Supplement of Geochronology, 4, 455–470, 2022
https://doi.org/10.5194/gchron-4-455-2022-supplement

Supplement of

Cosmogenic nuclide weathering biases: corrections and potential for denudation and weathering rate measurements

Richard F. Ott et al.

Correspondence to: Richard F. Ott (richard.ott@gfz-potsdam.de)

This document presents equations similar to those in the main text, but they account for radioactive decay. WeCode uses the equations shown in this supplement for calculation. For consistency, the equation numbers are the same as in the manuscript with the addition of a prime symbol. The decay constant is represented by λ , and all other terms are the same as those in the main text unless otherwise noted.

With decay, the differential equation of nuclide build-up in the regolith is

$$\frac{d < N_R >}{dt} = < P_R > - \lambda * < N_R > (t)$$

with the solution

$$< N_R > (t) = N_0 * e^{-\lambda t} + \frac{< P_R >}{\lambda} \left(1 - e^{-\lambda t}\right) \tag{2'}$$

and

$$N_0 = \sum_i \left(\frac{P_i(0)}{\frac{D}{\Lambda_i} + \lambda} \right) e^{-m_R/\Lambda_i} \tag{3'}$$

for the case of constant average production rate in the regolith (*i.e.*, constant regolith thickness).

$$< N_R > = N_0 * e^{-\lambda \frac{m_R}{D - W_B}} + \frac{< P_R >}{\lambda} \left(1 - e^{-\lambda \frac{m_R}{D - W_B}}\right) \tag{7'}$$

$$< N_g > = N_0 * \left(\frac{m_g}{m_i}\right)^{\frac{\lambda}{k}} + \frac{< P_R >}{\lambda} \left(1 - \left(\frac{m_g}{m_i}\right)^{\frac{\lambda}{k}}\right) \tag{11'}$$

$$N_0 = \sum_i \int_\tau^\infty P_i(m_R + Dt)\, e^{-\lambda t} dt \tag{12'}$$

$$< N_{R,X} > = \sum_i \frac{X_R}{X_B} \int_0^\tau < P_{i,R} > - \lambda * < N_{R,X} > (t)\, dt + N_0 \tag{13'}$$

$$< N_R > = N_0 * e^{-\lambda * \frac{m_R}{D} * \frac{1}{1 - CDF}} + \frac{< P_R >}{\lambda} \left(1 - e^{-\lambda * \frac{m_R}{D} * \frac{1}{1 - CDF}}\right) \tag{19'}$$

$$< N_{R,X} > = N_0 * e^{-\lambda * \frac{m_R}{(D - W_R)}} + \frac{< P_R >}{\lambda} \left(1 - e^{-\lambda * \frac{m_R}{(D - W_R)}}\right) \tag{23'}$$

$$< N_{R,X} >= N_0 * e^{-\lambda \frac{m_R}{D} * \frac{S_B D - W_R}{S_B (D - W_R)}} + \frac{< P_R >}{\lambda} \left(1 - e^{-\lambda \frac{m_R}{D} * \frac{S_B D - W_R}{S_B (D - W_R)}} \right)$$

$$= N_0 * e^{-\lambda \frac{m_R * \left(1 - \frac{W_R}{S_B D}\right)}{D - W_R}} + \frac{< P_R >}{\lambda} \left(1 - e^{-\lambda \frac{m_R * \left(1 - \frac{W_R}{S_B D}\right)}{D - W_R}} \right) \tag{24'}$$