

Analisis data penginderaan jauh dan integrasi data geosains dalam pemetaan prospek geothermal di daerah "Sigma" = Remote sensing data analysis and geoscience data integration in geothermal prospectivity mapping at "Sigma" area

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Abstrak

Pemetaan prospek geothermal di daerah "Sigma" dilakukan dengan pendekatan analisis data penginderaan jauh PJ dan diintegrasikan dengan data Geosains berupa Geokimia dan magnetotelluric MT. Hasil penelitian menunjukkan bahwa arah umum kelurusan yang berasosiasi dengan struktur geologi di daerah geothermal "Sigma" adalah NW-SE dengan sub-ordinate N-S dan NE-SW. Struktur N-S merupakan struktur paling awal, mengontrol vulkanisme di kompleks G. Maria. Sedangkan struktur NE-SW yang bersifat ekstensional berkaitan dengan munculnya manifestasi di daerah S. Apas, dan struktur paling akhir berarah NW-SE yang merupakan hasil pergerakan transpresional, berperan sebagai boundary dalam sistem geothermal daerah "Sigma". Berdasarkan analisis geokimia, manifestasi mata air panas dan mud pool di sekitar S. Apas merupakan manifestasi outflow dengan zona upflow diperkirakan berada di Tenggara puncak G. Maria. Estimasi temperatur reservoir berdasarkan geothermometer Na-K-Ca adalah 186 C. Berdasarkan model inversi 3D MT lapisan claycap resistivitas ≤ 20 m tersebar di bagian Tenggara puncak G. Maria, dengan TOR top of reservoir pada kedalaman sekitar 800 m. Posisi reservoir berada di atas suatu bentukan dome yang diinterpretasikan sebagai heat source. Sistem geothermal daerah "Sigma" adalah sistem Vulkanik-Hidrothermal berumur Kuartar dengan temperatur sedang. Litologi penyusun komponen sistem geothermal adalah produk G. Maria, berupa piroklastik dan lava. Daerah prospek geothermal daerah "Sigma" berada di Tenggara puncak G. Maria dengan luas sekitar 8 km².

The geothermal prospectivity mapping in "Sigma" area is conducted by remote sensing data analysis approach, integrated with geoscience data which are geochemistry and magnetotelluric MT. The results shows that the general trend of the lineament associated with the geological structure in the geothermal region Sigma is NW SE with sub ordinate N S and NE SW. The structure of the N S is the earliest, controlling volcanism process in the Mount Maria complex. While the NE SW structure is extensional in relation to the emergence of manifestations in the S. Apas region, and the most recent NW SE trending structure which is the result of transpressional movement, acting as a boundary in the geothermal system of the Sigma area. Based on geochemistry analysis, the manifestation of hot springs and mud pools around S. Apas is an outflow manifestation with an estimated upflow zone located in the southeastern peak of Mount Maria. Estimated reservoir temperature based on Na K Ca geothermometer is 186 C. Based on the 3D MT inversion model, claycap layer resistivity ≤ 20 m is spread over the southeastern peak of Mount Maria, with TOR top of reservoir at around 800 m depth. The reservoir position is above a dome that is interpreted as heat source. The geothermal system in "Sigma" area is a Quarternary Hydrothermal Volcanic System with medium temperature. The lithology composed this geothermal system is the product of Mount Maria, which are the pyroclastic and lava. The geothermal prospect area located in the Southeast of Mount Maria peak with an area of about 8 km².