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Behavior Of Seasonal Induced Seismicity In Southeast Brazil

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We examine an uncommon case of induced seismicity from ground hydraulic stimulation linked to the drilling of water wells in the district of Jurupema, located in the interior of the state of Sao Paulo, Southern Brazil. We analyze the seismicity in this region with temporary seismic station deployments during 2016 and 2017 for size, distribution both in time and space, and its links to the water well drilling in and around the district. The seismic activity in this region exhibits a swarm-like behavior that begins the rainy months in early 2016 and appears to end when the rainy season comes to an end, with epicenters initially located near deep (∼100 m) water wells used for irrigation. During 2017, a similar seismic behavior was present around the same season, with epicenters migrating, but exhibiting similar nature.

In this region, water wells are often drilled to provide irrigation to farming areas, during the months with less precipitation, down to about 100 m depth. These penetrate beyond the uppermost sandstone rock layer (∼50 m) into a fractured basaltic rock layer, reaching the confined aquifer within it. While during the dry season wells are constantly pumped, during the course of the rainy season (when these are not being used), possible infiltration in the confined basaltic aquifer from both rainwater and the upper sandstone aquifer add changes to the pore pressure of the fractured rock, and modify the tectonic pre-stress conditions, facilitating stress release mechanisms in pre-existing faults and cracks.