Investigation of Terrestrial Corpuscular Radiation and of Cosmic Rays During the Flight of a Cosmic Rocket

SOV/20-125-2-16/64

high intensity is dealt with. In the center of the outer zone, where particle density is the greatest, the effective energy of electrons is minimal. In conclusion, cosmic radiation is dealt with. Beginning with a distance of 66000 km, the intensity of all components remains constant. The strict constants of all components at distances of from 66000 to 150000 km indicates the existence of a radiation upon which the terrestrial magnetic field exercises no influence. Therefore, either the terrestrial magnetic field vanishes at a distance of 10 earth-radii, or there are no particles with momenta of

$1.5 \cdot 10^8$ to $4 \cdot 10^7$ ev/c in interplanetary space. The energy-flux of the photons is very low and contributes partly nothing to ionization. There are 2 figures and 4 Soviet references.

SUBMITTED: February 25, 1959

Card 3/3

LOGACHEV, Yu. I., Cand Phys-Math Sci -- (diss) "Research into radiations in flights of artificial satellites and cosmic rockets." Moscow, 1960. 13 pp; (Academy of Sciences USSR, Physics Inst im P. N. Lebedev); 150 copies; price not given; (KL, 27-60, 148)

LOGACHEV, YU. I.

PHASE I BOOK EXPLOITATION SOV/4282

Akademiya nauk SSSR

Iskusstvennyye sputniki zemli, vyp. 5 (Artificial Earth Satellites, No. 5) Moscow, Izd-vo AN SSSR, 73 p. Errata slip inserted. 7,000 copies printed.

Resp. Ed.: L. V. Kurnosova; Ed. of Publishing House: M. I. Fradkin; Tech. Ed.: O. M. Gus'kova.

PURPOSE: The booklet is intended for scientists and engineering and scientific personnel working in the field of space travel and satellite flight.

COVERAGE: The collection of 10 articles deals with problems of satellite orbits, magnetic measurements, radiation, the visibility of space vehicles, the upper atmosphere, and meteoric substances. No personalities are mentioned. References accompany some of the articles.

AVAILABLE: Library of Congress

AC/pw/mal
11-30-60

Card 3/3

VERNOV, S.N.; CHUDAKOV, A.Ye.; VAKULOV, P.V.; LOGACHEV, Yu.I.; NIKOLAYEV, A.G.
/ Associate Member, Academy of Sciences, USSR.

"Radiation Measurements During the Flight of the Second Soviet Space Rocket."

report presented at the First Intl Space Science Symposium, Nice, France, Jan 1960.
National Academy of Sciences of the USSR, Moscow.

3.9000
3.2000
~~29 (2), 29 (5)~~

67908

S/020/60/130/03/009/065
B014/B014

AUTHORS: Vernov, S. N., Corresponding Member of the AS USSR, Chudakov, A. Ye., Vakulov, P. V., Logachev, Yu. I., Nikolayev, A. G.

TITLE: Radiation Measurement During the Flight of the Second Cosmic Rocket

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 130, Nr 3, pp 517 - 520 (USSR)

ABSTRACT: The equipment of the interplanetary rocket launched on September 12, 1959 was designed for measuring the outer radiation-belt of the Earth, for recording cosmic radiation on its flight from the Earth to the Moon and a potential radiation belt of the Moon. The individual parts of the apparatus, which consisted of six gas-discharge and four scintillation counters, are described in detail. Furthermore, this paper contains results of the first evaluation of data obtained for the range of from 9,000 to 120,000 km away from the center of the Earth and in the neighborhood of the Moon. Figure 1 illustrates the trajectories of the first and second interplanetary rockets referred to the terrestrial magnetic field. Ionization measure-

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ments are also graphically represented in figure 1. It is noted that the shift of the ionization maximum between the two measurements was not caused by the slight difference of the trajectories of the two rockets. The radiation belt is most probably deformed by streams of solar corpuscles. This assumption seems to be confirmed by a comparison with the results of measurements performed by the American rocket Pioneer III. The energy-flux density of electrons of more than 5 Mev or of protons of more than 30 Mev is said to be 1 particle/cm^2.sec. Furthermore, a radiation was detected which consisted of electrons having an energy of the order of 10^6 ev, or of protons of an energy of about 10 Mev. The first possibility is considered to be more probable. This electron flux is said to be 5.10^5 particles/cm^2.sec. The existence of electron fluxes having an energy of between 20 and 50 kev (flux: 10^{10} particles/cm^2.sec), which had already been detected by the first intercontinental rocket, were proven again. Thus, two essential groups of particle fluxes were found: electrons

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67908

Radiation Measurement During the Flight of the Second Cosmic Rocket

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of about 20 kev and 10^6 ev electrons. The energy of the first group is close to the mean energy of the solar corpuscular radiation and allows to assume the existence of a thermodynamic equilibrium between protons and electrons on their penetration into the terrestrial magnetic field. It is pointed out that the electron momenta of the second group are close to the proton momenta of corpuscular radiation and to the momenta of the electrons arising from the decay of the reflected neutrons. The existence of a lunar radiation belt could not be proven. Constant radiation intensity was measured at a distance of 70,000 km from the Earth. There are 2 figures, 1 table, and 2 references, 1 of which is Soviet.

SUBMITTED: November 20, 1959

Card 3/3

89610

S/020/60/136/002/013/034
B019/B056

9.9130 (1041, 1046, 1060)

AUTHORS: Vernov, S. N., Corresponding Member of the AS USSR, Chudakov, A. Ye., Vakulov, P. V., Gorchakov, Ye. V., Logachev, Yu. I., and Nikolayev, A. G.

TITLE: Radiation Measurements During the Flight of the Third Cosmic Rocket

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 136, No. 2, pp. 322-324

TEXT: The third cosmic rocket launched on October 4, 1959 contained a scintillation counter and three gas discharge counters. All gas discharge counters had a wall strength of 50 mg/cm² steel sheets and were, in addition, surrounded by several shields. Counter I had a shield made from 3 mm lead + 1 mm aluminum with a counter window of 0.28 cm², which was closed by a 0.2 mm thick aluminum sheet. Counter II had the same shield, but without counter window, and counter III was in an aluminum container made from 2.5 mm thick aluminum. The scintillation counter recorded the ionization of the crystal (NaI) and the counting rate. Preliminary results of evaluation of the instrument readings are given from the time from

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October 4, 1959, to October 18, 1959. The trajectory of the rocket was in practical agreement with that of the first and second cosmic rocket. From a comparison of the readings of the various counters, the authors conclude that the intensities of the particles recorded by the instruments depend on the absorption in the container walls. Measurements in the interplanetary space showed that the cosmic radiation on the boundary of the terrestrial magnetic field is very strong; only individual small fluctuations were recorded. Finally, the agreement existing between the recorded intensities and those of a monitor are dealt with. From these considerations the authors draw the conclusion that the weak variations in the time from October 4 to October 18 are in connection with the variations of the magnetic fields in the solar system and the interactions among the latter are connected with cosmic radiations. There are 1 figure, 1 table, and 3 Soviet references.

SUBMITTED: October 26, 1960

Card 2/2

VERNOV, S. N., GORCHAKOV, Ye. V., LOGACHEV, Yu. I., NESTEROV, V. E., PISARENKO, N. F., SAVENKO, I. A. and SHAVRIN, P. I.

"Investigations of Radiation During Flights of Satellites, Space Vehicles and Rockets"

Report presented at the International Conference on Cosmic Rays and Earth Storm, 4-15 Sep 61, Kyoto, Japan.

37282
S/169/62/000/004/067/103
D218/D302

3,2410 (2205, 2705, 2805)

AUTHORS: Baradzey, L.T., Logachev, Yu.I., and Shishkov, P.P.

