Radiometric Dating Isochron

1. How can you tell from the isochron plot whether or not the system has been closed throughout its “lifetime”? What would the data look like if the system had experienced significant diffusion. Why?

Use the following real data (Weber and Kohler, 1999) and the corresponding $^{87}\text{Rb} - ^{86}\text{Sr}$ isochron diagram to answer the following:

1. Are the data clustered around the line of best fit or scattered?

2. Calculate the age of the sample ($\lambda = 1.42 \times 10^{-11} \text{ a}^{-1}$).

3. Was there any initial daughter?

4. What was the original $^{87}\text{Sr}/^{86}\text{Sr}$ ratio?

5. Was the system open or closed (see (a) above)?
Use the following real data (Weber and Kohler, 1999) and the corresponding $^{147}$Sm-$^{143}$Nd isochron diagram to answer the following:

1. Are the data clustered around the line of best fit or scattered?

2. Calculate the age of the sample ($\lambda = 6.54 \times 10^{-12} \text{ a}^{-1}$).

3. Was there any initial daughter?

4. What was the original $^{143}$Nd/$^{144}$Nd ratio?

5. Was the system open or closed (see (a) above)?

References

Powell, J.L., (2001), Mysteries of Terra Firma.
Use the published data plot below to complete the following questions and calculations:

1. Are the data points clustered around the line of best fit, or are they scattered? Based on your answer, was the system open or closed?

2. Calculate the age of the system as follows:
   a. Pick any 2 points on the line of best fit and determine their x and y values. Note: These do NOT have to be data points. It is typically best to choose the leftmost and rightmost points on the line.
   b. Calculate the slope of the line using the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$ (i.e. “rise over run”).
   c. The age of the rock is $t = \frac{1}{\lambda_{total}} \ln \left( m \frac{\lambda_{total}}{\lambda_1} + 1 \right)$, as discussed in class.

3. Determine the initial daughter concentration, $\frac{D_0}{D_t}$

Use the published data plot below to complete the following questions and calculations:

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3. Determine the initial daughter concentration, $\frac{D_0}{D_i}$.

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1. Are the data points clustered around the line of best fit, or are they scattered? Based on your answer, was the system open or closed?

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3. Determine the initial daughter concentration, \( \frac{D_0}{D_i} \).