STRUCTURAL CONTROLS OF THE EMERSON PASS GEOTHERMAL SYSTEM, NORTHWESTERN NEVADA: CHARACTERIZATION OF A "BLIND" SYSTEM

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Detailed geologic analyses have elucidated the kinematics, stress state, structural controls, and past surface activity of a blind geothermal system in Emerson Pass on the Pyramid Lake Paiute Reservation, western Nevada. The Emerson Pass area resides near the boundary of the Basin and Range and Walker Lane provinces and at the western edge of a broad left step or relay ramp between the north- to north-northeast-striking, west-dipping, Fox and Lake Range normal faults. The step-over provides a structurally favorable setting for deep circulation of meteoric fluids. Strata in the area are comprised of late Miocene to Pliocene sedimentary rocks and the middle Miocene Pyramid sequence mafic to intermediate volcanic rocks, all overlying Mesozoic metasedimentary and intrusive rocks.

A thermal anomaly was discovered in Emerson Pass by use of 2-m temperature surveys deployed within a structurally favorable setting and proximal to surface features indicative of geothermal activity. The 2-m temperature surveys define a north-south elongate thermal anomaly that has a maximum recorded temperature of ~60°C and resides on a north- to north-northeast-striking normal fault. Although the active geothermal system is expressed solely as a soil heat anomaly, late Pleistocene travertine and tufa mounds, chalcedonic silica/calcite veins, and silica cemented Pleistocene lacustrine gravels indicate a robust geothermal system was active at the surface in the recent past.

The geothermal system is controlled primarily by the broad step-over between two major range-bounding normal faults. In detail, the system likely results from enhanced permeability generated by the intersection of two oppositely dipping, southward terminating north- to north-northwest-striking (Fox Range fault) and north-northeast-striking normal faults. Structural complexity and spatial heterogeneities of the strain and stress field have developed in the step-over region, but kinematic data suggest a west-northwest-trending (~280° azimuth) extension direction. Therefore, geothermal activity in the Emerson Pass area is probably hosted on north-to north-northeast striking normal faults.