

Diffusion of Radiogenic Gases

Kiran Sathaye

September 12, 2015

Knowing the concentrations of the radioactive isotopes of Uranium, Thorium, and Potassium, I compute the amount of radiogenic daughter products ^4He and ^{40}Ar produced and retained in the Earth's crust. Both of these systems follow the general diffusion-production equation of

$$\frac{\partial C_i}{\partial t} = -\tau\phi D(z) \left(\frac{\partial^2 C_i}{\partial z^2} \right) + A_i(z, t) \quad (1)$$

$$\left. \frac{dC_i}{dz} \right|_{z=45km} = 0 \quad \text{and} \quad C_i|_{z=0} = 0. \quad (2)$$

The particular cases for ^4He and ^{40}Ar are solved in `DiffScript.pdf` using finite differences with varying θ between explicit and implicit methods. Diffusion profiles are saved to `ArHeDiff.pdf`.