I. A. Zhitnik, S. L. Mandel'shtam, I. P. Tindo, and A. M. Urnov. *New observational data on x-ray flares and active regions on the sun.* The problem of solar flares is one of the central problems in the physics of the sun. During a flare an energy of $\approx 10^{28}$–10^{32} erg is released in the form of electromagnetic radiation (gamma, x-ray, ultraviolet, visible, infrared, and radio) and charged particles (electrons, protons and neutrons, and plasmoids). Flares strongly influence processes which occur in the earth's magnetosphere and ionosphere.

As the basic work of A. B. Severnyĭ and his coworkers has shown, the primary energy of flares derives from the local magnetic energy of the active region where the flare occurs. But what happens next? How is this energy trans- by fast electrons at the base of the loops, the matter in the chromosphere is "vaporized" and diffuses along the magnetic tubes, increasing the emission in the region of the flare up to $Y \approx 10^{49}$ cm^{-3} in the smooth phase of the flare. At the same time "superthermal" electrons with energies $\gtrsim 10$ keV continue to exist together with the thermal component of the plasma. This picture holds throughout the entire smooth phase of the flare, which makes necessary the assumption that energy flows into the region of the flare not only during the pulsed phase, but also during the smooth phase.

Immediate problems for further research, it seems to us,

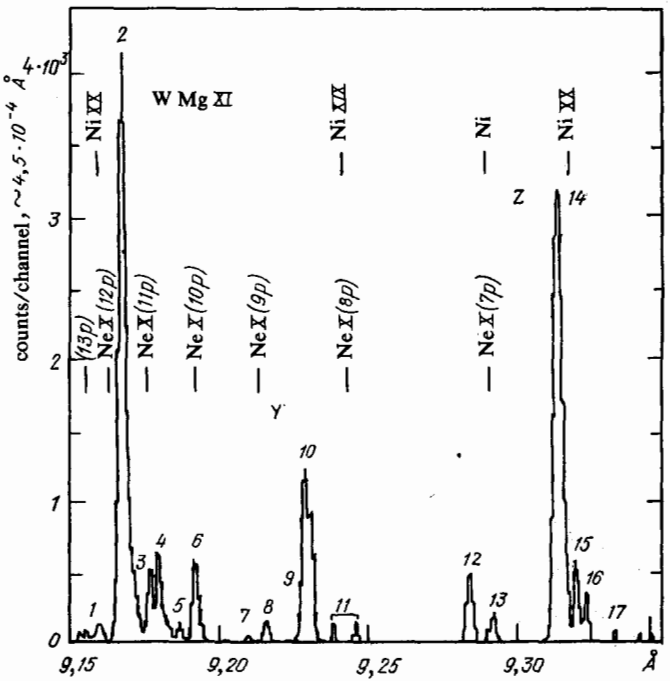

FIG. 1. Section of the x-ray spectrum of the sun near 9 Å, obtained on the Vertikal'-9 rocket on August 20, 1981.

include a more reliable localization of the region of primary energy release in flares and elucidation of the mechanism of the formation of the two plasma components—thermal and nonthermal: do they arise simultaneously in the same region of the corona or does one give rise to the other? It is possible that the plasma is first rapidly heated, which causes the appearance of accelerated "superthermal" electrons (acceleration by shock waves, appearance of instability, thermal runaway of electrons, etc.). It is possible, however, that the fast electrons appear first (for example, as a result of the appearance of a strong electric field), then these electrons heat the plasma in the region of the flare. We are now searching for new observational methods which would yield answers to these questions.

The existence of two plasma components—a thermal component with $T_e \approx 2\text{–}3 \cdot 10^6$ K and $Y \approx 10^{49}$ cm^{-3} and a nonthermal component with electron energies of $\sim(3\text{–}6)$ kT—is also characteristic for active regions on the sun in the absence of flares.

Figure 1 shows the section of the spectrum in such a region near 9 Å, obtained on the Vertikal'-9 rocket on August 20, 1981.

[1]Recent Advances in the Understanding of Solar Flares, Solar Phys. (1983).
[2]Z. Svestka, D. Rust, and M. Dryer, Solar Maximum Year, Adv. Space Res. **2**, 11 (1982).
[3]S. L. Mandelstam, A. M. Urnov, and I. A. Zhitnik in: Abstracts of the 25th COSPAR, Graz, Austria (1984).