



## **Observation of Doppler shifts of subionospheric VLF/LF signals and the seismic effect**

Masashi Hayakawa (1), Yasushi Kasahara (1), Takashi Nakamura (1), Yasuhide Hobara (1), Shinichirou Asai (2), and Toru Inaba (2)

(1) The University of Electro-Communications, Department of Electronic Engineering, Chofu Tokyo, Japan (hayakawa@whistler.ee.ucc.ac.jp, +81 424 425 785), (2) Denki-gakka Kougou K. K., Machida Tokyo 194-8560, Japan

### **Abstract**

The presence of ionospheric perturbations in possible association with earthquakes (EQs) and their characteristics have been extensively investigated by means of subionospheric VLF/LF propagation. As a possible generation mechanism of those perturbations, we have proposed the atmospheric gravity wave (AGW) (period=10 – 100 minutes) channel as being most plausible based on a lot of indirect evidence including the enhancement of AGW fluctuation in the subionospheric data before an EQ. In order to provide the “direct” support to this hypothesis, we have made, in this paper, the first attempt of observing Doppler-shifts of short-distance subionospheric signals from a Japanese LF transmitter JJY (40 kHz) at a few stations in the Tokyo area. As a preliminary analysis, the Doppler-shift data from JJY to a station, Machida (distance=230 km) during five months in 2008 have been analyzed, which has indicated significant enhancements of Doppler-shifts in the AGW range for two EQs and a further statistical correlation of Doppler-shift in the AGW range with large EQs. Finally the mechanism of lithosphere-atmosphere-ionosphere coupling is discussed.