TITLE: A study of cosmic-ray variations at altitudes of 9 - 12 km

PERIODICAL: Referativnyy zhurnal. Geofizika, no. 4, 1962, 13, abstract 4G66 (V sb. Kosmicheskiye luchi, no. 3, M., AN SSSR, 1961, 137-142)

TEXT: A report is given of the results of measurements of the general, hard, and neutron cosmic-ray components at altitudes of 9 - 12 km, which were carried out from an airplane in 1959 and covered the geomagnetic latitude range between 43° and 59°N. The readings of the instruments were recorded at intervals of five minutes. The following values of the barometric coefficients were determined from the altitude variation of the intensity in the pressure range 750 - 220 g/cm^2 : (0.495 ± 0.009)% g^{-1}cm^2 for the general component (0.405 ± 0.014)% g^{-1}cm^2 for the penetrating component and (0.654 ± 0.27)% g^{-1}cm^2 for the neutron component. At the altitude of 9 km in the latitude range 52° - 60°N, the latitude effect in the neutron

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component was (-2.4 ± 1.1)%; the latitude effect was absent in the general and hard components. At the altitude of 12 km and latitude of 44° - 52°N, the latitude effect in the neutron component reached (-14.7 ± 1.6)%, while the result for the hard and general components was (-9.0 ± 1.3)% and (-6.3 ± 0.8)% respectively. A reduction in the intensity of all the components was found during geomagnetic storms. In a number of cases the recovery in the intensity of the neutron component after the Forbush effect was incomplete. Moreover, it was found that after the Forbush effect, the recovery of the intensity of all the components to the normal level is faster at higher altitudes. [Abstractor's note: Complete translation].

Card 2/2

3,2420 (1049,1482)
17.2400

29879
S/169/61/000/009/036/056
D228/D304

AUTHOR: Logachev, Yu. I.

TITLE: Determining the spectrum of electrons of the outer radiation belt during the flight of the second cosmic rocket (September 12, 1959)

PERIODICAL: Referativnyy zhurnal. Geofizika, no. 9, 1961, 5, abstract 9G33 (Geomagnetizm i aeronomiya, v. 1, no. 1, 1961, 30-33)

TEXT: A description is given of the apparatus, and the results of investigation of the spectrum of electrons of the earth's outer radiation belt by the second cosmic rocket are given. The recording of electrons was accomplished by three gas-discharge meters of the type СТС-5 (STS-5). The differing thickness of the meters' screen permitted the measurement of the intensity of electrons with energies $E > 350$, > 650, and > 1100 kev. Simultaneous measurements by all three meters were carried out in the altitude range of from 30,000 to 33,000 km from the

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29879
S/169/61/000/009/036/056
D228/D304

Determining the spectrum...

earth's center. The maximum intensity of the outer radiation belt was located at a distance of 17,000 - 18,000 km from the earth's center. The particle flow recorded by the three meters respectively amounted to $(1.4 \pm 0.1) \cdot 10^6$, $(3.9 \pm 0.4) \cdot 10^5$, and $(5.5 \pm 0.3) \cdot 10^4$ cm^{-2} sec^{-1}. It follows that the integral spectrum of electrons $N(> E) \sim E - \gamma$ has the indicator $\gamma \sim 2$ in the interval 350 ÷ 650 kev and the indicator $\gamma \sim 3.5$ in the energy interval 650 ÷ 1100 kev. For energies E ~ 1500 - 500 kev, γ is evidently ~7. Evaluation of the spectrum of electrons in the energy field 20 - 350 kev gives a value of ~4 for the spectrum indicator γ. It is shown that the contribution of roentgen-radiation quanta to the observed counting-rate is negligible and that this effect does not change the character of the spectrum found in the energy field 350 ÷ 1100 kev. [Abstracter's note: Complete translation.]

Card 2/2

LOGACHEV, Yu. I.

34350
S/203/61/001/006/002/021
D055/D113

9,6150
3,2420 (1049,1482)

AUTHORS: Vernov, S.N.; Chudakov, A.Ye.; Vakulov, P.V.; Gorchakov, Ye.V.; Logachev, Yu.I.

TITLE: Radiation measurements in the outer radiation belt on February 12, 1961, during the rocket flight towards Venus

PERIODICAL: Geomagnetizm i aeronomiya, vol 1, no 6, 1961, 872-874

TEXT: The article deals with data on the Earth's outer radiation belt collected when the Earth-Venus rocket launched on February 12, 1961, was 30,000 - 45,000 km from the Earth's center. The special equipment installed in the hermetic container consisted of a scintillation counter and an СТС-5 (STS-5) gas-discharge counter. The distribution of matter around the NaJ(Tl) crystal and the gas-discharge counter is shown in a table. By reducing the dimensions of the crystal and increasing the resolving power of the electronic system of the counter, the radiation intensity in the belt was correctly registered. Fig. 1 shows the overload characteristics for the counting channels of the scintillation (1) and gas-discharge (2) counters.

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Radiation measurements ...

These channels could register up to 10^6 and 10^5 pulsations/sec. respectively. To penetrate the crystal of the scintillation counter and the working volume of the gas-discharge counter, electrons must have an energy of $\geq$ 3 Mev, protons - an energy of $\geq$ 32 Mev and the bremsstrahlung quanta - an energy of $\geq$ 30 kev. Curves on fig.2 represent the counting speed of the scintillation counter (1), that of the gas-discharge counter after corrections were made according to the curves in fig. 1 (3) and the energy release in the crystal in relation to the distance from the Earth's center (2). As all three curves were more or less parallel, the mean energy release in the crystal for one reading of the scintillation counter was 130 kev and remained constant between 32,000 and 40,000 km and the mean energy of the bremsstrahlung quanta did not vary with distance. The constancy of the mean-energy release showed that no great changes occurred in the spectrum of electrons of the outer radiation belt. A diagram (fig. 3) shows the paths of the interplanetary rocket (curve 1) and those of another three Soviet rockets (curve 2). A comparison of radiation and ionization data concerning the interplanetary rocket and the space rockets no. 1 and 2, showed that the outer radiation belt was stable for a period of 2 years when no magnetic perturbances were recorded. However, this period was not long enough to

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Radiation measurements ...

evaluate solar effects on the outer belt, but could be taken as an indication of the absence of such an effect. The space rocket no 3 was launched during a moderate magnetic storm (the change in the vertical and horizontal components of the terrestrial magnetic field was about 250 and 150 γ respectively). The external side of the belt was not measured, but the total energy release in the crystal during the entire flight coincided with that calculated for the rocket no 1 and was 1.5 times less than that of the rocket no 2, i.e. no changes occurred in the mean state of the outer zone during the flight of the rocket no 3 during a moderate magnetic storm. Since measurements were started a few hours after the beginning of a magnetic storm, the radiation intensity in the belt had not yet decreased. On the other hand, it is also possible that not all magnetic storms cause the radiation intensity of the Earth's outer radiation belt to decrease. There are 4 figures, 1 table and 3 non-Soviet references. The three English-language references are: W.H. Hess, J. Geophys. Res.,1960, 65, no 10, 3107; P. Rothwell, C.E. McIlwain. J. Geophys. Res., 1960, 65, no. 3, 793; R.L. Arnoldy, R.A. Hoffman, J.R. Winckler, J. Geophys.Res., 1960, 65, no 5, 1361.

Card 3/6

3/203/61/001/006/002/021
D055/D113

Radiation measurements ...

ASSOCIATION: Moskovskiy gosudarstvennyy universitet, Institut yadernoy fiziki (Moscow State University, Institute of Nuclear Physics)

SUBMITTED: September. 9, 1961

Card 4/6

34352
S/203/61/001/006/004/021
D055/D113

9.6150

AUTHORS: Vakulov, P.V.; Goryunov, N.N., Logachev, Yu.I., and Sosnovets, E.N.

TITLE: Radiation registered during the flights of Soviet artificial satellites and space rockets

PERIODICAL: Geomagnetizm i aeronomiya, v.1 , no.6, 1961, 880-887

TEXT: Methods of registering radiation, based on the use of scintillation and gas-discharge counters and applied in Soviet artificial satellites and space rockets, are described. The registration of weak currents (up to 10^{-10}a) with the aid of a relaxation oscillator on a neon tube is described. The scintillation counters measured the number of particles releasing more energy in the crystal than that determined by the thresholds of the counting devices. Ionization caused by radiation in the entire crystal was also measured. The gas-discharge counters registered charged particles and γ-radiation to an accuracy of $\sim$ 1%. The counters were located behind screens of various materials to facilitate the analysis of radiation according to

Card 1/3

Radiation registered ...

penetration. The devices with the counters were located both inside and outside the container with scientific apparatus. For economy the photomultipliers in the counters were fed without a divider by leads from a high-voltage battery direct to the electrodes. Ionization was determined from the currents of the anode and seventh dynode. By using two channels, these currents could be compared in order to estimate how much of the energy produced in the crystal resulted from saturation of the anode current during intense scintillation in the crystal. By this means comparatively high-energy particles could be detected in the inner zone during tests with the third artificial Earth satellite. The use of a single scintillation counter to measure many parameters permitted the weight and size of the device to be reduced but required careful selection of photomultipliers, which had to satisfy the following requirements: (1) there must not be more than one sound impulse per 10 sec. corresponding to energy liberation of above 30 kev in an NaJ(Tl) crystal and there must be practically no impulses corresponding to energy liberation of > 300 kev; (2) leakage current of the seventh dynode $\leq 1 \cdot 10^{-10}$ a; (3) anode dark current $\leq 1 \cdot 10^{-8}$ a; (4) leakage current of the other dynodes of the intervals $\leq 1 \cdot 10^{-7}$ a. The ETC-5(STS-5)

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Radiation registered ...

gas-discharge counters used were small and had a low operating voltage (~ 400 v) and a thin wall, which facilitated the recording of low-energy particles. The electronic circuits operating on semi-conductor elements and the calibration method are described in detail. There are 9 figures and 5 Soviet references.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M.V. Lomonosova. Institut yadernoy fiziki (Moscow State University imeni M.V. Lomonosov. Institute of Nuclear Physics).

