Realized and planned improvements in ESA/ESOC ionosphere modelling

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ESA/ESOC contributes to the activities of the IGS Ionosphere Working Group since the working group's establishment in May 1998. When these activities began, single layer approaches were widely used, and the time resolution of the TEC maps produced was one day. Also there were significant gaps in the IGS ground station network at that time. In the meantime especially the time resolution has been enhanced, currently to two hours, and the IGS station coverage could also considerably be densified. The realization of near-real-time processing and real-time processing is under discussion. Beyond these aspects, a clear trend to the establishment of 3-dimensional ionosphere models evaluating "classical" TEC data, derived from GNSS observables, in combination with electron density data obtained from LEO occultation's and ground based ionosondes, can be recognized.

At ESA/ESOC the currently still used single layer modelling has been improved with the aid of surface spherical harmonics, and to enhance the time resolution a special estimation scheme has been designed and implemented. Activities to realize an operational TEC map service locally for the ESA tracking sites will commence soon. Beyond that, activities are ongoing to develop a 3-dimensional ionosphere model which will use "classical" TEC data and electron density data as input. Additionally, there are considerations to establish global and regional ionosphere models based on wavelets.

This paper will provide an overview of the improvements made at ESOC in ionosphere modelling so far, as well as an outlook over further improvements which are currently under development.