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On the quality of automatic scaling of digital ionograms: DPS-4D/ARTIST-5 performance at a mid-latitude location

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The ionospheric sounder (ionosonde) remains one of the most reliable tools for monitoring space weather conditions in general, and the bottomside ionosphere in particular. The real-time provision of ionosonde measurements and ionospheric characteristics are nowadays widely used for various space weather services, for development and validation of data assimilation techniques and models. The quality of the output, and thus the ultimate usability, of any real-time model or service depends on the precision and accuracy of the input parameters. The automatic scaling of ionospheric characteristics from ionograms is a non-trivial task, which is prone to a variety of both random and systematic errors.

This presentation will report on a preliminary assessment of the performance of the digital ionospheric sounder at Dourbes, Belgium (URSI code: DB049, coordinates: 4.6°E, 50.1°N), in terms of its capability to deliver ionograms of good quality, at different sounding rates, and the quality of the automated scaling of ionospheric characteristics done by the dedicated computer software. The instrument is a Lowell Digisonde-4D, also known as the Digital Portable Sounder 4D, DPS-4D [1], equipped with the latest version of the autoscaling software, ARTIST-5 [2].

A thorough statistical analysis is currently carried out of the automatic processing and scaling of the more frequently used ionospheric characteristics – the critical frequencies (foF2, foF1, foE, foEs), the virtual heights (h'F2, h'F, h'E, h'Es), the propagation factor (M3000F2), and the maximum usable frequency (MUF3000F2). This analysis is based on the manually-scaled hourly values of the above-mentioned characteristics for the time period since the installation of the DPS-4D in April 2011. The current study builds upon the experience of operating previous versions of the Digisonde and the ARTIST software [3].

Based on the evaluation, error bounds (with 95% probability) for the autoscaled characteristics are deduced for possible use in assessing the uncertainties of ionospheric and space weather services.

References

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