SUBMITTED: October 12, 1961

Card 3/3

S/058/62/000/010/042/093
A061/A101

AUTHORS: Baradzey, L. T., Logachev, Yu. I., Shishkov, P. P.

TITLE: A study of cosmic ray variations at altitudes of 9 - 12 km

PERIODICAL: Referativnyy zhurnal, Fizika, no. 10, 1962, 61, abstract 10B456 (In collection: "Kosmicheskiye luchi, no. 3", Moscow, AN SSSR, 1961, 137 - 142, summary in English)

TEXT: This is a report of results obtained from measurements of the total intensity, the intensity of the penetrating component, and the neutron intensity at altitudes of 9 and 12 km (pressure 310 and 197 g/cm^2, respectively). The measurements were conducted in two groups of airplane flights from March 20 to May 18, 1959, and from October 15 to December 24, 1959. An intensity drop for different cosmic ray components, correlated in time with the magnetic storm periods, is noted. The drop of the neutron intensity is the greatest: (-16.9 ± 0.4) and (-13.3 ± 0.5)% at altitudes of 12 and 9 km, respectively. The intensity drop of total and penetrating radiations is of about equal magnitude: (-12.0 ± 0.3) and (-8.7 ± 0.5)% at 12 and 9 km, respectively. The intensity drop after magnetic

Card 1/2

A study of cosmic ray variations at...

storms grows with altitude according to approximately the same law for all recorded radiations.

[Abstracter's note: Complete translation]

Card 2/2

LOGACHEV, Yu.I.[translator]; TIMOFEYEV, G.A.[translator]; GORCHAKOV, Ye.V.[translator]; ASTAF'YEV, V.A.[translator]; SAVIN, B.I. [translator]; SHABANSKIY, V.P., red.; PAPTAYEVA, V.A., red.; DUBKOVA, S.I., red.; PRIDANTSEVA, S.V., tekhn. red.

[Solar corpuscular streams and their interaction with geomagnetic field]Solnechnye korpuskuliarnye potoki i ikh vzaimodeistvie s magnitnym polem Zemli. Moskva, Izd-vo inostr. lit-ry, 1962. 438 p. Translated from the English. (MIRA 15:11)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta (for Logachev, Timofeyev, Gorchakov, Astaf'yev, Savin).
(Solar radiation) (Magnetism, Terrestrial)

PISARENKO, N. F., SAVENKO, I. A., CHUDAKOV, A. Ye., SHAVRIN, P. I., VERNOV, S. N., GORCHAKOV, E. V., LOGACHEV, Yu. I., NESTEROV, V. E.,

"Investigations of Radiation During Flights of Satellites, Space Vehicles, and Rockets"

Soviet Papers Presented at Plenary Meetings of Committee on Space Research (COSPAR) and Third International Space sumposium, Washington, D. C., 23 Apr - 9 May 62.

VERNOV, Sergey N., [illegible], Ye. V., [illegible], I. A., CHUDAKOV, Alek Ye. and [illegible], V. Ye.

"The earth's radiation belt"

report to be submitted to the 13th Intl. Astronautical Congress, IAF, Varna, Bulgaria, 23-29 Sep 1962.

S/048/62/026/006/013/020
B125/B102

3.2420

AUTHORS: Vakulov, P. V., Vernov, S. N., Gorchakov, Ye. V., Logachev, Yu. I., Nesterov, V. Ye., Nikolayev, A. G., Pisarenko, N. F., Savenko, I. A., Chudakov, A. Ye., and Shavrin, P. I.

TITLE: Radiation studies during the flights of satellites, spaceships and rockets

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26, no. 6, 1962, 758-781

TEXT: This report deals with radiation measurements made by the second and the third Soviet spaceship, by the rocket launched toward the Venus on February 12, 1961, and by the third Soviet earth satellite (August 15, 1958). The spaceships were equipped with scintillation counters, gas discharge counters and elements for storing data through 24 hours. The northern and southern zones of increased radiation intensity are undoubtedly linked by the lines of force of the geomagnetic field. The increased radiation intensity is due to electrons of the outer radiation belt, slowed down in the jacket of the spaceship. The

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Radiation studies during the flights ...

boundaries of this belt were determined more accurately by the lower orbiting Soviet spaceship. At 16 hours after the chromosphere flare of June 17, 1958 had vanished but still a few hours before the magnetic storm, charged particle intensity increased. The electron spectrum of the outer radiation belt does not change much at an altitude of 32,000-40,000 km, nor did the magnetic storm which occurred during the flight of the third Soviet spaceship have any substantial effect on the outer radiation belt. Except for a few percent, the proton intensity of the inner radiation belt remained constant during the three weeks' flight of the third Soviet satellite. The increased radiation intensity over the Brazilian anomaly, observed on board of the second spaceship at an altitude of 320 km, was due to the inner radiation belt. In this anomaly, the proton component of the inner radiation belt is predominant at small geomagnetic latitudes. The portion of X-rays increases with increasing latitude. A zone of lower bremsstrahlung intensity separates the outer from the inner radiation belt. This zone is practically absent in the region of the Brazilian anomaly. The equator of cosmic rays determined by the second and the third Soviet spaceship resembles remotely a sine curve running between 11° of northern and 11° of southern latitude.

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Radiation studies during the flights ...

Between 60° western and 60° eastern longitude the equator of cosmic radiation lies north of the theoretical sine curve. The general trend of the lines of equal cosmic radiation intensity corresponds in general to the distribution of magnetic rigidity. There are 16 figures and 2 tables.

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gos. universiteta im. M. V. Lomonosova (Scientific Research Institute of Nuclear Physics of the Moscow State University imeni M. V. Lomonosov).
Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR)

Card 3/3

VAKULOV, P.V.; VERNOV, S.N.; GORCHAKOV, Ye.V.; LOGACHEV, Yu.I.; NESTEROV, V.Ye.; NIKOLAYEV, A.G.; PISARENKO, N.F.; SAVENKO, I.A.; CHUDAKOV, A.Ye.; SHAVRIN, P.I.

Study of radiations recorded in flights of artificial satellites, cosmic vehicles, and rockets. Izv. AN SSSR. Ser. fiz. 26 no.6:758-781 Je '62. (MIRA 15:6)

1. Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gos. universiteta im.M.V.Lomonosova i Fizicheskiy institut im. Lebedeva Akademii nauk SSSR.
(Van Allen radiation belts) (Artificial satellites) (Spaceships)

LOGACHEV, Yu. I. 6

VAKULOV, P.V., VERNOV, S.N., GORCHAKOV, YE.V., LOGACHEV, YU.I.
CHARAKHCHYAN, A.N., CHARAKHCHYAN, T.N., CHUDAKOV, A. YE.

Cosmic rays in the stratosphere and their correlation with solar activity.

Report to be submitted for Space Research Committee on COSPAR 6th plenary meeting
Warsaw, Poland 11 June 63-

L 2044-65 FSP(h)/FSS-2/EWT(1)/FS(s)/EPA(b)/EWG(v)/FCC/[illegible]

EWA(h) Pb-4/Po-4/Pd-4/Pe-5/Pq-4/Pac-4/Pac-2/Peb/P[illegible]-4 [illegible]

[illegible] AFTC(a)/[illegible] AP4044 [illegible]

TT/JW/WS

AUTHOR: Vernov, S. N.; Chudakov, A. Ye.; Vakulov, P. V.; Gorchakov, Ye. V.; Logachev, Yu. I.; Lyubimov, G. P.; Nikolayev, A. G.

