Hectometric Line Radiation found by the Arase (ERG) satellite

*Kozo Hashimoto[1], Atsushi Kumamoto[2], Fuminori Tsuchiya[2], Yoshiya Kasahara[3]

1. Kyoto University, 2. Tohoku University, 3. Kanazawa University

Nonthermal terrestrial continuum at frequencies below ~100 kHz was characterized by Gurnett and Shaw (1973) and Gurnett (1975). These emissions are found to originate at the plasma frequency at steep density gradients at the plasma pause and magnetopause regions of the Earth's magnetosphere. A higher frequency component of terrestrial continuum that appears to be generated inside the Earth’s plasmasphere was detected by the Geotail satellite at a frequency of 100 to 800 kHz, corresponding to the plasma frequency inside the plasmasphere at an altitude extending down to only a few thousand kilometers in the topside equatorial region of the Earth's ionosphere (Hashimoto et al., 1999 and 2006). They named this component as 'kilometric continuum' (KC), which is found to consist of multiple narrowband emissions sometimes lasting for 5 hours or more at a constant or slowly drifting frequency.

We reports newly observed line radiations with even higher frequencies in hectometric wavelengths of 600 to 1,700 kHz found by the Arase (ERG) satellite. Since they are composed of line spectra, we have named this as ‘hectometric line radiation’ (HLR). Although they look like extension of kilometric continuum, they are generally line emissions with long durations different from KC. This has the following characteristics.

1. This is composed of line emissions.
2. This sometimes continues more than five hours.
3. Their frequencies occasionally change.
4. The frequency rage is from 600 kHz to 1,700 kHz.
5. This terminates before the local plasma frequencies or UHR frequencies become close to the frequencies of emission lines.
6. It is not possible for medium frequency broadcasting signals to pass the ionosphere since f_oF_2s are higher the signal frequencies.

In conclusion, the HLR is believed to be new radio emissions generated in the topside ionosphere.

References

Gurnett, D. A. (1975), The Earth as a radio source: The nonthermal continuum, *J. Geophys. Res.*, **80**, 2751-2763.

Gurnett, D. A., and R. R. Shaw (1973), Electromagnetic radiation trapped in the magnetosphere above the plasma frequency, *J. Geophys. Res.*, **78**, 8136-8149.

Hashimoto, K., W. Calvert, and H. Matsumoto (1999), Kilometric continuum detected by Geotail, *J. Geophys. Res.*, **104**, 28,645? 28,656.

Hashimoto, K., J. L. Green, R. R. Anderson, and H. Matsumoto (2006), Review of kilometric continuum, in geospace, *Electromagnetic Waves and Radiation, Lect. Not. in Phys.*, vol. 687, edited by J. W. LaBelle and R. A. Treumann, pp. 37?54, Springer, New York.

Keywords: Arase, Hectometric radiation

