

Response to Kristina Krklek referee comments on “Impact of grain size and rock composition on simulated rock weathering” by Yoni Israeli and Simon Emmanuel

We thank Kristina Krklek for her helpful and constructive review. Responses to the comments are provided below, in underlined italics.

RC 1.1: In Methods section authors describe dissolution (chemical weathering), but it is not clear how mechanical weathering is calculated. Authors do give “hint” of that explanation in Page 3, Line 28-29 and in the last paragraph of Methods section (Page 4, Lines 1-5), but this should be described more clearly.

AC 1.1: After each time step the rock is scanned for regions that reached the threshold for chemo-mechanical detachment, i.e. grains that are surrounded by fluid from all directions. These regions are replaced to a characteristic value of M_F . The number of elements that underwent mechanical grain detachment and the number of detachment events is updated after each time step. In the revised manuscript we clarify this point on page 3, lines 7-10.

RC 1.2: In the last paragraph of Conclusions section (Page 7, Lines 11-19) authors mention implications of their research. Although it is encouraged to mention this in Conclusions with intention to describe/direct future research it is too extensive and general. Rephrased version of this paragraph should be included in Introduction section, accompanied with references.

AC 1.2: Since the original manuscript was submitted, the specific example we gave of the research on pyrite detachment in shales was published in EPSL (Kreisserman and Emmanuel, 2018). We believe that the model could be used to simulate the mobilization of contaminants in a way that cannot be achieved using existing geochemical models. In the revised manuscript this point is discussed in more detail (page 2, lines 22-34, page 7, lines 28-32, page 8, lines 1-2), and some additional references have been included.

RC 1.3: References in text should be listed chronologically. As well, in References section abbreviated journal names should be used.

AC 1.3: In the revised manuscript we have made sure that all the references in the text are in chronological order and have been cited according to the journal format.

RC 1.4: Page 1, Line 20: Wilson, 2004 – reference is not listed in the References. I presume this is the reference for weathering of architectural stone. If not, please provide additional reference.

AC 1.4: In the revised manuscript we have added the citation for Wilson, 2004 to the reference list. We have included an additional reference (page 9, line 37) concerning the weathering of architectural stone (Price, C. A., & Doehne, E., 2011).

RC 1.5: Page 7, Line 13: Correct CO₂ to CO₂

AC 1.5: This has been corrected (page 2, line 23).