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Examinations of seismo-magnetic signals using the Morlet wavelet method

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Ratios of geomagnetic daily variation ranges between two stations in Taiwan are approximately equal to 1, due to that magnetic latitude difference is less than 4° . When one station is located nearby epicenters, the ratios depart and recover the original constant few days before and after earthquakes, respectively. Although the anomalous changes of the ratios have been considered to be seismo-magnetic anomalies, a frequency band of them is still not fully understood. We apply the wavelet coherence as a numerical index to compare amplitude distributions in this study. When data recorded by two stations both away from epicenters are used, the wavelet coherence often approaches 1 suggesting that geomagnetic fields are dominated by changes in the ionosphere and/or magnetosphere. If one station located near epicenters is added into the analytical process, the small wavelet coherence (about 0.2) can be observed at the period of approximately 0.5 day during earthquakes. Analytical results and seismo-magnetic ratio changes yield a good agreement either in the time or frequency domain. Notably, the results also shed light on locating epicenters before earthquakes occur.

Keywords: Geomagnetic field, Earthquake prediction, Wavelet transform