

Application of blind source separation method in seismo-magnetic data analysis

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Along with the development of urban constructions, artificial disturbances in geomagnetic observations are becoming more and more tremendous. The near-field noises produced by human activities such as vehicles, subway and high-speed railways make it difficult to precisely measure geomagnetic pulsations on the ground, thus reducing the practical application value of geomagnetic data. Therefore, suppressing near-field noises has scientific significance and application value. In this study, by combining remote reference and blind source separation analysis methods, we proposed a new signal processing approach which is able to separate geomagnetic pulsation from near-field noise. First, we demonstrated the effectiveness of the new approach by separating signals of different sources in the simulation analysis. Then, we applied this method to geomagnetic field data observed in Chiba, Japan where DC-driven train noises were intense. The results showed that geomagnetic pulsations and train noises are separated clearly, and near-field train noise could be reduced effectively on that basis. It is concluded that the reference-based blind source separation analysis is useful in extracting geomagnetic pulsations and suppressing near-field noises, and may have potential application value in electromagnetic exploration.

Keywords: blind source separation, seismo-magnetic data analysis, Boso, Japan