GEOTHERMAL COMPONENT

NSF HIGHLIGHTS—TRACK 1 RESEARCH

TITLE

Locating and mapping blind geothermal systems with the geothermal energy component team

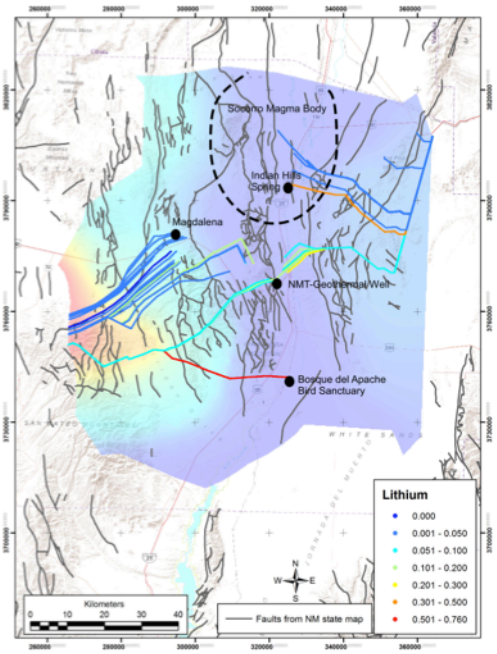
EXPLANATION

Chris McGibbon (left) and Karl Karlstrom of UNM install geo-thermal monitoring equipment in northern New Mexico

The geothermal energy team's goal is to develop a better understanding of factors that affect the viability and sustainability of NM's underlying natural hydrothermal systems. New Mexico is endowed with relatively high background heat flow and permeable, fractured bedrock. These conditions have given rise to numerous low temperature geothermal systems. However, developing geothermal energy as a viable and sustainable resource in New Mexico requires a better understanding of the underlying natural hydrothermal systems and of the practical limitations and human technologies involved in its application. In Year 2, the geothermal energy component team began an effort to locate blind geothermal systems using geochemical geothermometers combined with solute transport theory. This effort directly impacts the areas of inquiry for the team: How long-lived are fault-controlled and topography-driven geothermal systems, and how sustainable is the development of geothermal systems associated with discharge areas of topography-driven flow systems as opposed to fault-controlled systems? Hydrothermal energy exploration and utilization has the potential to become increasingly important to NM's energy future. Developing a fundamental understanding of the magnitude and sustainability of geothermal resources has direct implications for NM economic development as communities develop these resources for aquaculture, tourism and other possible uses.

OUTCOME

Shari Kelley and Mark Person assembled a statewide geochemical database, focusing on two trace elements (lithium and boron), which are often found in high concentrations within geothermal systems. The preliminary analysis within the Socorro-La Jencia Basins reveals some interesting observations. Along the Rio Grande Rift near the Bosque Del Apache Bird Sanctuary, elevated lithium concentrations occur in one of the Fish and Wildlife wells. This may be an upflow from the La Jencia-Socorro geothermal system. The team plans to contact the Bosque Del Apache Bird Sanctuary staff and the town of Luis Lopez (which is located to the south of Socorro along the projected flow path) to determine the availability of additional existing geochemical data. In the southern Albuquerque Basin, Indian Hills has elevated lithium concentrations. This could be due to a geothermal upflow zone associated with the Socorro magma body.



Pathlines within Socorro-La Jenica basin from geochemical wells with Lithium and Boron analyses are being used to identify locations of upwelling geothermal fluids

IMPACT/BENEFITS

The geothermal team is developing a methodology for locating blind geothermal systems using trace element concentrations combined with solute transport theory. The team is developing more complex, three-dimensional-hydrochemical models to test the hydrologic windows hypothesis, and generated a detailed three-dimensional model that includes multiple fault blocks and accommodation zones using the Lagrit mesh generation software at Los Alamos. The hydrogeologic framework model is based on four geologic cross sections, and the team used the hydrothermal model PGEOFE. The model created by the team consisted of 403,000 nodes and over 2,290,000 tetrahedral elements using the Los Alamos Lagrit mesh generation package. The model was run on the NM Tech cluster Rosemary (24 cores). Simulations took about 5 days to run for 0.5 million years.