URSI GASS 2021, Rome, Italy, 28 August - 4 September 2021

A statistical study of autoscaled data from ionograms by the ionoScaler

Chunhua Jiang* (1), Guobin Yang(1), Yuannong Zhang(1), and Zhengyu Zhao(1)
(1) School of Electronic Information, Wuhan University, 430072, Wuhan, China, e-mail: chuajiang@whu.edu.cn

Extended Abstract:
Most of modern ionosondes have been equipped with software tools to automatically obtain ionospheric parameters from ionograms. However, how to obtain the high accuracy of autoscaled data is still a challenge work for automatic scaling tools. To get high accuracy of data from ionogram, it is necessary to make a comparison between autoscaled and manual data using a large number of data to further test the performance of autoscaling techniques. Then, the statistical analysis of autoscaled data can help improve the performance of autoscaling techniques.
A novel high-frequency radar, named Wuhan Ionospheric Oblique Backscatter Sounding System (WIOBSS), was developed by the ionosphere laboratory of Wuhan University for ionospheric remote sensing. Equipped with different antennas and phase codes, WIOBSS is able to carry out oblique backscatter, oblique and vertical sounding of the ionosphere. Thus, the whole family system of WIOBSS was renamed Wuhan Ionospheric Sounding System (WISS) [1].
A software tool, ionoScaler [2], has been equipped with this kind of ionosonde developed by Wuhan University to automatically extract ionospheric parameters from ionograms. To further improve the performance of the ionoScaler, a statistical study of autoscaled data by the ionoScaler was conducted in this study. A large number of ionograms recorded by the ionosonde (Puer station, PUR, 22.7^{o}N, 101.05^{o}E, Dip Latitude 12.9^{o}N) in the Southwest of China was utilized to verify the performance of the ionoScaler. The autoscaled critical frequency (foF2) and base virtual height (h'F2) of the F2 layer are used to test the performance of the ionoScaler. We found that the acceptable values in foF2 and h'F2, respectively, are 78.52% and 92.15%. Results show that the autoscaled accuracy of foF2 was affected by the truncated traces on ionograms. If truncated traces of the F2 layer in high-frequency parts are identified and removed. The acceptable values in foF2 can reach up to 95.69%. In addition, autoscaled monthly median values (foF2 and h'F2) are more accurate than the immediate values. However, it is a challenge work to improve the accuracy of autoscaling algorithms. In the future work, it still needs to further be verified by other stations to improve the performance of the ionoScaler.

References

[1] S. Shi, G. Yang, C. Jiang, Y. Zhang and Z. Zhao, "Wuhan Ionospheric Oblique Backscattering Sounding System and Its Applications—A Review", *Sensors*, vol. 17, pp. 1430, June 2017.
[2] C. Jiang, G. Yang, Y. Zhou, P. Zhu, T. Lan, T., Z. Zhao, Z., and Y. Zhang, "Software for scaling and analysis of vertical incidence ionograms-ionoScaler," in *Adv. Space Res.*, vol 59, no. 4, pp. 968–979, November 2017. doi:10.1016/j.asr.2016.11.019.