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ULF Geomagnetic Anomaly Associated with the Sumatra Earthquakes

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Anomalous ULF geomagnetic field change is one of the most convincing and promising phenomena for earthquake-related electromagnetic studies such as emissions from the crust of the source region. There has been a good deal of accumulated and convincing evidence of ULF magnetic signatures before large earthquakes as reported in the previous studies. In order to verify these phenomena preceding large earthquakes and to clarify the relationship between electromagnetic phenomena and possible physical mechanism, we have been investigated on the basis of ULF geomagnetic observation at Kototabang and Biak stations associated with the Sumatra earthquakes. A case study is carried out in this work to investigate the pre-earthquake ULF geomagnetic anomalies during the Aceh earthquake on December 26, 2004 (magnitude Mw= 9.0 and depth = 30 km from USGS catalog), and Nias earthquake of March 28, 2005 (Mw= 8.7 and depth = 30 km). For this aim, the polarization analysis and transfer functions analysis based on wavelet transform method have been applied to the observed data. Results of polarization analysis show similar variation of those of amplitude for induction arrow in transfer function analysis. These variations at Kototabang exhibit an anomalous changes a few weeks before the larger earthquakes with M>6.5, while there are no apparent changes in Biak data. This suggests that the anomalous change might be a possible signal related with the earthquake preparation phase of Sumatra earthquakes.