UNIVERSITÄT BERN

Institute of Geological Sciences Kolloquium Seminar

Monday, 13th October 2025

at 16:15 Studer Auditorium, 2 OG

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"Applications of Structural Geology and Other Tools to Unleash the Geothermal Potential of North America's Basin and Range Province and Beyond"

As a result of its transtensional to extensional tectonic setting, the Great Basin region of the Basin and Range province in the western U.S. is richly endowed in geothermal resources. Estimates suggest that the Great Basin region is capable of producing much greater amounts of geothermal energy than the current ~800 MW from ~28 power plants. Major factors that have inhibited more widespread geothermal development include finding sufficient permeability and the blind or hidden nature of the bulk of the geothermal resources (i.e. lack surface hot springs and steam vents). In this region of pervasive high heat flow, sufficient permeability is more challenging to find than suitable temperatures for conventional resources. Thus, it is imperative that the favorable conditions for geothermal activity be synthesized and exploration methodologies developed to discover new hidden systems. We have therefore been proceeding on multiple fronts to 1) better characterize the favorable structural settings for conventional geothermal activity, and 2) improve methodologies for synthesizing geological and geophysical datasets to identify hidden geothermal systems. Nearly all systems reside in fault interaction zones, including step-overs (i.e. relay ramps) in normal faults, normal fault terminations, fault intersections, and accommodation zones in extensional areas and pull-aparts and displacement transfer zones in transtensional belts. High fault and fracture density in these settings facilitate high permeability and fluid flow. We incorporated these findings into geothermal play fairway analyses, whereby as many as 15 geologic, geochemical, and geophysical parameters were synthesized to produce geothermal potential maps of the region as a means for identifying hidden systems. These parameters were grouped into subsets to delineate rankings for local permeability, regional permeability, and heat, which collectively defined geothermal play fairways (i.e. most likely locations for significant geothermal fluid flow). Advanced geostatistics and machine learning techniques were employed in these analyses. To date, this has resulted in discovery of two new hidden systems. These methods have been applied to various other regions around the world, including western Turkey, Argentina, Peru, and New Zealand.