# Development of an Australian regional TEC model and the study of ionospheric TEC variability in the sub-equatorial Australian region

**Mike Terkildsen**

***IPS Radio and Space Services, Australian Department of Industry, Tourism and Resources***
***PO Box 1386, Haymarket, NSW 1240 Australia. mike.t@ips.gov.au***

## ABSTRACT

This information paper details current work being undertaken at IPS Radio and Space Services in the development of an Australian regional ionospheric TEC model with near real time capability and the related study of TEC variability in the Northern Australia (sub equatorial) region.

TEC may be derived from dual-frequency GPS satellite signals by one of a range of techniques. Furthermore, spatial mapping of TEC over a region using multiple GPS receivers requires the adoption of a mapping function, kriging or tomographic technique, as well as algorithms for the accurate estimation of GPS satellite and receiver interfrequency bias and corrections for cycle slip, phase ambiguity and multipath.

Real-time ionospheric TEC modelling can be used to monitor the ionosphere for both ionospheric research and practical applications and also provide calibration information for GPS users and for other space geodesy techniques. A near real-time ionospheric TEC model is being developed at IPS, driven by hourly GPS data from the Geosciences Australia ARGN network of GPS receivers. The model uses a grid-based algorithm and Kalman filter to estimate vertical TEC values. As part of the efforts to develop a near real-time ionospheric model, an assessment of the errors associated with interfrequency bias estimation using various techniques has been undertaken.

Further related work involves the study of TEC variability and TEC gradients in the sub-equatorial Australian region. Large TEC gradients cause simple model assumptions to break down. As a result, most TEC models have their greatest errors in the equatorial anomaly region which shows high TEC variability and where large TEC gradients are a daily occurrence. This study aims to understand the source of ionospheric variability and improve modelling of TEC gradients in this region.