SLEUTh Lab

Sea Level & Environmental reconstruction using Uranium-Thorium

U-Series Geochronology at UW-Madison

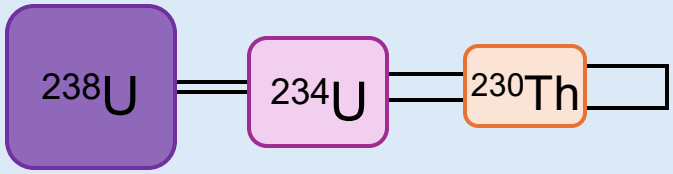
Secular equilibrium occurs when the number of atoms of a daughter isotope essentially becomes constant after some time. It **occurs when the parent half life is much longer than the daughter half life.**

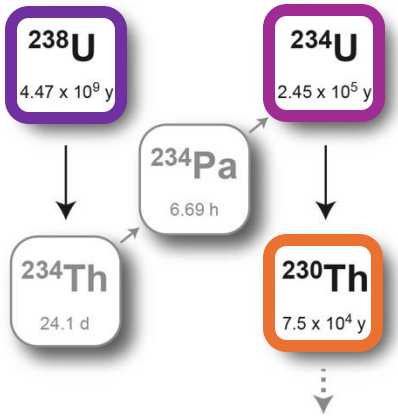
Half life (yrs)

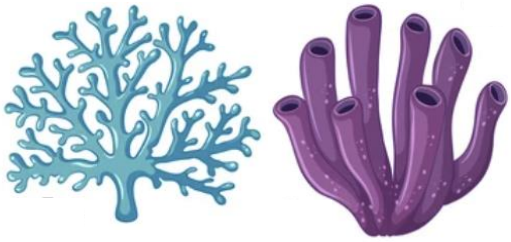
^{238}U = 4,400,000,000

^{234}U = 246,000

^{230}Th = 75,000





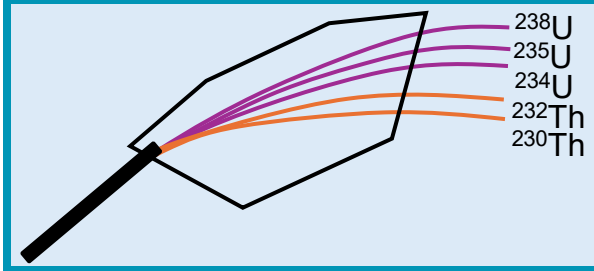


Corals take up U from seawater.

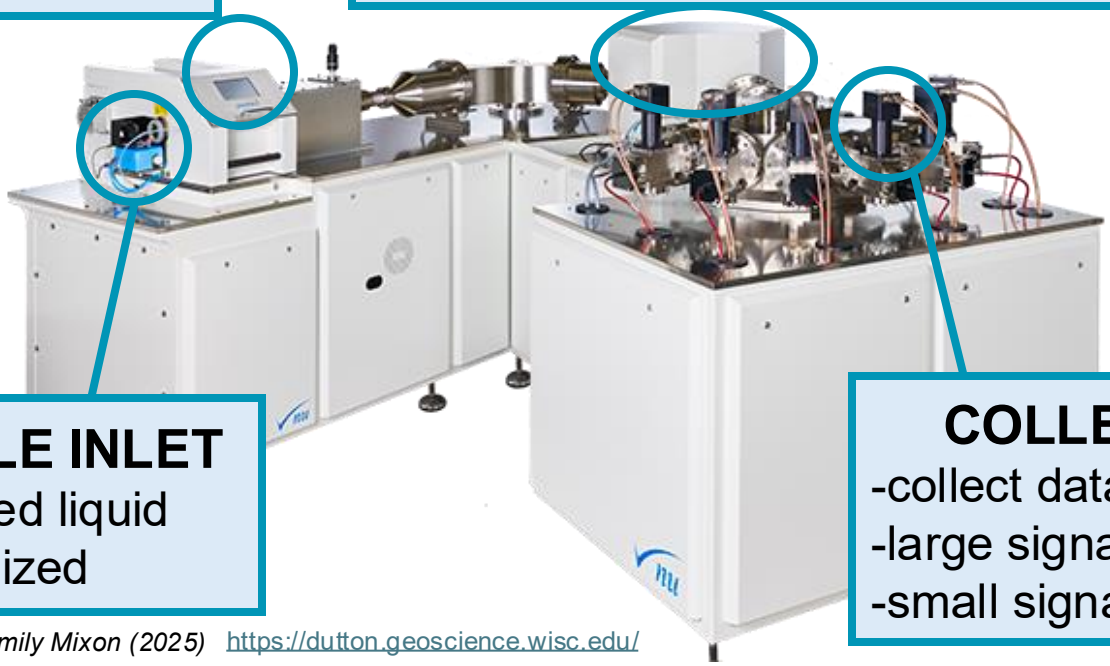
The $^{234}U/^{238}U$ and $^{230}Th/^{238}U$ ratios are **not in equilibrium** when coral skeletons first form. We use this **disequilibrium** and measure these two ratios to calculate the age of coral growth. This age and the context of the coral help us understand **past sea-level**.

