Values were obtained from the diffuse-reflection spectra for the energies of transitions with $h\nu > E_g$, and were used to construct one possible version of the band structure.

A possible band structure of AlSb is obtained from investigation of the optical absorption, reflection, and photoconductivity of AlSb in InSb-AlSb solid solutions.

The basic mechanisms of scattering in AlSb were determined from the temperature dependence of the Hall mobility and the transverse Nernst-Ettingshausen effect. At low temperatures, scattering is by ionized impurities, and at high temperatures (300–1000°K), it is by acoustic vibrations of the lattice. Both of these scattering mechanisms are in operation in the intermediate range (125–300°K). The experimental mobility compares quantitatively with the theoretical value calculated with consideration of the various scattering mechanisms. Phonon dragging of carriers is found to influence the thermal emf, thermomagnetic Nernst-Ettingshausen effect, and thermal conductivity in the low-temperature range. An intraband transition with an energy ~ 0.27 eV is observed from measurements of the Hall effect and optical absorption in n-AlSb.

Studies of the electrical, galvanothermomagnetic, and photoelectric properties of n- and p-InSb in broad temperature, carrier-density, and magnetic-field ranges indicated the possibility of producing high-resistance p-InSb crystals by thermal diffusion, established the nature of the thermal acceptors in InSb, and resulted in determination of the lifetimes of majority and minority carriers in p-InSb and the preparation of long external-magnetic-field-sensitive diodes based on p-InSb by the fusion method. The magnetic sensitivity of the diodes $\gamma \approx 70$ mV/G.

A technology was elaborated for the production of highly sensitive InSb, InP–InAs, and InSb–NiSb Hall transducers and magnetoresistors. A whole series of instruments was designed on the basis of these galvanomagnetic transducers.

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M. Berkeliev, G. G. Dzhemilev, A. Muradov, O. Ovezgel'dyev, and M. Shirmamedov. Certain Results from Study of the Physics of the Ionosphere.

1. A combined experimental investigation of the space-time variation patterns of sporadic formations was carried out. It was shown that, in contrast to the regular layers of the ionosphere, the temporal variation of the sporadic formations is a random process. By way of example, Fig. 1 shows three continuous measurement sessions performed at the same time on different days. The circles correspond to f_0E_s, and the points to f_bE_s. It is seen that the temporal variations of the frequency parameters differ greatly between these sessions and that their values are random quantities for any fixed point in time. Moreover, the classification of E_s layers as opaque and semitransparent on the basis of the difference $\Delta f_bE_s = f_0E_s - f_bE_s$, as is usually done on the basis of standard ionospheric data, is arbitrary in nature, since the quantity Δf_bE_s varies in a very broad range for a given formation, which may be both opaque and semitransparent during the time of its existence.

