# A Regional Resistivity Model of the Southeastern Canadian Cordillera from 3-D Inversion of Magnetotelluric Data: What Controls the Spatial Distribution of Geothermal Resources?

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The magnetotelluric (MT) method is a geophysical technique that uses naturally occurring radio waves to estimate the electrical resistivity structure of the Earth's crust and mantle. Electric and magnetic fields are measured at the surface of the Earth for hours, days, or weeks. The electrical resistivity of a rock at depth is proportional to the ratio of the electric and magnetic field components. The depth of investigation depends on the frequency of the electromagnetic signals, with lower frequencies providing information about deeper structure. We utilize the MT method to image the crustal and upper mantle structure of the Southern Canadian Cordillera and relate it to the geothermal potential of the region.

Over the past few decades, MT measurements were made at 344 locations across southeastern British Columbia and southwestern Alberta, as well as the northern parts of Washington, Idaho, and Montana. By applying geophysical inversion to these MT data, we have generated a 3-dimensional model of the electrical resistivity of this region to a depth of 150 km. There are large variations in resistivity, both laterally and vertically, in the crust and upper mantle.

The model extends into the North American craton to the east and the Canadian Cordillera to the west. The craton is highly resistive as expected for dry and relatively cold rocks. In contrast, the resistivity of the crust in the Canadian Cordillera is very low and a strong indicator of the presence of crustal fluids throughout the southern Cordillera. Several large-scale low-resistivity structures in the Cordillera will be discussed, some extending to depths of nearly 100 km. This region is in the backarc of the Cascadia Subduction zone and is known for its high surface heat flow and thermal features such as hot springs. Regional geologic and tectonic controls on fluid transport and geothermal energy distribution will be discussed.

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