Investigasi sumber panas sistem geotermal berdasarkan hasil inversi data 3-D metode magnetotellurik dan geokimia dalam menganalisa area prospek geotermal di Daerah “X” = Investigation of the geothermal heat source based on the results of 3-D magnetotelluric data inversion and geochemistry in analyzing geothermal prospects in Region "X"

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Abstrak

Aktivitas geotermal pada daerah X telah ditemukan melalui keberadaan manifestasi panas bumi yang sangat impresif di beberapa titik. Beberapa penelitian yang dilakukan di daerah ini bertujuan untuk menemukan lokasi dan karakteristik reservoir utama sistem geotermal yang ada di area prospek. Namun, beberapa hasil interpretasi yang ditemukan ambigu dikarenakan penggunaan metode survei yang tidak tepat. Dalam penelitian ini, model konseptual yang terintegrasi dari metode magnetotellurik, geokimia, dan geologi digunakan untuk mendelineasi zona reservoir, karakteristik fluida reservoir, dan temperatur reservoir. Berdasarkan hasil konstruksi model konseptual, reservoir sistem geotermal di daerah penelitian ini ditemukan menggunakan metode magnetotellurik berada tepat di bawah tubuh gunung A. Keberadaan manifestasi fumarol di puncak gunung A, tepatnya di kawah gunung A yang mengalami perluasan ke arah timur laut dan sebagian ke arah barat laut, memvalidasi hasil ini. Temperatur pada reservoir mencapai 310°C, dengan sumber panas yang berasal dari gunung A muda. Area prospek diperkirakan sekitar 24 km dengan top of reservoir pada elevasi 1000 meter. Berdasarkan hasil ini, pengeboran eksplorasi dengan tipe sumur standard hole direkomendasikan untuk memvalidasi hasil eksplorasi 3G (geofisika, geokimia, geologi), yang akan ditajak pada kedalaman 2000 meter.

.....Geothermal activity in area X has been identified through the presence of impressive manifestations of geothermal activity at several points. Several studies conducted in this area aimed to locate and characterize the main reservoir of the geothermal system present in the prospect area. However, some of the interpreted results were ambiguous due to the improper use of survey methods. In this study, a conceptual model integrated from magnetotelluric, geochemical, and geological methods was used to delineate the reservoir zone, fluid reservoir characteristics, and reservoir temperature. Based on the constructed conceptual model, the geothermal reservoir system in this study area was found to be located precisely beneath the base of Mount A using the magnetotelluric method. The presence of fumaroles at the summit of Mount A, specifically in the Kawah Mount A, which is expanding towards the east-northeast and west-northwest, validates these results. The reservoir temperature reaches 310°C, with the heat source originating from the young Mount A. The prospect area is estimated to be approximately 24 km with a top of reservoir at an elevation of 1000 meters. Based on these results, drilling exporation with a standard hole type is recommended to validate the 3G exploration results (geophysics, geochemistry, geology), which will be drilled to a depth of 2000 meters.