Aktivitas Anomali Geomagnetik pada Skala Ultra-low Frequency (ULF) di sekitar Stasiun Geomagnetik Sumedang, Jawa Barat = Geomagnetic Anomaly Activity on the Ultra-low Frequency (ULF) Scale around the Sumedang Geomagnetic Station, West Java

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Abstrak

Pulau Jawa berada di dekat zona subduksi Lempeng Eurasia dan Indo-Australia, yang menyebabkan terbentuknya patahan-patahan di daratan. Salah satu daerah yang terdampak adalah Kabupaten Sumedang, Jawa Barat. Prediksi gempabumi penting untuk meminimalisir kerusakan. Analisis aktivitas anomali geomagnetik Ultra-low Frequency (ULF) sebelum gempabumi dilakukan di sekitar stasiun geomagnetik TJS Sumedang menggunakan metode Polarization Ratio Analysis (PRA). Metode ini membandingkan nilai medan magnetik komponen vertikal terhadap horizontal (SZ/SG) berbasis Fast Fourier Transform (FFT) untuk mendeteksi anomali geomagnetik ULF (0.01 Hz - 0.04 Hz). Frekuensi ini dipilih karena mudah merambat ke permukaan, memungkinkan deteksi anomali yang jelas. Tiga gempabumi tahun 2020-2021 dengan magnitudo (M) 5 dan jarak episenter (R) 150 km (10 Maret 2020, M5; 25 Oktober 2020, M5.4; dan 27 April 2021, M5) dianalisis. Data geomagnetik malam hari komponen X, Y, dan Z dipilih untuk mengurangi noise. Hasil menunjukkan frekuensi 0.01 Hz - 0.04 Hz optimal mendeteksi prekursor gempa pada 27 April 2021. Anomali geomagnetik ULF tidak berkaitan dengan badai geomagnetik, dibuktikan dengan nilai indeks Dst (Disturbance storm time) yang tidak melebihi ambang batas.
.....Java Island is adjacent to the subduction zone of the Eurasian and Indo-Australian Plates, causing the formation of several faults on land. From the formation of faults that can be caused by earthquakes, there are areas that are affected, one of which is Sumedang Regency, West Java. Earthquake prediction efforts are very important to minimize the damage that will occur. Ultra-low Frequency (ULF) geomagnetic anomaly activity was analyzed before the earthquake around the TJS Sumedang geomagnetic station using the Polarization Ratio Analysis (PRA) method, which compares the magnetic field value of the vertical component to the horizontal component (SZ/SG) based on Fast Fourier Transform (FFT), which is used to convert data from the time domain into the frequency domain to see ULF scale geomagnetic anomaly activity from 0.01 Hz - 0.04 Hz because this frequency wave easily propagates to the surface, allowing clear anomaly detection. Three earthquakes in 2020-2021 taken at magnitude (M) 5 and earthquake epicenter (R) 150 km (EQ1 with M5 on March 10, 2020, EQ2 with M5.4 on October 25, 2020, and EQ3 with M5 on April 27, 2021) in the vicinity of the TJS Sumedang geomagnetic station were selected because the larger the M and the closer the R of the earthquake can strengthen the geomagnetic anomaly readings. Nighttime geomagnetic data of X, Y, and Z components were selected to reduce noise or human activity. The results showed that the frequency of 0.01 Hz - 0.04 Hz was optimal for detecting possible precursors of the M5 earthquake on April 27, 2021 (EQ1), and the ULF geomagnetic anomaly in this study was not related to geomagnetic storms, which was obtained from the Dst (Disturbance storm time) index value which did not exceed the threshold line.