Dual-source alternating electromagnetic field network monitors seismic precursor

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We introduce the composition of the first alternating electromagnetic field network with simultaneous continuous observation of both natural and artificial sources. Using the data from the Dali station in Yunnan Province, we examine the anomalous changes in apparent resistivity preceding the Yangbi 5.1 earthquake on March 27, 2017, with the epicenter distance of 32 km. Initially, selected data free from obvious non-seismic interference as the baseline for identifying seismic electromagnetic anomalies. Approximately 2.5 months before the earthquake, the apparent resistivity showed a pulsating increase and phase pulsating decrease. The increase in apparent resistivity accelerated 18 days before the earthquake. Four to five days before the earthquake, the apparent resistivity returned to normal values.

Before the 5.4 magnitude earthquake in Qingchuan, Sichuan Province on September 30, 2017, we identified an anomaly at Jiange Station, about 50 km epicenter distance. The amplitude of the electromagnetic field spectrum of artificial sources in the three days before the earthquake significantly increased which was 2.5 to 3 times of the normal background field spectrum. This example shows that the normal background field without the interference of non-seismic factors can be easily identified and determined by using the electromagnetic field of artificial source. Thus when observing the artificial source signal, other interference effects are suppressed by the strong artificial source signal, and if there is an earthquake anomaly, it can be easily identified, showing the advantages of the artificial source signal. We have also observed some other anomalies before earthquakes using the dual-source electromagnetic network.

Acknowledgments This work was supported by the National Major Science and Technology Infrastructure Project (15212Z0000001) and the National Natural Science Foundation of China (41374077).