TITLE: Investigation of cosmic radiation during the flight of the Mars-1 and Moon-4 space stations

SOURCE: Kosmicheskiye issledovaniya, v. 2, no. 4, 1964, 633-640

TOPIC TAGS: cosmic radiation, space station, Mars 1, Moon 4, Earth radiation belt, scintillation counter, gas discharge counter

ABSTRACT: Recordings of cosmic-radiation intensity beyond the Earth's magnetic field made during the flights of Mars-1 (20 November 1962 to 25 January 1963) and Moon-4 (2-14 April 1963) are discussed. Data on the Earth's radiation belts received from Mars-1 and data on the cosmic-ray intensity during various cycles of solar activity are given. The equipment aboard Mars-1 consisted of two scintillation and two Geiger gas-discharge counters. It was discovered that the intensity of cosmic radiation remains practically constant beyond a distance of 0.24 astronomical units. During the flight of Moon-4,

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L 7044-65
ACCESSION NR: AP4043502 O

slow and smooth variations in cosmic-ray intensity connected with changes of the magnetic situation in the solar system were recorded. The particle fluxes in the radiation belts recorded by Mars-1 are given. The average energy yield in the crystal of the scintillation counters for a single count was about 2 Kev. Orig. art. has: 5 figures and 4 tables.

ASSOCIATION: none

SUBMITTED: 30Jan64 ATD PRESS: 3104 ENCL: 00

SUB CODE: AA, SV NO REF SOV: 002 OTHER: 005

Card 2/2

L 21116-65 EEC-4/EWG(r)/EWA(h)/EWT(l)/EEC(t)/FS(v)-3/EEC(m)/FCC/FSF(h)/FSS-2
Pe-5/Pg-4/Pi-4/Pl-4/Po-4/Pq-4/Pae-2/Peb/Pb-4 AEDC(b)/BSD/AFWL/SSD/ASD(a)-5/
AEDC(a)/AFHD(c)/AFETR/AFTC(a)/AFTC(b)/APGC(f)/ESD(si) TT/GW/WS
ACCESSION NR: AP5002106 S/0048/64/028/012/2058/2074

AUTHOR: Vernov, S. N.; Chudakov, A. Ye; Vakulov, P. V.; Gorchakov, Ye. V.; Ignat'yev, P. P.; Kuznetsov, S. N.; Logachev, Yu. I. Lyubimov, G. P.; Nikolayev, A. G.; Okhlopkov, V. P.; Sosnovets, E. N.; Ternovskaya, M. V.

TITLE: Radiation study by Cosmos 17 [Report presented at the Vsesoyuznoye soveshchaniye po fizike kosmicheskikh luchey (All-Union Conference on the Physics of Cosmic Rays), held at Moscow, 4-10 October 1963]

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 28, no. 12, 1964, 2058-2074

TOPIC TAGS: radiation measurement, spaceborne ionization measurement, primary cosmic radiation, scintillation counter, gas discharge counter/ STS-5 gas discharge counter, Cosmos-17

ABSTRACT: The article describes equipment used in the flight of Cosmos-17 (apogee, 788 km; perigee, 260 km) for investigating the Earth's radiation belts and primary cosmic radiation.. The equipment consisted of two scintillation counters (with NaI and CsI crystals) and

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ACCESSION NR: AP5002106

a STS-5 gas-discharge counter. The cylindrical NaI counter (20 X 20 mm) was mounted under the shell of the satellite and was fitted with aluminum shielding (1 g/cm^2). On one channel it recorded ionization produced in the crystal by radiation; on the two others, it registered the number of pulses with energy release in the crystal over the specified thresholds (50 kev and Mev). The effective cross section of the NaI crystal for particles registered along the ioniza- tion and first threshold channels was approx. 4.7 cm^2; for the second channel, it was roughly 5% smaller for particles with quadruple ioni- zation and 20% smaller for relativistic particles.

The STS-5 gas-discharge counter has an effective cross section of 4.3 cm^2. It was placed inside the device containing the scintillation counter and was not fitted with any special protection. Up to count- ing rates of 3 x 10^3 pulse/sec, the counter registered virtually all particles. At higher rates, the count became less reliable.

The flat CsI counter (crystal diameter, 6 mm; thickness, 3 mm) was mounted outside the container. For protection from light, the crystal was covered with aluminum foil (2 mg/cm^2). For protection against

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L 21116-65
ACCESSION NR: AP5002106

bremsstrahlung, the photomultiplier and the crystal were shielded with 5 mm of lead and 11 mm of aluminum, except for the front of the photomultiplier, which had a conical opening for particle incidence (aperture angle, 40°). This counter carried out ionization measurements and particle registration at energy release in the crystal of 45 and 160 kev and 5.4 and 8.5 Mev. Both electrons and protons could be registered along the first two (45 and 160 Kev) channels. Along the other two (5.4 and 8.5 Mev) channels, the count was mainly of protons; at an electron path perpendicular to the crystal surface energy losses were about 2 Mev and oblique paths were precluded by the thickness of the shielding. Table 1 of the Enclosure gives the minimal particle energies registered by the counters. Orig. art. has: 2 tables and 4 formulas.

ASSOCIATION: none

Card 3/5

VERNOV, S.N.; CHUDAKOV, A.Ye.; GORCHAKOV, Ye.V.; LOGACHEV, Yu.I.; NESTEROV, V.Ye.; SAVENKO, I.A.; SHAVRIN, P.I.

Radiation belts of the earth. Geofiz. biul. no.14:96-108 '64. (MIRA 18:4)

VAKULOV, P.V.; GORCHAKOV, Ye.V.; LOGACHEV, Yu.I.; CHUDAKOV, A.Ye., doktor fiziko-matem. nauk, otv. red.; ISAKOVICH, T.D., red.

[Collection of articles] Sbornik statei. Moskva, Nauka. No.6. 1965. 112 p. (MIRA 18:5)

1. Akademiya nauk SSSR. Mezhduvedomstvennyy komitet po provedeniyu Mezhdunarodnogo geofizicheskogo goda. VII razdel programmy MGG: Kosmicheskiye luchi.

L 52771-65 FSS-2/EWT(1)/T3(s)/EWG(v)/FCC/EWA(d)/EEC-4/EEC(t)/EWA(h) Pc-4/
[illegible]-4/Pac-4/Pae-2/Pef Pi-4 TT/GW-2

ACCESSION NR: AT5009977 UR/3010/65/000/014/0096/0109

AUTHOR: Vernov, S. N., Chudakov, A. Ye., Gorchakov, Ye. V., Logachev, Yu. I., Panasov, V. Ye., Savenko, I. A., Shavrin, P. I.

TITLE: The radiation belts of the Earth

SOURCE: AN SSSR. Mezhduvedomstvennyy geofizicheskiy komitet. Geofizicheskiy byulleten', no. 14, 1965, 96-109

TOPIC TAGS: radiation belt, radiation belt anomaly, cosmic ray measurement, Mars 1 satellite, Luna 4 satellite

ABSTRACT: This survey article, based mostly on published Soviet and Western papers, discusses the discovery and study of radiation belts, outlines their structure, describes the discovery of radiation belt anomalies, and presents some results of the study of cosmic rays beyond the boundaries of the magnetosphere. This last part contains graphs describing the intensity of cosmic radiation recorded by station Mars 1 as a function of its distance from the Sun, the counting rate of the gas-discharge counter STS-5 on Mars 1 and the stratosphere (at 64° latitude) over the November 1962 - January 1963 period, and the counting rate of the STS-5 counter on the Luna 4 satellite station and in the stratosphere during the first half of April of 1963. Orig. art. has: 16 figures and 2 tables.

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L 3281-66 FSS-2/EWT(l)/FS(v)-3/FCC/EWA(d)/EWA(h) T/GS/GW
ACCESSION NR: AT5023614 UR/0000/65/000/000/0425/0433

AUTHOR: Vernov, S. N.; Chudakov, A. Ye.; Vakulov, P. V.; Kuznetsov, S. N., Logachev, Yu. I.; Sosnovets, E. N.; Stolpovskiy, V. G.

