MEETINGS AND CONFERENCES

Scientific session of the Division of General Physics and Astronomy, USSR Academy of Sciences (18 December, 1974)

Usp. Fiz. Nauk **116**, 539–546 (July 1975)

PACS numbers: 01.10.Fv

An excursion scientific session of the Division of General Physics and Astronomy was held on December 18, 1974 at the USSR Academy of Sciences Institute of Terrestrial Magnetism, the Ionosphere, and Radio Wave Propagation (IZMIRAN) (Academy Enclave, Krasnaya Pakhra). The following papers were delivered:

1. V. V. Migulin, Introductory Address.
2. A. V. Gurevich and E. E. Tsedilina, Theoretical Investigation of Ultralong-range Propagation of Short Radio Waves.
3. S. F. Golyan and L. A. Lobachevskiĭ, Results of Experimental Studies of the Global Propagation of Short Radio Waves.
4. A. N. Pushkov, É. B. Faĭnberg, T. A. Chernova, and M. V. Fiskina, Secular Variations of the Geomagnetic Field According to Recent Data.
5. I. A. Zhulin, Coordinated Studies of Corpuscular Incursions into the High-latitude Ionosphere.
6. É. I. Mogilevskiĭ, The Fine Structure of the Solar Magnetoplasma.
7. V. I. Karpman, Nonlinear Propagation of Helicons in the Magnetosphere.

We publish below brief contents of five of the papers.

V. V. Migulin, Introductory Address. The functions of IZMIRAN are to study the constant and variable parts of the geomagnetic field, the structure and properties of the ionosphere and higher layers of the atmosphere, which form a highly unstable terrestrial plasma of complex composition, and the propagation behavior of short (decameter) waves with consideration of the structure and state of the ionosphere, and to conduct research in the area of solar-terrestrial physics.

Study of the mechanism by which the solar electromagnetic and corpuscular radiation influences processes in the magnetosphere and ionosphere and the establishment of features of nonstationary processes on the sun that affect the intensity and nature of the action of solar activity on the state of the terrestrial plasma and the earth's magnetic field have in recent years emerged as one of the important trends in the scientific activity of IZMIRAN. Rapid variations of the earth's magnetic field, nonstationary processes in the ionosphere, the associated variations of decameter propagation conditions, and other wave-type electromagnetic processes are found to be closely related to solar-activity instabilities. The entire aggregate of these phenomena requires coordinated study and the conduct of ambitious and many-sided research.

Apart from its great applied importance, study of the constant or slowly-varying component of the geomagnetic field (GMF) and its spatial distribution over the globe should lead to establishment of the true mechanism of GMF generation and features of the earth's internal structure. The variable components of the GMF, its variations, are associated with external sources, with the dynamics of the terrestrial plasma and with effects of solar radiation. Study of these components is therefore one sector of a broad range of studies in solar-terrestrial physics and makes it possible to establish many hitherto unknown relationships of processes on the earth and in near-earth space to the state of the magnetic field in interplanetary space and the state of the solar wind.

Ionospheric radio propagation is a problem of interest to IZMIRAN both from the standpoint of ascertaining the mechanism of radio-wave propagation in the real ionosphere in all of its details and inconstancy and from the standpoint of solving the inverse problem—obtaining information on the ionosphere from study of the properties of radio signals received after interacting with the ionosphere. Study of the propagation of radio waves over short and long distances, the interaction of electromagnetic waves in the radio band with the plasma of the ionosphere and magnetosphere, nonlinear effects in this interaction, and the development of a regular radio propagation forecasting system—this is far from a complete list of problems confronting IZMIRAN investigators.

The new technical facilities that have been developed during recent decades—rockets, satellites and space-probes, and new and highly improved radio systems—have made possible a substantial expansion of our opportunities for obtaining information on the state and properties of the ionosphere and magnetosphere and features of the processes that unfold in them. One of the important problems being solved at the IZMIRAN is that of putting these new possibilities to work and broadening the already extensive body of information on the basis of which our conceptions of the objects and processes under study are built up. But perhaps one of the most important tendencies is a kind of "ideological" restructuring of the entire orientation of the IZMIRAN's scientific work—a transition from simple collection of data, from an observational psychology, and from "observational physics" to the meditated design of coordinated experiments, to the use of experiments in which the medium to be studied is subjected to a predetermined disturbance, to active experiments, to "research physics." Studies in which the ionosphere is beamed with powerful radio-frequency radiation, the injection of a powerful electron beam from a rocket into the ionosphere, the release of barium clouds, etc.—these are only the first few examples of experiment designs capable of yielding much more information than the cumulative results of measurements made under random uncontrollable conditions. And there is no question that ,ystematic implementation of programmed series of designed experiments of this type will make it possible, in combination with observational experience with natural processes, to develop a quite sound and complete

picture of the physical processes in near-earth space, over the earth, on the earth, and as related to solar activity, and their effects on the propagation of radio waves, on the magnetic field, and perhaps also on meteorological processes.