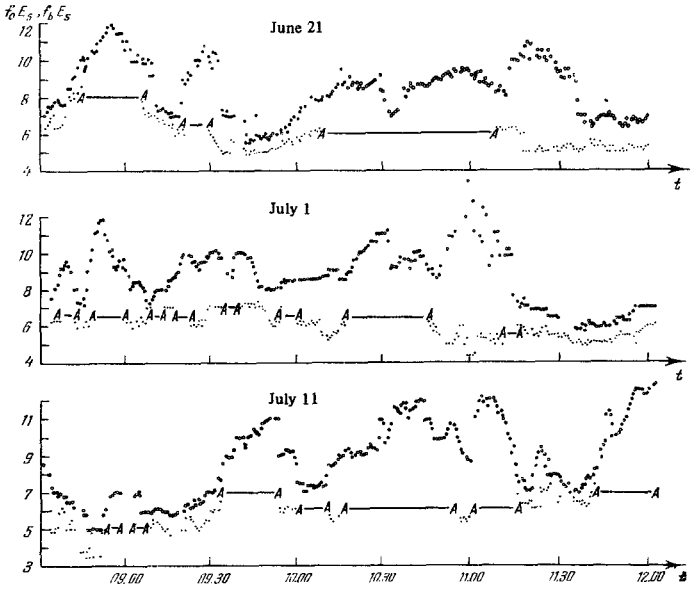

FIG. 1

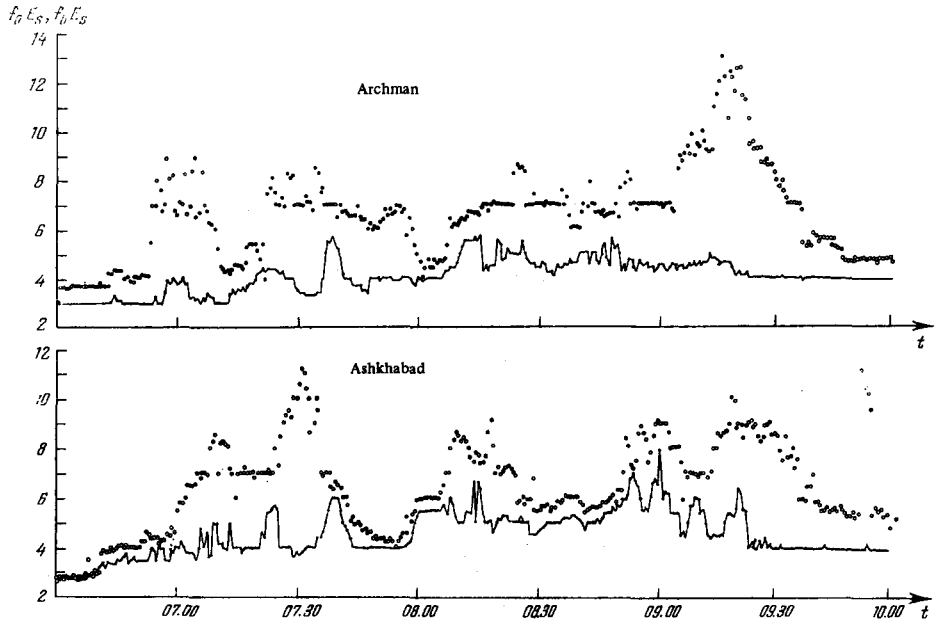

FIG. 2

It is shown that the temporal variation of the sporadic E layer in the daytime and nighttime hours is nearly a stationary random process. The empirical autocorrelation functions of the frequency parameters were determined on this basis. For the daytime hours, the autocorrelation functions $R_{f_0E_S}$ and $R_{f_bE_S}$ are expressed analytically by the formulas

$$R_{f_0E_s} = \exp(-0.06|\tau|),$$
$$R_{f_bE_s} = \exp(-0.12|\tau|),$$

while for night they have the form

$$R_{f_0E_s} = \exp(-0.17\sqrt{|\tau|}),$$
$$R_{f_bE_s} = \exp(-0.19\sqrt{|\tau|}).$$

To study the spatial structure of the E_S layer, synchronous soundings were made by identical ionospheric stations positioned at various distances apart. The results of these experiments indicate that the electron density in the layer is highly nonuniform in the horizontal plane and that the cross correlation of the frequency parameters is relatively low. Figure 2 presents the results from one measurement session in which the stations were separated by 120 km. The results of the experimental measurements were used to determine the spatial correlation function of the screening frequency f_bE_S, which directly characterizes the maximum electron density of the layer:

$$R_{f_bE_s} = \exp(-0.11\sqrt{\tau}).$$

2. Certain investigations of the physics of the F region were carried out. The existence of a transitional zone (20–40° of geomagnetic latitude) in which the basic features of the diurnal and seasonal variations of F-region ionization at heights of 200–300 km are governed by internal aeronomical processes, chiefly recombination[1,2], was demonstrated. In many respects, the development of the F region in the afternoon and evening hours is governed by the magnitude of the diffusion flux. Diffusion is a decisive factor in the longitudinal variation of the diurnal ionization curve above 200 km in the transitional latitudes.

Numerical characteristics of the effect of vertical drift on the behavior of the F region during ionospheric disturbances and of features of the diurnal ionization curve under quiet conditions were obtained by numerical solution of the nonstationary continuity equation with consideration of ionization and recombination processes. The appearance of the morning and evening maxima on the F-region ionization curve[3,4] was explained as an effect of vertical drift.

3. The A_1 method was used to investigate the diurnal, seasonal, and annual variations of absorption and the dependence of absorption on the sun's zenith angle and on solar activity[5,6].

Cases of the appearance of a reflection coefficient $\rho > 1$ were analyzed on the basis of data from low-latitude stations. Special basis observations were also carried out, resulting in establishment of the fundamental laws of the $\rho > 1$ manifestation. It is shown that the anomalous value of ρ is observed basically during sunrise and sunset, when the lines of equal electron density have their strongest curvature. The influence of small-scale inhomogeneities on the results of absorption measurements is analyzed. It is established that the influence of small-scale inhomogeneities is negligible for averaging intervals larger than 10 min[7,9].

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Kh. Gul'medov and A. P. Savrukhin. Research in Astrophysics and the Physics of the Upper Atmosphere in the Turkmenian SSR.

