

MANIFESTATIONS OF ACCELERATED ELECTRONS AND PROTONS IN THE 20 JANUARY 2022 MAJOR SOLAR FLARE OBSERVED WITH FERMI AND THE SIBERIAN RADIOHELIOGRAPH

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Sporadic solar activity is responsible for space-weather disturbances that can disrupt ground-based and space-borne systems and threaten human activity and health. The 20 January 2022 solar event (N07 W83) produced a major M5.5 flare, shock wave, and a fast (1430 km/s) CME. The appearance of > 100 MeV gamma-ray emission indicated the acceleration of protons to energies of > 300 MeV. Accelerated protons reached the Earth's orbit. The ionizing flare radiation and energetic protons caused disruptions in radio communications. Identification of sources of accelerated particles is important both for predicting such events and for understanding the processes of their acceleration. A joint analysis of observational data from the Siberian Radioheliograph (SRH) and the Fermi mission revealed the evolution of accelerated electrons and protons in the flare. The spectra of electrons and protons show similarities that apparently indicate a common mechanism for particle acceleration to high energies and a probable similarity of injection functions in their common source. The proton flux was greatest and had the hardest spectral index at the maximum rate of flare magnetic reconnection. The microwave flux caused by accelerated electrons reached almost 1200 sfu at 9.4 GHz. The analysis of Fermi and SRH data suggests that electrons were trapped in flare-associated magnetic structures and retained there for several minutes. Apparently, the same thing happened to protons.