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Testing GNSS ionosphere models based on the position domain

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As is well know, the ionosphere is one of the main contributors to the navigation error of single-frequency users. Currently, there are many models available for correcting the ionosphere delay. Thus, the different GNSS provide its own ionosphere corrections in the Signal-in-Space as for instance, NeQuick G for Galileo or Klobuchar for GPS. Other sources for ionosphere corrections are the Satellite Based Augmentation Systems (i.e. EGNOS or WAAS), Global Ionospheric Maps (i.e. provided by IGS), regional maps and even climatological models, like NeQuick or IRI. With this large variety of models, there have been a lot of efforts to define a suitable strategy to test the accuracy of the different models. Usually, this testing has been done by computing a "reference ionosphere", using all kind of GNSS techniques, using ionosonde data or using altimeter data. These techniques are not bias free and they may raise questions on which is the absolute accuracy they achieve. In order to complement these tests, a new methodology has been developed to test ionosphere models for GNSS. This methodology is based on the position domain, modeling the observables on each frequency with geodetic accuracy, and then to combine the obtained least square solutions to determine the ionosphere error. The results of the testing for different GIMs from IGS and different Signal-in-Space models (GPS, Galileo, and EGNOS) will be presented for 2 years of the last Solar Maximum with more than 40 receivers worldwide. The weaknesses and strengths of the new methodology will also be shown to get a comprehensive idea of its capabilities.