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Complex multi-stage magmatic system imaged under geothermal prospect in the Main Ethiopian Rift

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In search for volcanic geothermal resources the magnetotelluric (MT) method has proven to be an efficient tool. Electrical conductivity of the subsurface, imaged by MT, is used for detecting magmatic heat sources such as zones with partial melting and for delineating layers of electrically highly conductive clays formed around the strata of hot circulating fluids.
We present a new case study using an MT data set, measured at 112 sites, covering an area of 18 by 11 km at a geothermal prospect in the Main Ethiopian Rift. Our recovered electrical resistivity model shows typical features of a high-enthalpy geothermal system: A highly conductive shallow clay cap, which is underlain by a more resistive zone, commonly interpreted as a propylitic reservoir, representing the main geothermal target for drilling. An interesting discovery is a magmatic intrusion at crustal depths, which connects to a deeper melt source in the upper mantle. The recovered structure is supported by geochemical studies and coincides with the significant uplift over three years revealed by InSAR.