

NEW EVIDENCE OF THE CAUSATIVE RELATIONSHIP BETWEEN WELL INJECTION AND MICROSEISMICITY IN THE GEYSERS GEOHERMAL FIELD

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ABSTRACT

A new analysis demonstrates a rough correlation between microseismicity with focal depths at ~2 km and injection in one well located in the southeastern portion of the Geysers geothermal field (in and near Unit 13), confirming what Stark (1990) has shown for the area to the northwest. The abrupt onset of microseismicity near well McKinley-5 early in 1980 follows the initiation of injection there by about three months. Until 1986, injection and numbers of earthquakes within 3000 feet of this well appear to be roughly correlated, with injection increases or decreases leading the rise or fall of microearthquake numbers. For the years after 1986, there seems to be no correlation between earthquake frequency and injection; this may be due to the overall decline of injection volumes in the well. A similar analysis was conducted for well Thorne-7, but no correlation is evident. However, after the start-up of injection in 1984, microseismicity near this well did become more continuous from month to month.

This article also presents a concise review of previous work on the subject of induced microseismicity in the Geysers geothermal field. It appears that both fluid injection and withdrawal trigger microseismicity, but that injection, on balance, triggers deeper events than does production. Causative mechanisms for triggering are also reviewed.

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