For a linear, first-order decay reaction:

$$\frac{dn}{dt} = -kn \qquad -(1)$$

where k is rate constant.
It can be easily related to half-life $t_{1/2}$ as

$$k = \frac{\ln(2)}{t_{1/2}}$$

$\therefore$ solution of (1) is $N = N_0 e^{-kt}$

Assuming U_{238} goes directly to lead Pb_{206}

$$\frac{dn_U}{dt} = -k_U n_U \Rightarrow n_u = n_0 e^{-k_U t}$$

$$\Rightarrow n_{Pb} = n_0(1 - e^{-k_u t})$$

$$\frac{dn_{Pb}}{dt} = k_u n_u$$

$$\frac{n_{Pb}}{n_U} = \frac{n_0(1-e^{-k_u t})}{n_0 e^{-k_u t}} = \boxed{e^{k_u t} - 1}$$

exponential increase.

$\downarrow$

MATCHES EXACTLY in plot

$$k_u = \frac{\ln(2)}{t_{1/2}\, U238}$$