

CoRSEER: The Calculator of Rock Surface Exposure Age and Erosion Rates for Luminescence Rock Surface Exposure Dating

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Refree Comments are in black

Authors comments are in blue

My Review focussed on the equations, to ensure they are correct, i.e. sections 2 and 3 of the manuscript.

We acknowledge the effort in reviewing the equations and presentation of this work. We have updated the manuscript based on your comments.

I found one equation that needs correcting: In Eq 13 the letter b should be replaced with r.

Complied

I have some other minor comments that could improve readability:

1. Several acronyms are used and not all of them are defined: LRSED, FOK, GOK. It would be helpful to define them upon first use.

Thanks for pointing out. We have defined all of the acronyms before using them in L57, 91, and 93 for LRSED, FOK, and GOK.

2. It would be helpful to modify line 90: “The analytical solution as a confluent hypergeometric function M...” (please add “M”)

Complied in L90

3. 2.4 starts directly with an equation. It would be helpful to have an introductory sentence before the equation.

We have adjusted section 2.4 as :

“The modelling framework adopted in this study brings together the current understanding of rock-surface luminescence signal evolution within a single computational framework. It includes: (1) general-order kinetics, (2) advection through the natural mechanism of erosion, and (3) ambient dose-rate-driven signal accumulation. This formulation was required to simulate the luminescence-depth profile more accurately and builds upon earlier work by Lehmann et al. (2019a), Biswas et al. (2023), and Pathan et al. (2024). Lehmann et al. (2019a) introduced the advection term in response to erosion as $\dot{\epsilon} \frac{d\bar{n}}{dx}$ but for the FOK ($r = 1$) in addition to earlier models. Thus, the instantaneous change in normalised luminescence $\bar{n}$ (see Section 3.1 for normalisation procedure) with respect to time t at depth x , is termed as:

$$\frac{d\bar{n}}{dt} = \left\{ \frac{\dot{D}}{D_o} (1 - \bar{n}) \right\}_{growth} - \left\{ \bar{n}^r \bar{\sigma} \bar{\varphi}_o e^{-\mu x} \right\}_{decay} + \left\{ \dot{\epsilon} \frac{d\bar{n}}{dx} \right\}_{erosion} \quad (15)$$

This model can be solved with the finite-difference method with a second-order upwind scheme for the advection term rather than altering the depth term (Sohbati et al., 2018).”

4. In Eqn 15 the normalised n (“ n -bar”) is introduced. At this point it is not clear how n was normalised and no explanation is given. It would be good to refer to section 3.1 so that the reader knows where to look for the normalisation procedure.

Thanks for pointing that out. We have added the reference in the updated section 2.4