Commission G Report

July 16, 2013

1. Research Report

1.1. Realtime ionospheric disturbance monitoring

(Susumu Saito, Electronic Navigation Research Institute;
Takuya Tsugawa, National Institute of Information and Commnucations Technology)

Electronic Navigation Research Institute (ENRI) and National Institute of Information and Communications Technology (NICT) developed a system to monitor ionospheric disturbances in realtime. Observed data of 200 GPS receivers selected from the Japanese nationwide GPS reference network (GEONET) are transferred to ENRI in realtime with a sampling rate of 1 Hz. The data are processed to produce a map of perturbation component of ionospheric total electron content (TEC) every 5 minutes with a typical time delay of 1-2 minutes. The realtime monitor will be utilized in the JAXA/ISAS sounding rocket experiment for medium-scale traveling ionospheric disturbances to monitor occurrence of the target phenomenon.
(http://www.enri.go.jp/cnspub/susaito/rocket/recent_mstid.html).

The two-dimensional maps of absolute TEC, rate of TEC change index (ROTI), and loss of lock on GPS signals (LOL) are also available from NICT with 10-30 minutes delay
(http://seg-web.nict.go.jp/GPS/RT_GEONET/index_e.html)

1.2 A new data format to promote international exchange and share of GNSS-TEC data

(Takuya Tsugawa, National Institute of Information and Commnucations Technology)

Several 100 km to 1,000 km scale ionospheric variations caused by equatorial plasma bubble and/or travelling ionospheric disturbances can degrade single-frequency GNSS positioning and differential GNSS positioning. However, these ionospheric disturbances have not been monitored enough due to the lack of dense wide-coverage ionospheric observations. One of the most effective methods for such dense and wide-coverage ionospheric observations is two-dimensional TEC observations using a dense GNSS receiver network. Dense GNSS receiver networks are now available only limited areas such as Japan, North America, and Europe. It is needed to expand the GNSS-TEC observation area using all the available GNSS receiver networks with international collaboration of ionosphere and space weather researchers in the world. We propose a new data format, GNSS-TEC Exchange format (GTEX), to promote international exchange and share of GNSS-TEC data. The main concept of the GTEX is to include slant TEC data from each GNSS receiver. By sharing slant TEC data which are not converted to vertical TEC, various ionospheric studies may be possible without affected by specific analysis procedures such as satellite/receiver bias estimation, or different mapping heights. The structure of GTEX is designed to be as close to the format of GNSS observation data (RINEX) as possible, because RINEX is a de facto standard in exchanging GNSS observation data and potential users of GTEX would be familiar with RINEX. Since the 1st Asia-Oceania Space Weather Alliance (AOSWA) workshop held at Chiang Mai, Thailand during 22-24 February, 2012 (AOSWA, 2013), we have collaborated with several organizations researching ionosphere and space weather in Korea, Thailand, Indonesia, Malaysia, and China to share the GTEX data of each country and to develop dense wide-coverage TEC maps in the Asia-Oceania region. The GTEX has been adopted as the basis of ionospheric data sharing by Ionospheric Studies Task Force (ISTF) established in the Asia-Pacific Region of International Civil Aviation Organization (ICAO), which is working on ionospheric characterization for facilitation of GNSS implementation for aviation (ICAO/ISTF, 2012).

Reference

Asia-Oceania Space Weather Alliance (AOSWA) (2013), http://aoswa.nict.go.jp/

ICAO/ISTF (2012), Report of the second meeting of ionospheric studies task force (ISTF/2), International Civil Aviation Organization Asia and Pacific Office, Bangkok, Thailand, October 2012, http://www.bangkok.icao.int/cns/meeting.do?method=MeetingDetail&meeting_id=206

1.3. Airglow imaging experiment

(Kazuo Shiokawa, Solar-Terrestrial Environmental Laboratory, Nagoya University)

The Solar-Terrestrial Environment Laboratory (STEL), Nagoya University is conducting various optical and radio measurements of ionosphere and thermosphere at 13 ground-based stations over the world. The STEL have started new routine measurements of VLF/ELF waves at Athabasca (54.7°N, 246.7°E), Canada since September 25, 2012, in collaboration with Kanazawa University and Athabasca University. STEL also started routine measurements of ionospheric airglow emssions at 630-nm at Haleakala, Hawai (20.7°N, 203.7°E) in March 2013 in collaboration with Kyoto University and Tohoku University. These ground-based data are available from STEL web site.
Quick-look spectra are available at http://stdb2.stelab.nagoya-u.ac.jp/vlf/index.html

2. Meetings (future meetings)

Following meetings are scheduled in relation to URSI Commission-G.

IAGA the XIIth Scientific General Assembly, Merida Yucatan, Mexico, August 26-31, 2013
Symposium web-page: http://www.iaga2013.org.mx/

International CAWSES-II Symposium, Nagoya, Japan, November 18-22, 2013
Symposium web-page: http://www.stelab.nagoya-u.ac.jp/cawses2013/

Mesosphere, Thermosphere, Ionosphere Research Meeting,
National Institute of Information and Communications Technology, Koganei, Japan,
September 16-17, 2013

3. Publication list

<u>Thermosphere studies</u>

H. Liu, T. Hirano, S. Watanabe, "Empirical model of the thermospheric mass density based on CHAMP satellite observations", J. Geophys. Res., 118, 843-848, doi:10.1002/jgra50144, 2013a.

Liu, H. H. Jin, Miyoshi, Y., H. Fujiwara, H, Shinagawa, Upper atmosphere response to stratosphere sudden warming: Local time and height dependence simulated by GAIA model, Geophys. Res. Lett., 40, 635-640, doi:10.1002/grl.50146, 2013b.