Multi-Collector Inductively Coupled Plasma Mass Spectrometer

PLASMA
-ionizes elements
-6000 °C (T of sun!)



MAGNET
separates ions by kinetic energy (mass: charge)



SAMPLE INLET
-dissolved liquid
-aerosolized

COLLECTORS
-collect data!
-large signals (Faraday)
-small signals (Daly)

Andrea Dutton, Emily Mixon (2025) https://dutton.geoscience.wisc.edu/

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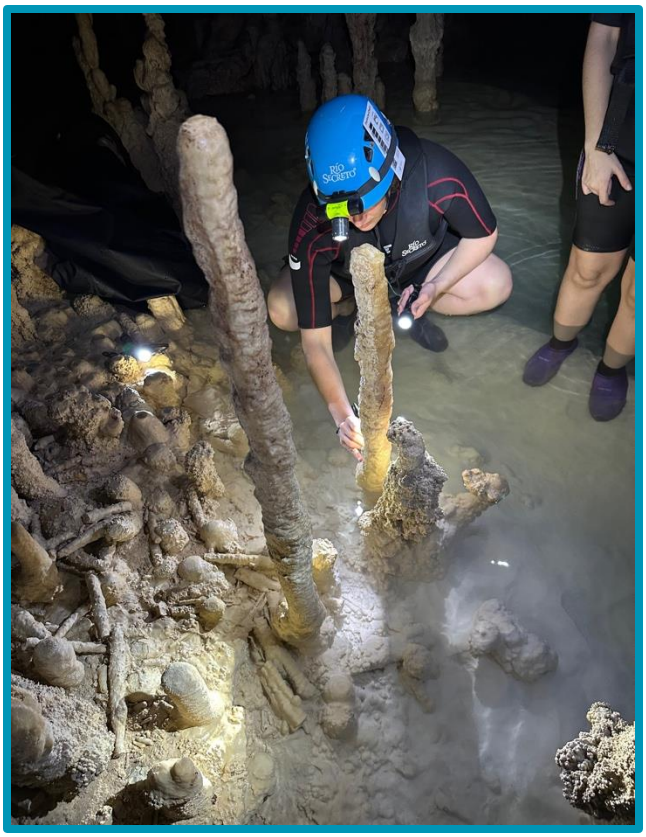
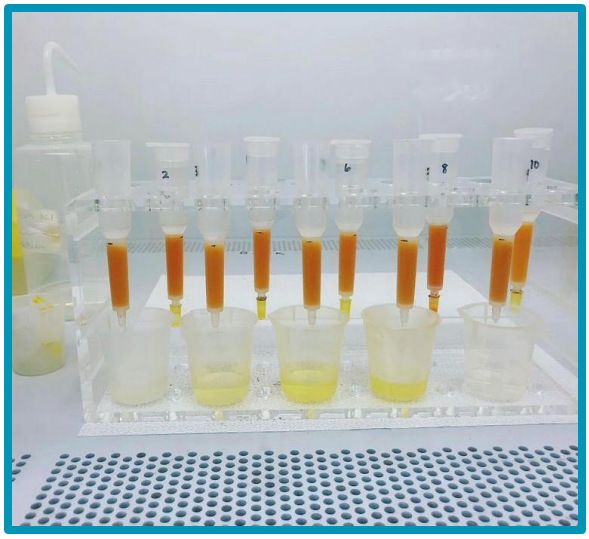


Researchers **go in the field** to collect **corals** and **speleothems**. They do careful work to characterize the area they are sampling.



Samples are **powdered**, **dissolved** in acid, and processed through **chemical separation** in our **metal-free cleanroom.**

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