Turkmenia is the southernmost republic of the Soviet Union and enjoys a large number of clear days in the year, a fact that permits systematic observations of meteors, the skyglow, and other celestial phenomena in this region. Broad astrophysical research on meteors, comets, and the gegenschein were begun in Turkmenia in 1942. During the International Geophysical Year, the work on meteors was expanded and research on night-sky emissions was begun.

A system of radar stations for meteor observations, working in continuous generation at 25 MHz, has now been created. It has been used to obtain data on the deceleration of meteors in the earth's atmosphere and to determine the orbital elements of faint meteors[1,2]. Comparison of these data with the results of photographic observations of bright meteors indicates substantial differences between bright and faint ones.

During the approach of the Leonid meteor swarm to the earth in 1965–1967, Turkmenian astrophysicists obtained a great wealth of material from photographic and telescopic observations of the glowing trains of the meteors and their drift. Spectra of the meteor trains were obtained. Reduction of these spectra indicated that most of the emission is in the yellow and red parts of the spectrum, and several emission lines were resolved[3].

Electrophotometric investigations of the atomic-oxygen emission lines at λ 5577 Å and λ 6300 Å in the intrinsic luminescence of the upper atmosphere made it possible to establish morphological features of the emission-line strengths and to investigate their diurnal and seasonal variations and their relation to geomagnetic activity and lunar tidal phenomena in the atmosphere. A peculiarity of the λ 5577 Å emission is the presence of space-time inhomogeneities in the distribution of the emission intensities over the celestial vault. The shape, dimensions, and strength of the inhomogeneity luminescence experience rather rapid changes in time[4].

The kinetic temperature of the atmosphere at heights of 250–300 km was determined by measuring the profile of the λ 6300 Å emission on a Fabry-Perot interferometer. Its value at night during magnetically quiet periods is 700–1500°K, with minima around local midnight. At times of geomagnetic disturbances, the upper atmosphere heats up sharply, with a simultaneous increase in the strength of the emission[5].

Spectrographic observations of the rotational-vibrational bands of hydroxyl in the skyglow brought out short-period variations in the intensity of the emission. The average rotational temperature of the OH molecule is 240°K.

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A. Ashirov, A. V. Anikin, O. Gandymov, and A. S. Vasilevskaya. Results of X-ray Structural and X-ray Spectral Investigations of Certain Compounds.

Research on the topic "Formation and Structure of Crystals" is being conducted in two trends at the Physico-technical Institute of the Turkmenian Academy of Sciences: deciphering the atomic structure of crystals and experimental and theoretical study of fine structure in the x-ray absorption spectra of metals and metallic alloys.

In the first trend, the monoclinic structure of the hydrated magnesium borate inderite $Mg_2B_6O_{11} \cdot 15H_2O$ was exhaustively resolved by direct determination of the signs. Especially characteristic for the deciphered structure are the discrete neutral complexes $MgB_3O_3(OH)_5 \cdot 4H_2O$, in whose composition, in turn, the "island" anion trinuclear radical $[B_3O_3(OH)_5]^{-2}$ is distinguished; the "molecular" complexes are combined into a single structure by hydrogen bonds.

The doubts that existed as to the summetry of hydroboracite $CaMg[B_3O_4(OH)_3]_2 \cdot 3H_2O$ were eliminated, and its monoclinic structure was fully deciphered. The efficiency of two-stage harmonic analysis with Fourier syntheses of higher symmetry in the presence of pseudosymmetry in Patterson syntheses was demonstrated. Colemanite-type $[B_3O_4(OH)_3]_n^{-2n}$ boron-oxygen chains emerge most characteristically in the structure of hydroboracite and are bound into a single architectural motif by parallel chains of Mg octahedra and columns of Ca octagons. The heavy-atom method was used to determine the crystal structure of p-veatchite $Sr_2[B_5O_8(OH)]_2 \cdot B(OH)_3 \cdot H_2O$. For the first time, boron-oxygen radicals $[B_5O_8(OH)]_n^{-2n}$ that are infinite in two dimensions were identified in the structure of this hydrated borate. It was established that witschite and p-veatchite are two dimorphic modifications whose structures are composed of identically constructed boron-oxygen network layers and differ only in the relative arrangement of these layers. Insular triangular boron-oxygen complexes $B(OH)_3$ are present simultaneously in the structures of these minerals. These first known mixed borates permit an expansion of the borate classification scheme by addition of a fifth class of "mixed borates," the first representatives of which must be recognized in the witschite and p-veatchite that we have deciphered...

The crystal structure of the n-hydroxy isomer of cyclohexyl-o-cresyl ketone was determined by a direct method. It was established that the packing of the molecules forms endless chains in which the molecules are bound crystallographically to one another at planes of glancing reflection. Formation of the chains is explained