SETP03

Novel Coupled Thermochronometric and Geochemical Investigation of Fluid Flow and Geothermal Systems in Extensional Tectonic Settings, Dixie Valley, Nevada

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The objective of this research is to develop a thorough understanding of the interaction between normal and strike-slip faults, the effects of transient fluid flow on thermal systems, and the controls on geothermal systems by addressing issues with a novel application of integrated thermochronometric, structural, and geochemical techniques. The Dixie Valley and Stillwater Range area in Nevada has been chosen for this study because it is one of the best-characterized and studied extensional systems in the Basin and Range and the locations of geothermal anomalies are well known. The region is host to dilational fault corners and relay structures, as well as processes relating to fluid flow that are in question, and will therefore serve as a natural laboratory.

The combination of (U-Th)/He and $^{4}He/^{3}He$ dating techniques will enable the generation of a thermal background and record events associated with fluid flow, respectively, and will constitute an unprecedented approach to resolving a fundamental process. The novel application of $^{4}He/^{3}He$ thermochronometry will quantitatively constrain the time-temperature history of grains at very low temperatures. These analyses will be used to determine the control of structural features on geothermal anomalies, derive the thermal and tectonic evolution of the Stillwater Range, with insights on the driving forces, and, finally, to quantify the secondary thermal history imposed on the rocks in the range by transient flow of geothermal fluids. This study is focused on understanding diverse fundamental processes and therefore it will be possible to extrapolate findings to new problems and other regions.

Keywords: $^{4}He/^{3}He$ thermochronometry, (U-Th)/He, geochronology, geothermal