

D4.2 Product Validation Report

(one PVR per sub-theme or one single document, to be agreed between the Agency & team)

1. Introduction

This section describes the validation activities which were performed in order to ensure the quality of the SPECTRE service products (Vertical TEC maps).

2. Overview

The SPECTRE service was developed in 2004 in the frame of ESA, CNES and French ministry funding. It is an operational ionosphere mapping service that provides TEC maps over Europe from GPS network. It was validated against Global TEC Maps (IONEX products) generated by the International GNSS Service (IGS).

3. Validation Activities

VTEC maps produced by SPECTRE were validated by comparison with TEC estimations of several instruments like ionosondes, altimeter satellites and Global Ionosphere Maps (GIMs) supported by International GNSS Service (IGS). Moreover, we demonstrated that Regional Ionosphere Maps (RIMs) produced by SPECTRE provide a better resolution of the small scale variations of the ionosphere than GIMs from IGS.

The best method to assess pertinence and precision of VTEC maps is to compare against other VTEC estimations like Global Ionosphere Maps (GIMs), ionosonde measurements and VTEC measurements of bi-frequency satellite altimeters. Thus, we performed these comparisons for a time period of 7 months, from June 2004 to December 2004. We compared the Regional Ionosphere Maps (RIMs) produced by SPECTRE and the GIMs produced by Jet Propulsion Laboratory (JPL), Centre of Orbit Determination for Europe (CODE), University Polytechnica of Catalunya (UPC) and the combined solution of International GNSS Service (IGS). We compared SPECTRE VTEC maps and GIM's against Jason-1 and Topex ionosphere measurements but also against seven HF sounders observations. Moreover we analysed the VTEC maps dynamics during magnetic storms and during the occurrences of small-scale ionosphere waves.

The performance of the SPECTRE service VTEC maps were good in terms of absolute TEC values and were very good in terms of space and time resolution.

The overall analysis was presented during the Galileo Colloquium in Toulouse, 2007 and is reported in the related proceedings [Crespon et al, 2007].

4. References

Crespon, F., Jeansou E., Helbert J., Moreaux G., Lognonné P., Godet P.E., Garcia R., "SPECTRE (www.noveltis.fr/spectre): a web Service for Ionospheric Products", in Proceedings of 1st Colloquium Scientific and Fundamental Aspects of the Galileo Programme, Toulouse, France, October, 2007.