Responses to editor's comments

Please see author responses to the editor's comments in bold and italics below.

We would like to thank the Associate Editor, Sumiko Tsukamoto, for their useful comments in improving this manuscript. Please see the original comments from the Associate Editor below and our responses to them (in bold and italics).

Thank you very much for submitting your responses and the revised version of the paper. The manuscript has been improved significantly.

I have only one remaining concern regarding Fig. 4. There are several remarks about the intercept of the fitted line. However, these seem unnecessary if the fitting is constrained through the origin (for both linear and polynomial fittings), which is also the approach adopted in previous studies. Reviewer 2 also noted that the intercept does not carry a clear physical meaning. In fact, for the data of Fig. 4b you calculated the slope by forcing the fit through the origin for comparison. Could you consider applying this approach consistently, or alternatively provide a clear justification for retaining the current method of fitting?

Thank you for this comment. We have decided to leave the fits shown in Figure 4 as they are, retaining the intercepts. As in the previous work cited in the discussion (Ankjægaard and Murray, 2007), when the fits are forced through the origin, we observe a decrease in the predictive accuracy of the models for the predicted alpha and gamma dose rates, whilst the beta dose rates are the same. Therefore, as we are aiming for the greatest predictive power based on our large dataset, this justifies retaining the intercepts. The same argument was made for the choice of a second order polynomial fit for predicting the gamma dose rate from the beta dose rate, prompted by Martin Autzen's comments, so this rationale is consistent.

I have added a comment to the section of the discussion where the comparison between fitting choices is made (Line 564):

'If we use a linear fit forced through the origin for these data then the ratio of IM $\dot{D}_\gamma$ to IM $\dot{D}_\beta$ would be 0.58, which agrees very closely with previous findings of 0.50 (Ankjægaard and Murray, 2007) and 0.59 (Roberts et al., 2009). However, we find that there is a poorer agreement with unity for the relationships between the data calculated without the intercepts and high precision dose rates for both estimated IM $\dot{D}_\gamma$ (R^2 = 0.51) and IM $\dot{D}_\alpha$ (R^2 = -0.29), relative to the estimates calculated using the intercepts shown in Figure 6, whilst the accuracy of IM $\dot{D}_\beta$ estimates are the same. Ankjægaard and Murray (2007) also found that using a model fitted through the origin also resulted in a slight reduction of predictive power when estimating IM $\dot{D}_\gamma$. Whilst both sets of results are within uncertainties, we suggest that the intercepts be retained.'

Other minor suggestions are listed below.

-Line 16: I would remove "accurately".

Changed, thank you.

-Line 24-25: Could you comment about gamma?

A comment has been added (Line 25):

'The regression equations can predict external beta dose rates to a good degree of accuracy based on K content alone, whilst external gamma dose rates are predicted less accurately and external alpha dose rates are predicted the least accurately.'

- Guerin should be Guérin (throughout the text)

Changed, thank you.

-Rizza et al. (2024) (line 82) is not listed in the reference list.

Added, thank you.

- Consider combining Tables 2 and 3. I see why they are separate, but it could be easier for readers to see all these parameters in one table.

The tables have been combined into just Table 2, thank you.