The October 2019 earthquake swarm in the Mineral Mountains, Utah and its relation to the geothermal system

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In October 2019 an earthquake swarm initiated in the Mineral Mountains, Utah near the Roosevelt Hot Springs. The area has been characterized as swarm-genic after the recording of an energetic swarm (1044 microearthquakes, M less than 1.5) during the summer of 1981. This study primarily aims to investigate the spatio-temporal properties of the newly detected earthquake swarm and compare its occurrence to prior seismic activity. The October, 2019 earthquake swarm lasted four days and consists of forty-three shallow earthquakes that were cataloged by the University of Utah Seismograph Stations (UUSS) with magnitudes -0.7 to 1.31. All the events were recorded by a dense local broadband seismic network located around the Frontier Observatory for Research in Geothermal Energy (FORGE) in southcentral Utah, ~10 km west of the activated area. The close proximity of the seismic network along with the density of the seismicity allows us to apply techniques for improving the detection level and earthquake location. To achieve this, we use the earthquakes detected by the UUSS as templates and scan the continuous data for new events by applying a matched filter technique. To perform a detailed spatial analysis of the earthquake swarm and look for migration patterns, we create a high-resolution earthquake catalog using a double difference technique and differential times from both catalog and cross correlation data. To gain insight into the stress regime, we compute fault plane solutions from first motions for individual events and composite focal mechanisms for families of similar events. We further attempt to explore the underlying mechanism by examining the presence of repeating earthquakes comprising the earthquake swarm and their relation to aseismic slip. Such observations may shed insights into the role of fluids and the influence of the high heat flow, due to the geothermal system, on earthquake triggering and migration.