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Heterogeneous Hydrogeological Control on Volcanic Aquifers at Mount Ciremai, West Java, Indonesia

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Mount Ciremai's spring zone exhibits complex relationships among modern and solitaire topography, lava flow geometries, and groundwater flow patterns. As many as 161 springs were observed (140 on east slope and 21 on west slope).

The majority of springs show hypothermal signal, on both slopes. TDS-Water temperature shows more homogeneous plot on east slope, representing identical geological control on the three volcanic aquifers. Scattered points on west slope signify heterogeneous geological control, including faults from previous geophysical mapping. Elevation-EC chart on both slopes show larger EC readings on lower elevation. East slope plot shows value range from 19 to 200 μSiemens with scattered anomaly from 300 to 620 μSiemens, indicating less mineralization in the system, from geothermal or older marine sediments. West slope plots show similar range with EC reading not more than 300 μSiemens, indicating less influence of additional mineralization.Elevation-Q chart demonstrates scattered points on east slope indicating there are at least two systems: captive system aquifer with no water leakage from the above aquifer and open system aquifer with leakage between aquifers. West slope illustrates more regular trend indicating interaction between aquifers towards lower elevation and positive break demonstrating possible fault boundary.

In young volcanic deposits with large amounts of annual precipitation, high recharge rates coupled with fractured volcanic aquifers that have large near-surface hydraulic conductivity lead to broad systems. The aquifer is locally guided by the extent of permeable lava flows. The air and water temperature in most of the springs are close to atmospheric, implying shallow flow paths. Water discharging at large and hypothermal springs have limited interaction with geothermal system. Anomalously large springs suggest that topographically defined watersheds may not correspond to aquifer boundaries. The field observations reveal that average recharge elevations are concurrent with extensive young lava flows.