TITLE: Irregular flows of high energy electrons close to the boundary of the earth's radiation belts

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); Trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 425-433

TOPIC TAGS: geomagnetic field, satellite data analysis, radiation belt

ABSTRACT: The authors analyze data obtained from "Elektron-1" and "Elektron-2" during their first month of operation. The equipment used on the satellites is briefly described. Analysis of data pertaining to the midnight meridian indicates that the intensity of the electrons at the boundary of the outer belt decreases by two or three orders of magnitude within a narrow range of radial distances. It is established that the radiation belt on the night side of the earth terminates on quiet days at $L = 6.5—7.5$. On the day side, the boundary of the belt extends on the

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L 3281-66

ACCESSION NR: AT5023614

average to L = 9—10. (Here L is the nominal McIlwain parameter calculated in the dipole approximation and expressed in earth radii.) It is found that irregular flows of electrons outside the boundary of the earth's radiation belts appear with an increase in perturbation of the geomagnetic field both at the surface of the earth and at distances of ~30,000 km from the earth. A theoretical explanation is given for this phenomenon. The experimental data support the hypothesis of a closed system of lines of force in the earth's magnetic field up to latitudes of 75°. [14]

Orig. art. has: 9 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 02Sep65

NO REF SOV: 002

ENCL: 00

OTHER: 010

SUB CODE: ES,SV

ATD PRESS: 4105

Card 2/2

L 1552-66 FSS-2/EWT(1)/FS(v)-3/FCC/EWA(d)/EWA(h) TT/GS/GW

ACCESSION NR: AT5023628 UR/0000/65/000/000/0502/0506

AUTHOR: Vernov, S. I.; Vakulov, P. V.; Zatsepin, V. I.; Logachev, Yu. I.; Okholopkov, V. P.; Chudakov, A. Ye.

TITLE: Primary cosmic radiation investigations

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii, Moscow, Izd-vo Nauka, 1965, 502-506

TOPIC TAGS: cosmic ray, cosmic radiation, primary cosmic ray, primary cosmic radiation, Elektron 2, Elektron 4

ABSTRACT: Experimental data obtained by Elektron-2 and -4 on primary cosmic radiation are presented and interpreted. The data, covering the period 30 January to 1 November 1964, were obtained primarily by means of gas-discharge counters with an average frequency of 20 pulses/sec. The apogee of the satellites was 68,000 km, keeping them outside the earth's radiation belts most of the time. The higher count frequency as the thickness of the screens was increased, made it possible to conclude that the primary radiation did not contain particles within the 50 to 110 Mev range. Two types of radiation intensity variations were distinguished:

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ACCESSION NR: AT5023628

those connected with the 11-year period of solar activity, and fast variations, with a period of the order of two weeks. The 11-year period variations grew in intensity at the rate of about 2 percent per month during the first half of 1964. During the second half of the year the intensity reached a ceiling and in October indicated a tendency to decline. These data are in fair agreement with those of the Fort Churchill and Deep River observation posts. Certain indications of a phase shift between the periods of solar activity and the intensity of cosmic rays were discerned in the sequence of monthly averages of the intensity of cosmic radiation, the relative number of solar spots, and the solar flux of 10.7-cm radio waves. These observations, however, are not considered conclusive. The short-period variations of radiation with a 1.5-percent amplitude periodically acquire a clearly cyclic character. The same observation was made in April 1963 by the Luna-4 interplanetary station. In general, however, the cyclicity is not very regular and the nature of these variations remains obscure. There are also indications of a 27-day period in the data for 1964. An attempt was made to correlate these periods with the sun's rotation. A regular coincidence was not observed, but in some cases (rotations 1792, 1793, and 1794) there was a fair indication of parallelism. The absence of a conclusive connection with the sun's rotation suggests the possibility that the short-period variations have a common

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ACCESSION NR: AT5023628

origin with the 11-year variations. It is also possible that the intensification of cosmic radiation during decline of solar activity is not monotonic, but displays ups and downs stemming from changes in the condition of its propagation or dimensions of the region of its effective scattering within the solar system. Orig. art. has: 4 figures.

[FP]

ASSOCIATION: none

SUBMITTED: 02Sep65 ENCL: 00 SUB CODE: AA, SV

NO REF SOV: 003 OTHER: 001 ATD PRESS: 4094

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L 1553-66 FSS-2/EWT(l)/FS(v)-3/FCC/EWA(d)/EWA(h) TT/GS/GW

ACCESSION NR: AT5023610 UR/0000/65/000/000/0394/0405

AUTHOR: Vernov, S. N.; Chudakov, A. Ye.; Vakulov, P. V.; Gorchakov, Ye. V.; Kuznetsov, S. N.; Logachev, Yu. I.; Nikolayev, A. G.; Sosnovets, E. N.; Rubinshteyn, I. A.; Stolpovskiy, V. G.; El'tekov, V. A.

TITLE: Geometric position and particle composition of the earth's radiation belts

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 394-405

TOPIC TAGS: cosmic radiation, earth radiation belt, cosmic ray, Elektron 1, Elektron 2

ABSTRACT: An exhaustive study is made of data recorded by the Elektron-1 and -2 satellites, which were launched on 30 January 1964. Orbital data are given in Table 1 of the Enclosure. The first orbits were positioned so that the satellites passed their apogee at about 3 o'clock a.m. local time. The outer boundary of the radiation belt was thus crossed at about midnight and again at about 7—8 p.m. on the return branch of the orbit. The subsequent orbits were shifted toward the sunset: Elektron-1, by 8 min, and Elektron-2, by about 4 min in the 24-hr period. Elek-on

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tron-1 and -2 were equipped with similar instrumentation. In some cases, however, there were differences in energy thresholds. A chart summarizing all data shows the electron and proton fluxes of different energies in the equatorial plane and for comparison gives IMP-1 data. The following conclusions can be made from the chart: 1) A belt of artifically injected electrons exists at distances closest to the Earth's center. The maximum of the belt in February 1964 was at L = 1.35. The flux of electrons with energy above 2 Mev at the maximum was about 1×10^7 $cm^{-2} \cdot sec^{-1} \cdot ster^{-1}$. 2) The average directed flux of protons with an energy of 45—70 Mev at the maximum of the inner belt (L = 1.45) was about 1.5×10^3 $cm^{-2} \cdot sec^{-1} \cdot ster^{-1}$. A change in the integral spectrum at proton energies above 50 Mev was observed at L = 2.2; the spectrum of these energies is in the process of hardening, which could be explained by the theory of albedo neutrons. 3) The spatial distribution of protons with an energy of one to several Mev differs from that of the electrons. There is a definite regularity in the distribution of protons according to their energies. The average directed flux of protons with an energy above 2 Mev was about 4.5×10^5 $cm^{-2} \cdot sec^{-1} \cdot ster^{-1}$ in the equatorial plane at L = 2.8. It appears that the majority of the protons in this energy range are created by transverse drift with respect to the magnetic field lines. 4) A belt of high-energy electrons was observed at L = 2.75. Its width at the equator was about 0.4 earth radii. The average directed flux of electrons above 6 Mev was about 10^2 $cm^{-2} \cdot sec^{-1} \cdot ster^{-1}$. 5) A minimum of distribution

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L 1553-66

ACCESSION NR: AT5023610

of electrons of above 150 kev energy was observed in the region between L = 3 and L = 4. The altitude intensity shift is subject to large fluctuations in time and may drop at times to negligible magnitudes. 6) The maximum of the outer belt is positioned, on the average, at L = 4.8. The maximum altitude intensity shift indicator m = 0.5 +0.3/-0.2 within a wide range of L. There is a sharp intensity jump on the night side at L = 7 + 0.5. On the morning side, a slow monotonic drop of intensity was observed. The average directed flux of electrons with an energy of over 70 kev at the maximum of the outer belt is about 5×10^6 $cm^{-2} \cdot sec^{-1} \cdot ster^{-1}$ and can change by more than an order of magnitude. The electron energy spectrum observed within the 70 to 600 kev range is in agreement with the data of other researchers. The electron energy spectrum in the energy range above 1 Mev appears to be softening, in comparison with measurements of earlier years. Orig. art. has: 11 figures. [FP]

ASSOCIATION: none

SUBMITTED: 02Sep65 ENCL: 01 SUB CODE: AA, SV

NO REF SOV: 007 OTHER: 004 ATD PRESS: 4094

Card 3/4

L 3096-66 FSS-2/EWT(1)/FS(v)-3/FCC/EWA(d) TT/GS/GW
ACCESSION NR: AT5023615 UR/0000/65/000/000/0433/0434

AUTHORS: Vernov, S. N.; Chudakov, A. Ye.; Vakulov, P. V.; Gorchakov, Ye. V.; Logachev, Yu. I.; Nikolayev, A. G.; Rubinshteyn, I. A.; Sosnovets, E. N.; Ternovskaya, M. V.

