

The excitations of anomalous resonances observed at Nakatsugawa before large earthquakes

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We have carried out the observation network of ULF/ELF electromagnetic waves below 50Hz at Nakatsugawa (in Gifu Prefecture), Shinojima (in Aichi Prefecture), and Minami-Izu (in Shizuoka Prefecture). Three magnetic components (Bx, By, Bz) are measured with induction coil antennas (the permalloy of 1.2m length with 100,000 turns of the copper wire) and are digitized with sampling frequency 100Hz. By using FFT analyze, the amplitude ratio and phase difference between the three magnetic components are estimated.

We have already reported on the intensity and arrival direction of background noise observed at Nakatsugawa for earthquakes of Off Kii Peninsula, 2004 Mid-Niigata Prefecture Earthquake, and Sumatra-Andaman Earthquake (Ohta et al., 2005, etc.).

We have also observed anomalous excitations of Schumann resonances for large earthquakes. We present the detailed experimental results on these excitations.

We have observed the excitation of anomalous resonances possibly associated with earthquakes since 1999 at Nakatsugawa station in Gifu prefecture in Japan. We analyzed the anomalous strong Schumann resonance and another anomalous resonance observed before the 2004 Mid-Niigata Prefecture earthquake and the 2007 Noto Hantou earthquake. The intensity of a particular mode of the Schumann resonance increased before the large earthquake near the observation station, and decreased after the occurrence of earthquake. An excitation of another anomalous resonance was also observed at the frequency shifted by about 2 Hz from the typical frequency of the Schumann resonance. This anomalous resonance had high Q factor and strong intensity. Since the temporal change of the intensity of the anomalous Schumann resonance and excited another anomalous resonance was almost same, there is a possibility that another anomalous resonance was made by the Schumann resonance. However we need to consider more convincing generation mechanism of anomalous resonances and consider about the some factor unique to Nakatsugawa station. There is a possibility that the excited another anomalous resonance was arrived at Nakatsugawa as the induced magnetic field from the epicentral region. However, these anomalous resonances were always detected at only one component (Bx component or By component).

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