Reply to the Referee

We are grateful to the referee for his/her useful comments and appreciate very much his/her efforts in improving our paper. The authors note that the referee has carefully and critically evaluated our paper. We have provided answers to all the issues raised in this report below. In addition, our revisions within the manuscript are highlighted in black colour to assist the reviewer.

Referee report

Authors: Anatoliy Lozbin, Viktor Fedun, and Olga Kryakunova
Title: **«Complex analysis of the middle-latitude ionosphere parameters during the geomagnetic storm at Jan, 20, 2010 based on the DEMETER satellite data analysed using DIAS Software»**

The paper presents software for effectively processing data from the DEMETER satellite. The processing aims at searching for the effects in geospace that are caused by different sources. The study is urgent since the DEMETER satellite has collected a large amount of data requiring further processing. The software performance is illustrated by some results of data processing. The paper layout is quite successful. The manuscripts need some improvements.

Referee comment

(1) The paper is of an advertising character since it contains few physical results. The storm effects are actually absent. The January 20, 2010 storm is described in the literature. The authors should compare their results with the results obtained by others (see, e.g., the results obtained by the incoherent scatter technique [Domnin, I. F., Emelyanov, L. Ya., Pazura, S. A., Kharytonova, S. V., Chernogor, L. F. Dynamic processes in the ionosphere during the very moderate magnetic storm on 20-21 January 2010 (In Russian) // Space Science and Technology. 2011. Vol. 17, no. 4. Pp. 26–40].
The authors should have considered a strong storm.

Our reply

The main idea of this paper is to tell about an absolutely new instrument for researcher, using, maybe, not the best example. But, even in this case the complex analysis of parameters of the ionosphere was performed.

Referee comment

(2) The authors allegedly discovered the effects arising from the particle precipitation during the storm. However, precipitations from the inner radiation belt can only occur during strong storms. [Baker, D. N., Kanekal, S. G., Li, X., Monk, S. P., Goldstein, J., and Burch, J. L.: An extreme distortion of the Van Allen belt arising from the 'Hallowe'en' solar storm in 2003, 432, 878–881, https://doi.org/10.1038/nature03116, 2004.].

Our reply

As you can see on Spectrogram 5, the presence of energetic electrons with energy 100-150 keV is no doubt. Truly, electrons precipitation can be caused only by strong storms and this is noticed in paper. Also, it is considered that this precipitation can be caused by VLF transmitter activity (in our case it is the north magneto-conjugate zone of NWC transmitter). Nevertheless, such

precipitation is very rare (just several per year), so, I think, there should be additional conditions for that effect.

Referee comment
(3) The authors assert (line 10-15) that magnetic storms affect ionospheric parameters. This approach seems outdated. Magnetic and ionospheric storms, like atmospheric and electrical storms, are components of a single process, namely, a geospace storm (see, e.g, Chernogor L. F., Garmash K. P., Guo Q., Zheng Y. Effects of the Strong Ionospheric Storm of August 26, 2018: Results of Multipath Radiophysical Monitoring / L. F. Chernogor, K. P. Garmash, Q. Guo, Y. Zheng // Geomagnetism and Aeronomy. – 2021. – Vol. 61, No. 1. – Pp. 73–91; Chernogor L. F., Garmash K. P., Guo Q., Luo Y., Rozumenko V. T., Zheng Y. Ionospheric storm effects over the People's Republic of China on 14 May 2019: Results from multipath multi-frequency oblique radio sounding / L. F. Chernogor, K. P. Garmash, Q. Guo, Y. Luo, V. T. Rozumenko, Y. Zheng // Advances in Space Research. – 2020. – Vol. 66, Is. 2. – Pp. 226–242; Luo Y., Chernogor L. F., Garmash K. P., Guo Q., Rozumenko V. T., Zheng Y. Dynamic processes in the magnetic field and in the ionosphere during the 30 August–2 September, 2019 geospace storm. Annales Geophysicae. https://doi.org/10.5194/angeo-2020-57 .

Our reply

Here you are right and this sentence is changed taking into account your remarks.

Referee comment
(4) The authors mistakenly state that "… effect of radio transmitters on the ionosphere" (line 25). The ionosphere is actually affected by the radio emissions from the transmitter.

Our reply
Corrected

Referee comment
(5) It is necessary to expand the figure captions, to make them more informative.

Our reply
Done

Referee comment
(6) *Kp*max should be specified.

Our reply
Done

We hope that after these corrections the referee will find our MS suitable for publication in *Annales Geophysicae.*

On behalf of all the authors
Sincerely Yours

Anatoliy Lobzin