49-50 “With this method, we obtain slow cliff recession rates, between 0.05 and 0.5 mm/a.” This suggests that this method can only capture this one order of magnitude. Is that the case? I think you are actually talking about the three sites you target here. Worth clarifying.

You are right, we discuss later in the discussion section that this method is suitable for retreat rate lower than 1cm/y (higher erosion would result in no measurable 10Be).

l. 50 mm/yr not mm/a, distance per time, not per age.

According to “HOLDEN N. E., BONARDI M. L., DE BIÈVRE P., RENNE P.R. & VILLA I.M., 2011 - IUPAC-IUGS common definition and convention on the use of the year as a derived unit of time (IUPAC Recommendations 2011). Pure and Applied Chemistry, 83 (5), 1159-1162.”, it is suggested to use /a.

l. 50 “reverse” do you mean inverse?

Yes!

l. 55 The sentence suggests that it is expected that there’s a hillslope above the cliff but that it will be ignored.

OK; we removed the reference to the hillslope. Actually, there is almost always a hillslope but we explain then that we sampled carefully at sites where the contribution from the hillslope is either null because the top of the cliff is a drainage divide (no hillslope above the cliff) or necessarily small because we are below a ridge. There is only one site that is more ambiguous (BRAVE2) and that we discuss in the discussion and in the Supplementary material: we demonstrate from mass balance arguments that the hillslope contribution is unable to significantly bias our result.

l. 56 ongoing erosion?

Done, thank you for the suggestion..

l. 66 coasts don't have a summit, or do they? I think it's clearer to directly mention the object you target, which is the top of the coastal cliff.

OK.

l. 70-71 the escarpment surface is regolith? or the top surface in which the cliff is cut?

We reworded it as “cliff surface”.

l. 93 small note: subscripts that are not variables themselves are usually not italicized.

We keep that as it is as we are consistent with the notation throughout the text.

l. 134-135 Is it just an educated guess (fine by me), or is there a method behind this estimate?

No, there is no specific method.

l. 148-149: So, when did the platform emerge? when did waves stop reaching the base of the cliff?

As the uplift rate is about 0.5 mm/a and the paleo-cliff foot is at about 100 m above modern sea level, an age of emersion of about 200 ka can be estimated. We have added a comment to indicate this typical duration.

l. 229: “when the sea level was largely below the current one, implying that the sea and waves” can be replaced by “when the sea level was lower and the waves”

OK thank you.

Figure 1 caption: “rather progressive” what does that mean?

Replaced by “ongoing”.

Figure 2 caption: “vertical equidistance” I don't know what vertical equidistance is. I guess it means contour line spacing. In the case I'm not the only person unfamiliar with the term, I'd suggest "contour lines are traced every 20 m." Feel free to ignore.

Done.

Thank you very much!