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ABSTRACTS

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DECODING THE SUBSURFACE: GRAVITY ANOMALIES AND CONCEPTUAL MODELING OF THE WAHAWA GEOTHERMAL FIELD

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The Wahawa geothermal field in Sri Lanka is a region of significant geothermal activity, characterized by surface manifestations such as hot springs and hydrothermal alterations. It is situated within the Vijayan Complex, a structurally complex Precambrian basement terrain influenced by deep-seated fault systems. While surface expressions of geothermal activity are well-documented, the subsurface structure and heat source remain poorly understood. To address this knowledge gap, a 2D gravity profile was conducted to investigate the underlying geophysical characteristics of the region. The study involved a 5 km-long gravity profile with a 50 m sampling interval, reduced near the geothermal field for higher resolution. After applying the necessary corrections, free-air and Bouguer gravity anomalies were calculated. The results reveal a distinct gravity low within the Wahawa geothermal field, indicating a region of reduced subsurface density. This anomaly suggests the presence of fractured basement rocks, hydrothermal alteration, or deep-seated magmatic intrusions that may act as heat sources or fluid reservoirs. Based on these findings, a conceptual model is proposed, depicting a thermally active subsurface zone where heated fluids migrate through fault-controlled permeable pathways. The presence of deep-seated structural features enhances fluid circulation, contributing to the geothermal potential of the region. This study provides valuable geophysical insights into the Wahawa geothermal system, offering a foundation for future exploration and potential geothermal energy development in Sri Lanka by demarcating the more suitable areas for drilling. Understanding these subsurface structures is crucial for assessing geothermal resource viability and optimizing sustainable energy strategies in the region.

Keywords: 2D Gravity Anomaly, Wahawa Geothermal Field, Free Air Anomaly, Conceptual Model