TITLE: Pulsations of the earth's magnetic field, from the measurements taken by the Elektron-3 satellite

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 433-434

TOPIC TAGS: satellite, satellite data analysis, pulse counter, pulse amplifier, pulse amplitude, earth magnetic field

ABSTRACT: The Elektron-3 satellite, launched on July 11, 1964, carried a coil with a ferrite core. Signals from this coil were transmitted to two amplifying circuits, one for the band of 1—10 cps, the other for 30—300 cps. Both circuits recorded pulses with amplitudes exceeding ~1, ~5, ~25 γ. The type and operation of the memory bank are briefly described. From a small amount of data processed it can be seen that no pulses with the amplitudes ≥25 γ were recorded, that at

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ACCESSION NR: AT5023615

the maximum sensitivity ($\gtrsim$ 1 γ) the count exceeded seven pulses per 2 minutes, and that at the intermediate sensitivity ($>$ 5 γ) about 2—3 pulses were recorded by the low-frequency circuit and about 1 by the high-frequency circuit. It is noted that the number of magnetic field pulses with the amplitude $\gtrsim$ 5 γ is generally greater in the frequency region of 1—10 cps than in the region of 30—300 cps and that the pulse intensity tends to increase in some geographical regions. Normally, this increase is recorded by the low-frequency circuit but not by the high-frequency one.

[04]

ASSOCIATION: none

SUBMITTED: 02Sep65 ENCL: 00

NO REF SOV: 000 OTHER: 000 SUB CODE: ES, SV

ATD PRESS: 4106

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L 17777-66 EWT(1)/FSS-2/FCC/EWA(d)/EWA(h) TT/GW
ACC NR: AP6006652 SOURCE CODE: UR/0203/66/006/001/0003/0010

AUTHOR: Vernov, S. N.; Driatskiy, V. M.; Kuznetsov, S. N.; Logachev, Yu. I.; Sosnovets, E. N.; Stolpovskiy, V. G.

ORG: Moscow State University, Institute of Nuclear Physics (Moskovskiy gosudarstvennyy universitet. Institut yadernoy fiziki)

TITLE: Behavior of the radiation belts and anomalous absorption of cosmic radio noise in the aurora borealis region during the magnetic storms of 12-14 February and 20-21 February 1964

SOURCE: Geomagnetizm i aeronomiya, v. 6, no. 1, 1966, 3-10

TOPIC TAGS: cosmic noise measurement, radio wave absorption, aurora, magnetic storm, radiation belt, magnetosphere

ABSTRACT: The authors make a direct comparison of electron fluxes with differing energies in the outer radiation belt during various stages of geomagnetic disturbances. The data used in this study were those transmitted by the Electron-1 and Electron-2 satellites during the magnetic storms of 12-14 and 20-21 February 1964.

Card 1/4 UDC: 550.385.41:621.391.81

These were relatively weak storms with an abrupt onset. The outer radiation belt behaved differently in each of these cases in spite of the fact that the storms were approximately identical with respect to the amplitude of the main phase. *Pc* oscillations with a period of approximately 40 seconds were observed on the day of the first storm, indicating a quiet magnetosphere. During the first hour of the storm, an electron flux of $N \sim 1.5 \times 10^8$ cm^2/sec/kev was observed at a distance of approximately 10 Earth radii. This region lies far outside the radiation belts of the Earth, and the flux was apparently due to the storm. The magnetic field increased in this region during the first phase of the storm. Electron intensity decreased somewhat after the initial phase. Electron-1 data gave the boundary of the outer radiation belt on the night side as L = 6.5–7 before the abrupt onset of the storm, while the data of Electron-2 gave a value of L = 7.4. Data from these satellites gave L = 5.5–5.8 and L = 5.9, respectively, after the initial phase of the storm. This may be explained by compression of the magnetosphere. The period of *Pc* oscillations after the initial phase was approximately 20 sec. The period of the *Pc* oscillations was reduced to 16 sec when the boundary of the radiation belt shifted to L = 5. There was a faster increase in the flux of electrons with energies greater than 40 kev during the main phase of the storm than there was in the intensity of electrons with energies greater than 150 kev. The basic data for the

storm of 20-21 February were those transmitted by the Electron-1 satellite. These data show that the boundary of the outer radiation belt was at L = 6-6.5 before the storm. The period of *Pc* oscillations was approximately 50 sec. During the first phase of the storm, the boundary of the radiation belt was registered as L=5 and the period of *Pc* oscillations was 14 sec. An increase in the intensity of the magnetic field was observed at a distance of approximately 10 Earth radii. These data indicate compression of the magnetosphere. Low-energy electrons appeared at great distances from the Earth during the first phase of the storm. Data from 10 stations were used for studying the absorption of cosmic radio noise in the region of the aurora borealis. The first burst of auroral zone absorption was observed on the day side of the Earth during the first phase of the storm. This may be due to the fact that the boundary of the magnetosphere was approaching the Earth. The amplitude of anomalous absorption increased from ∿1 db to ∿3.5 db when the boundary of the radiation belt moved from L = 5.6 to L = 9.6. Beyond this point, there was a reduction in auroral zone absorption. After the initial phase, no more such strong "bursts" of anomalous absorption were observed until the development of the main phase. Anomalous absorption was again observed during the main phase but this time with no clear relationship to L. An analysis of the data shows that electrons pour out of the radiation belts on the day side of the earth during the first phase

of a magnetic storm. This is indicated by the reduction in electron intensity in the maximum of a belt and at higher values of L. Evaluations show that during the first phase of a storm the mirror points of electrons in the outer radiation belt may move several hundred kilometers closer to the Earth. Anomalous absorption in the auroral zone may be observed between the first and main phases of a magnetic storm. However, in this case they are accompanied by various effects in the radiation belt region. A comparison of data on auroral zone absorption and the behavior of radiation belts shows that anomalous absorption is sometimes accompanied by a reduction in intensity in the belt and sometimes by no changes at all or even an increase in the number of particles in the belt. More data are needed on auroral zone absorption around the entire Earth and at $L < 4$. Orig. art. has: 9 figures. [14]

SUB CODE: 08/ SUBM DATE: 03Aug65/ ORIG REF: 005/ OTH REF: 004
ATD PRESS: 4209

Card 4/4 TS

L 0-703-67 JKT

ACC NR: AP6030010 SOURCE CODE: UR/0020/66/169/C05/1044/1047

AUTHOR: Vernov, S. N. (Corresponding member AN SSSR); Vakulov, P. V.; Gorchakov, Ye. V.; Logachev, Yu. I.; Lyubimov, G. P.; Nikolayev, A. G.; Pereslegina, N. V.

ORG:

TITLE: Measurement of intensity of penetrating radiation on the Moon's surface [Paper presented at the Seventh COSPAR Meeting held in Vienna in May 1966]

SOURCE: AN SSSR. Doklady, v. 169, no. 5, 1966, 1044-1047

TOPIC TAGS: moon, radiation intensity, lunar probe, radiation measurement/ Luna-9 lunar probe

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ABSTRACT: The lunar probe "Luna-9" launched by the Soviet Union on 30 January 1966 made a soft landing on the Moon on 3 February at 24 hr, 45 min, 30 sec (Moscow time); it was equipped with an instrument containing a 6 x 10-mm discharge counter to measure the intensity of radiation. The minimum shielding of the counter mounted inside the probe near its jacket was ~1 gm/cm².

The instrument was switched on immediately after "Luna-9" was put into orbit and was kept in operation until the probe stopped functioning. The data on the intensity detected with the gas counter averaged over 14 time intervals are shown in Fig. 1. The first five time intervals are those for the flight from the Earth to the

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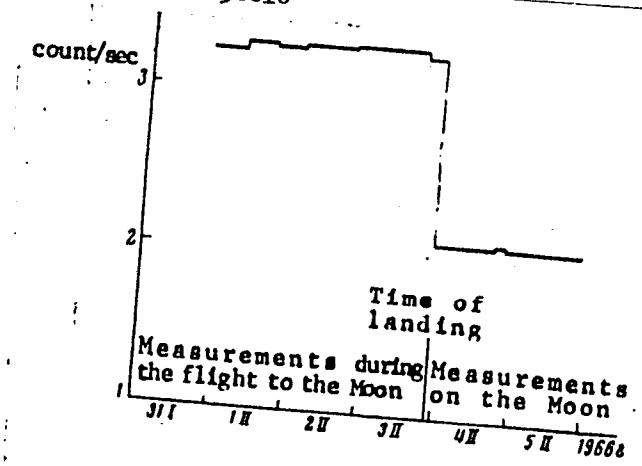

Fig. 1. The mean-count rate of "Luna-9" discharge counter

Moon. The next (sixth) interval is that for the flight near the Moon (beginning with at a distance of ~50,000 km from the Moon), the landing, and the first 5 minutes on the Moon's surface. The subsequent eight intervals are related to operations on the Moon's surface. Table 1 shows the accurate values of the time intervals and the mean-count rates recorded in these intervals. The basic errors in determining the count rate are statistical.

