Title: **Investigations into THE Permeability and Tectonic Lineaments of Homa Hills Geothermal Prospect,using Ground Magnetic Method**

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Abstract: In this study, the tectonic lineaments and permeability around Homa Hills geothermal prospect, Nyanzian rift were investigated in order to explore its geothermal potential using ground magnetic method. A proton-precession magnetometer model G-856 of accuracy of ±O.lnT was used to take total magnetic field intensity of the earth at every station. A total of 86 magnetic stations were established over an area of about 76km2. The magnetic data at each station was corrected for both diurnal variations and geomagnetic corrections. The geomagnetic field was calculated using the mathematical model of earth's magnetic field called International Geomagnetic Reference Field (LG.R.F) model 2000-2015 using PofeI1f software at each station and subsequently subtracted. This model was calculated based on average geomagnetic field of 33420nT, inclination of -22.3° and declination of 0.9°. Total magnetic Intensity (TMI) map and residual magnetic map of Homa Hills were then plotted using Surfer 8.0 software. Qualitative interpretations of the TMI map, residual magnetic map and vertical derivative map revealed fracture/fault lineaments on the survey area trending NW-SE, NNW-SSE and N-S represented by distinct broad negative magnetic anomalies suggesting demagnetisation due to fluid-rock interactions, thus, showing these regions to be relatively permeable. There exist relatively quiet magnetic anomalies on the north eastern and eastern parts of the survey area suggesting absence of faults/fracture, thus impermeable. Modelling of selected profiles revealed presence of intrusive bodies on the southern, central and northern regions with the subsurface structures being as shallow as 60m and as deep as 511m. These bodies display magnetic susceptibilities as high as 0.0298 SI units and as low as -0.113 SI units, suggesting them to be carbonatite sills, dykes and plugs of different kinds based on geologic units of the area. 2D Euler solutions revealed subsurface faulting activities up to a depth of about 250m and the prese-n. c,e of fluid-filled zones within the survey area which are marked by the absence of magnetic sources. The zones trend in the NW -SE, NNWSSE and N-S within the northern, central and southern parts of Homa Hills. This method confirms that faults/fractures-like structures trending NW-SE, NNW-SSE and N-S on the northern and southern parts of the area serve as fluid conduits which support the upward flow of the geothermal fluid and that the heat sources are shallow intrusive bodies such as dykes, plugs and sills taping from deeper magmatic bodies and that these intrusive bodies form along fracture zones.