Oral | Symbol P (Space and Planetary Sciences) | P-EM Solar-Terrestrial Sciences, Space Electromagnetism & Space Environment

[P-EM36_28PM2]Physics and Chemistry in the Atmosphere and Ionosphere

Convener:*Yuichi Otsuka(Solar-Terrestrial Environment Laboratory, Nagoya University), Takuya Tsugawa(National Institute of Information and Communications Technology), Seiji Kawamura(National Institute of Information and Communications Technology), Chair:Mitsuru Matsumura(Center for Space Science and Radio Engineering, University of Electro-Communications), Tatsuhiro Yokoyama(National Institute of Information and Communications Technology)

Mon. Apr 28, 2014 4:15 PM - 6:00 PM 312 (3F)

This session covers a broad scope of studies of physics and chemistry in the atmosphere and the ionosphere. Coupling processes between plasma and neutral species, and upward and downward coupling among lower/upper atmosphere, and ionosphere/mesosphere/thermosphere including magnetosphere are discussed. We solicit papers based on experiments with ground-based and/or space-borne instruments, theoretical studies, numerical simulations, and development of new observation techniques.

5:15 PM - 5:30 PM

[PEM36-P12_PG]Measurement of LF Standard-Frequency Waves JJY along the track of Shirase during JARE55: Preliminary Report

3-min talk in an oral session

*Hideaki KITAUCHI[1], Kenro NOZAKI[1], Hiroyuki ITO[1], Takumi KONDO[1], Shigeru TSUCHIYA[1], Kuniyasu IMAMURA[1], Tsutomu NAGATSUMA[1] (1.NICT)

Keywords:low frequency (LF) radio waves, call sign JJY of 40 kHz and 60 kHz, standard frequency and time signals (SFTS), self calibration, Japanese Antarctic Research Expedition (JARE), Japanese Antarctic Research Icebreaker Shirase

We developed a highly sensitive, reliable receiving system for the purpose of reception of low frequency (LF) radio waves. The system consists of digital lock-in amplifiers and crossed-loop antennas. Digital lock-in amplifier (DLA) employs phase-sensitive detection (PSD) of periodic signal multiplied by the input reference source of the known signal frequency. This makes it possible to realize very narrow bandpass filter around the reference frequency, detecting/measuring that of very weak signal even in noisy environment. The antenna, on the other hand, consists of orthogonally crossed, larger double loops (receivers R_X, R_Y) and smaller doubles (transmitters T_X, T_Y): the former receivers R_X, R_Y receive LF radio signals of x-, y-components, the latter transmitters T_X, T_Y transmit an instant, weak signal from each x-, y-component for self calibration purpose. The self calibration test is performed by transmitting a weak LF signal for an instant every an hour from the transmitter T_X, T_Y respectively, and receiving this signal from the receivers R_X, R_Y to obtain preassigned field strength. This test indicates if the receivers of the system are working properly and allows us to obtain reliable measurements.We apply the receiving system to measure the field intensity and phase of the standard frequency and time signals (SFTS) JJY of LF 40 kHz and 60 kHz during the summer expedition of the 55th Japanese Antarctic Research Expedition (JARE), from November 2013 to April 2014. Figure 1 shows temporal evolution of the field intensities JJY 40 kHz (light blue dots) and 60 kHz (brown dots) as well as the self-calibrating radio signals. Our receiving system detects both the LF JJY radio signals even offshore Syowa Station,

Antarctic, about 14,000 km away from those transmitting stations. Also the field intensities of the self calibration test show about a consistent preassigned value, assuring the measurements.