

Generation of GPS Observables for Global Ionospheric Mapping

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A data-driven model for global mapping of vertical ionospheric total electron content (TEC) has been developed at the Jet Propulsion Laboratory (JPL) using GPS data from a globally-distributed set of receiver sites. The encryption of the broadcast GPS signal beginning in February of 1991 ("Anti-Spoofing" or A/S) has significantly decreased the signal-to-noise ratio of pseudorange observables available from the global network, particularly at low elevation angles. In order to maintain the accuracy of the global ionospheric maps, improved strategies for processing GPS data have been investigated, particularly with regards to data editing and "phase leveling", whereby the absolute level of the more precise carrier phase observable for each phase-connected data arc is determined from the much noisier, but unambiguous, pseudorange observables.

We have examined the pseudorange noise in GPS global network data as a function of elevation angle, length of phase-connected arc, receiver type, receiver latitude and encryption condition (A/S on or off). Based on this study, data processing strategies have been modified to improve the quality and quantity of ionospheric observables used as input for the global maps. Improvements in map accuracy have been assessed by comparing the mapped TEC with ionospheric measurements available from the dual-frequency radar altimeter onboard the TOPEX/POSEIDON satellite.

American Geophysical Union Abstract Form

Reference # 0000
Session 0.00

1. 1995 Spring Meeting
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5. (a) G07
(b) 2494, 2435, 2479
(c)
6. N/A
7. 0 (X published elsewhere)
8. Charge \$50 to Ulf J. Lindqwister
VISA card 4798 2640 0507 7953,
expires 02/97
9. C
10. Schedule after paper by (II). J.
Lindqwister, et al.
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Date received: 8 Feb 95
Date form added: March 10, 1995
Form version: 1.1