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SAPIENZA UNIVERSITÀ DI ROMA

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Fault-controlled fluid flow in the Earth's crust, impacts on groundwater and geothermal exploration

18.03.2025, Aula Lucchesi , h:16:30 and on Meet

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DOTTORATO DI RICERCA IN SCIENZE DELLA TERRA

ABSTRACT

Investigating faults and mineralized veins provide insights into the processes of paleofluid flow in subsurface reservoirs. Such studies can help in modeling current fluid flow in the subsurface, specifically the understanding of fault-controlled accumulation or leakage into potential subsurface groundwater and geothermal reservoirs.

This talk will encompass two case studies, in the Jura fold-and-thrust belt in France and in the Variscan fold-and-thrust belt in Germany, where the role of faulting and fracturing was fundamental in groundwater and geothermal fluid migration across reservoirs during geological times. Specifically, the role of carbonate faults, damage zones, and veins were investigated through field, microstructural, and geochemical methods, to unravel fluid flow circulation in faults and veins, as well as their role as barriers or conduits to fluid flow.

In the Jura fold-and-thrust belt, results suggest that strike-slip tear faults and thrusts allowed the circulation of meteoric derived fluids and groundwater, while impermeable rock layers hindered the up flow of warm, deep-seated fluids along faults. Currently, geothermal targets could be located in fault zones below impermeable rock layers. In the Variscan fold-and-thrust belt, geothermal targets and zones of high fluid flux and permeability could be located in areas of fault complexity, such as dilational jogs and fault tips, as testified by fault-related veins.