Towards an IGS Combined Ionosphere Product

Stefan Schaer
Astronomical Institute, University of Berne, Switzerland

For a long time the IGS community is aware of the fact that the world-wide IGS network offers a unique opportunity to extract information on the Earth's ionosphere. At the IGS Workshops held in Potsdam in May 1995 and in Silver Spring in March 1996, sessions were dedicated to ionospheric issues. For the latter workshop, total electron content (TEC) maps provided by CODE, DLR, ESOC, and UNB were compared, considering only regional (European) maps and the corresponding portion of global maps, respectively [Feltens et al., 1996]. As a consequence of the above TEC comparisons, an official format for the exchange of ionosphere maps, called IONEX, has been developed [Schaer et al., 1998] and approved by the IGS community. The IONEX format allows the storage of snapshots of the electron density (including associated RMS information) referring to particular epochs and to a 2- or even 3-dimensional, earth-fixed grid. IONEX is not a GPS-specific format. It is an interface to non-GPS users of IGS ionosphere products.

Several IGS Analysis Centers (ACs) derive global ionosphere maps (GIMs) and, as a by-product of the TEC determination, differential code biases (DCBs) on a regular basis (or are close to do so). At the 1998 IGS AC Workshop in Darmstadt, Germany, it was concluded that the IGS should monitor the ionosphere for (at least) the next period of high solar activity and study in particular the impact of the ionosphere on IGS core products [Feltens and Schaer, 1998]. For that purpose, it was recommended to focus on two kinds of products: (a) 2-hourly GIMs in 2-dimensional grid form and (b) daily sets of DCBs for the satellites. The development of an IGS Ionosphere Model may be seen as a long-term goal. In order to accomplish these goals, an IGS Ionosphere Working Group shall be established in May 1998. The start of the pilot phase, where the IONEX files as produced by the individual ACs will be sent to the IGS Global Data Centers, may be expected for mid 1998. Finally, the provision of IGS Combined Ionosphere Maps is planned.

Figure 1 shows the evolution of the mean TEC during a period of low solar activity. The smoothed curve indicates (among other features) 27-day fluctuations caused by the Sun's rotation and reveals that we have passed the recent ionospheric minimum in summer 1996 and are approaching the next maximum!

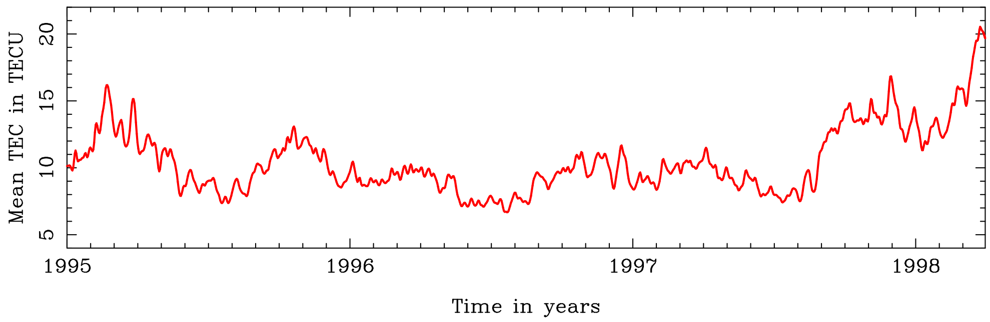

Figure 1. Mean TEC over 3.25 years computed by CODE.

References

Feltens, J., J.M. Dow, T.J. Martin-Mur, C. Garcia Martinez, M.A. Bayona-Perez, 1996, Verification of ESOC Ionosphere Modeling and Status of IGS Intercomparison Activity, Proceedings of the IGS AC Workshop, Silver Spring, MD, USA, March 19-21, 1996, pp. 205-219.

Feltens, J. and S. Schaer, 1998, IGS Products for the Ionosphere, Proceedings of the IGS AC Workshop, Darmstadt, Germany, February 9-11, 1998.

Schaer, S., W. Gurtner, and J. Feltens, 1998, IONEX: The IONosphere Map EXchange Format Version 1, February 25, 1998, Proceedings of the IGS AC Workshop, Darmstadt, Germany, February 9-11, 1998.