The data in Table 1 show that the mean-count rate recorded on the Moon's surface was about 63% of the count rate of the same counter in free space. In other words, if only primary cosmic rays had been detected, the counter on the Moon's surface would have counted not quite half as much as during the flight in free space. The detected excessive radiation

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Table 1.

	Interval boundaries	Averaging interval	Mean-count rate	Note
31 Jan 1966	18 h 38 min 40 sec	10 h 12 min 30 sec	3.229±0.010	During the flight
1 Feb 1966	04 h 51 min 10 sec 15 h 45 min 30 sec	10 h 54 min 20 sec	3.277±0.010	"
2 Feb 1966	23 h 01 min 45 sec 16 h 29 min 00 sec	07 h 16 min 15 sec 17 h 27 min 15 sec	3.267±0.011	"
3 Feb 1966	15 h 34 min 15 sec 21 h 50 min 00 sec	23 h 05 min 15 sec 06 h 15 min 45 sec	3.278±0.007 3.286±0.006	" "
4 Feb 1966	00 h 06 min 54 sec 06 h 35 min 04 sec 17 h 02 min 00 sec	02 h 16 min 54 sec 06 h 28 min 10 sec 10 h 26 min 56 sec	3.245±0.012 2.065±0.016 2.069±0.010	Near the Moon and on the Moon On the Moon "
5 Feb 1966	19 h 52 min 30 sec 04 h 00 min 40 sec 19 h 01 min 40 sec 20 h 37 min 30 sec 22 h 42 min 20 sec	02 h 50 min 30 sec 08 h 08 min 10 sec 15 h 01 min 00 sec 01 h 35 min 50 sec 02 h 04 min 50 sec	2.074±0.008 2.077±0.014 2.058±0.009 2.055±0.006 2.059±0.020 2.059±0.017	" " " " " "

The mean-count rate during the flight is 3.272±0.004
The mean-count rate on the Moon is 2.064±0.004

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is 0.43 count/sec or ∿26% of half the cosmic-ray intensity. This excessive radiation may be due to the radioactivity of the Moon's surface and to the secondary cosmic radiation produced by the primary cosmic radiation in the matter on the Moon's surface region closest to the station (cosmic-ray albedo).

Until now, no experimental data have been available on the radioactivity of the Moon's surface. The "Luna-9" measurements make it possible to evaluate the radioactivity of the Moon's surface in the landing area near the Ocean of Storms. Assuming that the total detected additional radiation is due to the radioactive gamma radiation from the Moon's surface, the radioactivity of the Moon's surface may be ∿20 times greater than that of the Earth's surface (the count rate of "Luna-9" from the natural radioactivity on Earth was 0.02 count/sec). However, the radioactivity on the Moon's surface has been evidently overestimated, because the effect of multiplication of the primary cosmic radiation producing the cosmic-ray albedo particle fluxes may explain the major part or even all of the additional radiation detected. Using the data from an earlier Soviet paper, it can be shown that the albedo particle flux is 20% of the total cosmic-ray flux or 40% of half the cosmic-ray flux. Additional considerations show that at least in the region of the "Luna-9" landing, cosmic rays will be the main source

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of radiation hazard and that the radioactivity on the surface of the Moon is close to the radioactivity on the surface of the Earth.

It was shown during the flight of the second Soviet space probe in September 1959 that at the distances greater than 1000 km from the Moon's surface, the intensity of the radiation trapped by a possible lunar magnetic field does not exceed 10% of the cosmic-ray intensity. The "Luna-9" data make it possible to evaluate the fluxes of the trapped radiation at distances less than 1000 km from the Moon's surface.

The mean-count rate just before and during the first minutes after the landing was 3.25 ± 0.012 count/sec (see Table 1). If this count rate is corrected for the geometric shielding of the counter by the Moon during the approach of the station to the Moon and during the period of radiation detection on the Moon's surface (this correction is about 1%), the resulting count rate is 3.28 count/sec. This practically coincides with previous measurements. The time required for the "Luna-9" to cover the last 1000 km to the Moon's surface was ∿2% of the time measured in the given interval. At the measuring accuracy mentioned above, an increase of 50% in the count rate during this time interval would be noticeable.

Thus the upper limit for the possible radiation flux penetrating the "Luna-9" jacket and trapped by the hypothetical magnetic field of the Moon at the altitudes below 1000 km from the Moon's surface is not more than half the primary cosmic-radiation flux. The variation which would decrease the intensity of cosmic rays might somewhat change the evaluation of the upper limit of the hypothetical trapped radiation near the Moon, but the main conclusions that the Moon has no radiation belts and consequently no marked magnetic field remain unchanged.

Fig. 2 shows the mean-count rates in free space and on the Moon's surface. The intensity in the transition interval has been corrected for the geometric shielding by the Moon.

It can be seen from Fig. 2 that the cosmic-ray intensity undergoes slow gradual changes (solid curve) similar to those recorded during the flight of "Luna-4." This makes it possible to assume that during the period of the station's approach to the Moon, no appreciable variation in cosmic-ray intensity occurred. Neither the available neutron-monitor data nor the stratospheric data of A. N. Charakhchyan and T. N. Charakhchyan (unpublished) revealed any considerable decrease in the cosmic-ray intensity.

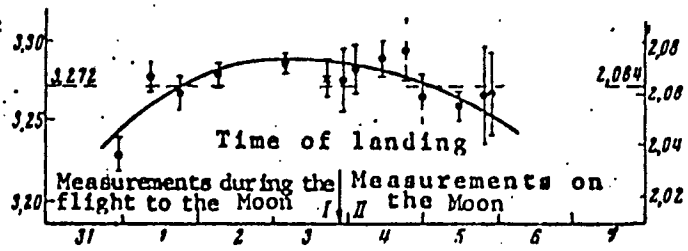

Fig. 2. The count rates of the discharge counter during the "Luna-9" flight in free space and on the Moon's surface. The mean-count rate on the Moon's surface has been reduced to the mean-count rate during the flight, and the scale has been changed in proportion to the mean-count rates during the flight and on the Moon's surface.

The absolute flux of the cosmic-ray particles detected by "Luna-9" was equal to 5.35 $\pm$ 0.5 cm^{-2} sec^{-1}. The great error in the determination of the absolute fluxes is due to the 10% uncertainty in the operational dimensions of the counter. Analogous measurements from "Luna-7" and "Luna-8" stations performed on 4—6 October and 3—6 December 1965 have shown the particle fluxes to be 5.4 and 5.9 cm^2 sec, respectively. The cosmic-ray intensity in February 1966 decreased compared to December 1965. This

ACC NR: AP6030010

is likely to be associated with the beginning of a new cycle of solar activity.

Thus the cosmic-ray intensity maximum occurs during the period December 1965—January 1966, and the lag in the cosmic-ray intensity maximum behind the solar maximum detected for the protons of energies higher than 30 Mev is about 1.5 years. This conclusion is also confirmed by the data of the "Zond-3," "Venus-2," and "Venus-3" space probes.
[FSB: v. 2, no. 10]

SUB CODE: 22 / SUBM DATE: 11May66 / ORIG REF: 003 / OTH REF: 001

Card 8/8 fv

L 9604-66 EWT(1)/FCC/EWA(h) GW
ACC NR: AR5020397 UR/0313/65/000/003/0035/0035

SOURCE: Ref. zh. Issledovaniye kosmicheskogo prostranstva, Abs. 8.62.238

AUTHOR: Vernov, S.N.; Chudakov, A.Ye.; Gorchakov, Ye.V.; Logachev, Yu.I.; Nesterov, V.Ye.; Savenko, I.A.; Shavrin, P.I.

TITLE: Radiation belts of the earth

CITED SOURCE: Geofiz. byul. Mezhduved. geofiz. kom-t pri Prezidiume AN SSSR, no. 14, 1964, 96-109

TOPIC TAGS: satellite, rocket, radiation effect, cosmic radiation

TRANSLATION: A short outline is given of the results obtained from studies conducted using Soviet artificial satellites and cosmic rockets of the radiation belts and of primary cosmic radiation beyond the limits of the magnetic sphere.

SUB CODE: 04,03 ENCL: 00

Card 1/1

ACC NR: AP7001543 SOURCE CODE: UR/0020/66/171/003/0583/0586

AUTHOR: Vernov S. N. (Corresponding member AN SSSR); Chudakov, A. Ye. (Corresponding member AN SSSR); Vakulov, P. V.; Logachev, Yu. I.; Lyubimov, G. P.; Pereslegina, N. V.

