

U-Pb Geochronology of Fluid Flow Events in the Barstow Formation, California

Sontarp, Ethan (School: Commack High School)

Diagenesis is the compositional change in geologic samples such as fossils, which are often used to date significant geological events in their vicinity. Fossilized dentin from teeth can undergo diagenesis during a geologic fluid flow event due to its high porosity. By contrast, tooth enamel cannot sequester Uranium during a fluid flow event because of its low porosity, which is required in order to date a fluid flow event in a sample. The purpose of this experiment was to investigate components of fossils, namely dentin, enamel, and foot bones, for their viabilities as models for determining the age of geological events, using U-Pb geochronological dating methods. Tooth and bone samples from California's Barstow Formation were prepared, then analyzed using LA-ICPMS (Laser Ablation- Inductively Coupled Plasma Mass Spectroscopy) to determine the concentration of certain isotopes of U, Pb, and rare-earth elements (REE). Iolite software was used to process the isotope data from several locations in fossils. A preserved sample was dated at ~10 Ma for both enamel and dentin locations. An eroded sample showed results with differing ages for the enamel sections and the dentin sections, with the dentin at 10 Ma and the enamel at 4.5 Ma. The bone sample varied in its local dates of diagenesis because of an ancient fracture, with an average age of 4.5 Ma that was consistent with the enamel ages. The samples yielding 4.5 Ma and 10 Ma differed in their REE content, distinguishing between two known fluid flow events in the Barstow Formation. Going forward, these results suggest that a dentin sample may be a stronger candidate than an enamel sample for U-Pb dating of older geological events, whereas enamel locations would be more viable for dating the most recent fluid flow event.

Awards Won:

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