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Enhancing Geothermal Exploration Through Integrated Transient Electromagnetics and Satellite-Based Remote Sensing

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Abstract

The increasing demand for clean energy has led to a growing interest in geothermal energy as a reliable and sustainable alternative. However, identifying suitable locations for geothermal exploration remains a significant challenge. This study proposes a novel approach that combines Transient Electromagnetic (TEM) surveys, and satellite-based remote sensing to improve the efficiency of geothermal exploration. By integrating these techniques, we can refine resistivity models, identify thermal anomalies, and simulate steady-state heat flow through the subsurface. Our methodology involves a multi-step approach, including TEM data acquisition and processing, integration with surface temperature data, and inversion for thermal conductivity. The results show a significant low-resistivity anomaly, indicating a potential geothermal resource. This innovative approach enhances the accuracy of geothermal exploration, increasing the likelihood of discovering new resources and supporting the development of this clean and sustainable energy source.

The next step involves numerical modelling using finite volume methods to simulate heat flow and fluid flow in the subsurface, allowing for predictions of temperature pore pressure in the geothermal system. This integrated approach has significant implications, as it improves the accuracy of geothermal exploration, enabling the identification of potential resources and reducing uncertainty, ultimately supporting the development and monitoring of clean and sustainable energy.