

4th International Congress on Earth and Geological Sciences

July 21-22, 2025 | Paris, France



Valentina Antonova, Vadim Lutsenko, Galina Gordiyenko, and Sergey Kryukov

Institute of Ionosphere, Almaty, Kazakhstan

Experimental study of the impact of thunderstorms on ionospheric parameters

The article presents the results of an extended study of thunderstorm activity events at the high-mountain Tien Shan station (3340 m above sea level) over an 11-year period using data on the parameters of the surface atmosphere, ionosphere, geomagnetic activity and geoeffective solar events. The objective is to determine the impact of thunderstorm activity on the ionosphere in conditions of calm "space weather". All thunderstorm events (125 cases) are classified by the types of lightning discharge development: positive, negative. The tendency for thunderstorm activity to appear with a delay of 1-2 days or more after the impact of geoeffective coronal mass ejections on the Earth's atmosphere and magnetosphere is confirmed. The results of the study of the impact of thunderstorm activity on the ionosphere under conditions of a quiet geomagnetic field showed that changes in the ionospheric parameters occurred during thunderstorm activity with positive lightning discharges, namely, with them the development of sprites is associated. A modification of the regular daily cycle of the total electron content is observed during thunderstorm activity, typical for the summer season of mid-latitudes. Against the background of the daily cycle, the appearance of wave-like disturbances with an amplitude of about 3-4 TECu and a period of 2-5 hours is detected. On days with thunderstorm activity, an increase in f_{min} values was also observed, which indicates an increase in the level of radio wave absorption in the D-region of the ionosphere. The observed intensification of the sporadic E layer indicates an increase in the level of electron concentration at altitudes of 100-120 km.

Keywords: Atmosphere, ionosphere, electric field, thunderstorm activity, lightning, return stroke

Biography

Dr. Subir Kumar Nag is a graduate in Agriculture and Post-Graduate in Agricultural Chemistry & Soil Science. He is Ph. D. in Agricultural Chemicals from ICAR-IARI, New Delhi. Dr. Nag has more than 29 years experience in working as ARS Scientist under the ICAR. His research areas include monitoring and risk assessment of xenobiotics, ecotoxicology, carbon sequestration and GHG emission from wetlands etc. Dr. Nag has authored more than 80 research papers, edited book, several book chapters, other publications. He is a Pos-Doc from Australia and recipient of many fellowships, awards and recognitions. Dr. Nag has guided three Ph.D. students.