ORG: Moscow State University im. M. V. Lomonosov (Moskovsky gosudarstvennyy universitet)

TITLE: Cosmic ray variations according to data from Zond-3 and Venera-2

SOURCE: AN SSSR. Doklady, v. 171, no. 3, 1966, 583-586

TOPIC TAGS: cosmic ray, cosmic ray intensity, cosmic ray measurement

ABSTRACT: At the end of 1965 and beginning of 1966 two Soviet space stations, Zond-3 and Venera-2, were in space simultaneously measuring cosmic ray intensity. The first was in motion away from the Sun and the second toward the Sun, which made it possible to determine both variations in the intensity of cosmic rays and their dependance on the distance from the Sun (i.e., their radial gradient). Data obtained by STS-4-type gas-discharge counters onboard the spacecraft revealed the radial gradient as $\delta = (3.1 \pm 0.4)\%$ per 1 astronomic unit. The radial

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ACC NR: AP7001549

gradient was irregular; this phenomenon was attributed to changes in the character and magnitude of the Forbush effect. Detectors of the n-p type onboard the space stations measured the radial gradient of protons with energies of 1—5 Mev. In addition to a sharp temperature increase, the detectors revealed a very stable and time-independent noise which exceeded by about 10 times the possible noise of high-energy particles. It was also found that the intensity of protons increased in moving away from the Sun. When the distance from the Sun was increased from 130 x 10^6 to 190 x 10^6 km, the intensity of 1—5-Mev protons, whose origin is known to be solar, increased 5 times. A mechanism is proposed for explaining this paradox. The nature of the radial gradient may possibly be explained by Parker's diffusion theory. Orig. art. has: 4 figures. [WA-75]

SUB CODE: 04/ SUBM DATE: 11Aug66/ ORIG REF: 002/
OTH REF: 002 ATD PRESS: 5111

Card 2/2

ACC NR: AP7001894 SOURCE CODE: UR/0020/66/171/004/0847/0850

AUTHOR: Vernov, S.N. (Corresponding member AN SSSR); Chudakov, A.Ye. (Corresponding member AN SSSR); Vakulov, P.V.; Logachev, Yu.I.; Lobimov, G.P.; Nikolayev, A.G.; Perslegina, N.V.

ORG: Moscow State University im. M. V. Lomonosov (Moskovskiy gosudarstvennyy universitet)

TITLE: Measurement of solar protons with energies of 1—5 Mev by the Venera-2, Venera-3, and Zond-3 space probes

SOURCE: AN SSSR. Doklady, v. 171, no. 4, 1966, 847-850

TOPIC TAGS: solar radiation, solar radiation intensity, proton counter

ABSTRACT: During the flights of the Zond-3, Verena-2, and Venera-3 space probes, the counting rate of proton detectors and Geiger counters on board increased markedly on six occasions. The semiconductor surface-barrier proton detectors had an area of about 0.2 cm^2; the p-n junction was 35 μ thick. On the side of free space within a solid angle of ~1 sterad, the detectors were shielded with 2 mg/cm^2-thick aluminum foil; on other sides the shielding was more than 1 g/cm^2 thick. The detectors were tuned to record protons with energies varying from 1 to 5 Mev. The intensity range measured corresponded to 1.1×10^{-3} to 1.1 pulse/sec.

UDC: none

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ACC NR: AP7001894

An analysis of the recorded data indicates that the protons are accelerated on the Sun and are propagated without hindrance along the magnetic force lines in interplanetary space. The width of proton fluxes with energies of 1—5 Mev was estimated at 3×10^{12} cm. It is concluded that these protons of comparatively low energies are generated periodically from the active areas on the Sun. They reach distant regions in interplanetary space through a "tunnel" produced by the corpuscular streams. [WA-75]

SUB CODE: 03/ 04/ SUBM DATE: 11Jul66/ ORIG REF: 002/ OTH REF: 002/
ATD PRESS: 5113

Card 2/2

BANDMAN, M.K.; LOGACHEVA, A.A.

Transportation and trade relations of Krasnoyarsk Territory and the outlook for their development. Trudy Transp.-energ. inst. Sib. otd-AN SSSR no. 10:23-46 '60. (MIRA 14:1)
(Krasnoyarsk Territory--Commerce)

CHERMENSKIY, M.P.; LOGACHEVA, A.A.; BANDMAN, M.K.

Main trends in the development of transportation and trade relations and the transportation system of the Angara Valley within Krasnoyarsk Territory. Trudy Transp.-energ. inst. Sib. otd. AN SSSR no. 10:47-68 '60. (MIRA 14:1)

(Angara Valley--Transportation)

LOGACHEVA, A.A.

Development of transportation and trade relations of Siberia with regions of Central Asia and Kazakhstan in connection with the transportation of lumber. Trudy Transp.-energ. inst. Sib. otd. AN SSSR no. 10:97-111 '60. (MIRA 14:1)
(Siberia--Lumber--Transportation)

LOGACHEVA, L.I.; OBRAZTSOV, G.D., professor, direktor; KLEMPARSKAYA, N.N., professor, zaveduyushchiy.

Study of the mechanism of the effect of garlic phytoncides upon skin microflora; author's abstract. Zhur.mikrobiol.epid.i immun. no.8:16-17 Ag '53. (MLRA 6:11)

1. Kafedra mikrobiologii Chelyabinskogo meditsinskogo instituta (for Klemparskaya). 2. Chelyabinskiy meditsinskiy institut (for Obraztsov). (Phytoncides) (Skin) (Garlic--Therapeutic use)

LOGACHEVA, L.I.

Investigation of the duration of the effect of garlic phytoncides. Zhur.mikrobiol.epid.i immun. no.8:88 Ag '54. (MLRA 7:9)

1. Iz kafedry mikrobiologii Chelyabinskogo meditsinskogo instituta.
(GARLIC--THERAPEUTIC USE) (PHYTONCIDES)

PETROV, V.I.; PINSKAYA, F.S.; LOGACHEVA, L.I.

Case of fluorine damages to green plants. Gig.i san. 26 no.1:77 Ja '61. (MIRA 14:6)

1. Iz Dnepropetrovskoy gorodskoy sanitarno-epidemiologicheskoy stantsii.

(AIR—POLLUTION) (PLANTS, EFFECT OF FLUORINE ON)

LOGACHEVA, L.N.; ROMANOV, P.S.

Correction for the heterogeneity of surfaces of end measurements of lengths. Trudy VNIIM no.7:73-85 '49. (MIRA 11:6)
(Length measurement)
(Interferometry)

EYDINOV, V.Ya.; LOGACHEVA, L.N.

Checking the readings of goniometers. Izm. tekh. no.6:25-28 N-D '57.
(Goniometers--Testing) (MIRA 10:12)

24(0); 5(4); 6(2) PHASE I BOOK EXPLOITATION SOV/2215

Vsesoyuznyy nauchno-issledovatel'skiy institut metrologii imeni D.I. Mendeleyeva

Referaty nauchno-issledovatel'skikh rabot; sbornik No. 2 (Scientific Research Abstracts; Collection of Articles, Nr 2) Moscow, Standartgiz, 1958. 139 p. 1,000 copies printed.

Additional Sponsoring Agency: USSR. Komitet standartov, mer i izmeritel'nykh priborov.

Ed.: S. V. Reshetina; Tech. Ed.: M. A. Kondrat'yeva.

PURPOSE: These reports are intended for scientists, researchers, and engineers engaged in developing standards, measures, and gages for the various industries.

COVERAGE: The volume contains 128 reports on standards of measurement and control. The reports were prepared by scientists of institutes of the Komitet standartov, mer i izmeritel'nykh priborov pri Sovete Ministrov SSSR (Commission on Standards,

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Measures, and Measuring Instruments under the USSR Council of Ministers). The participating institutes are: VNIIM - Vsesoyuznyy nauchno-issledovatel'skiy metrologii imeni D.I. Mendeleyeva (All-Union Scientific Research Institute of Metrology imeni D.I. Mendeleyev) in Leningrad; Sverdlovsk branch of this institute; VNIIK - Vsesoyuznyy nauchno-issledovatel'skiy institut Komiteta standartov, mer i izmeritel'nykh priborov (All-Union Scientific Research Institute of the Commission on Standards, Measures, and Measuring Instruments), created from MGIMIP - Moskovskiy gosudarstvennyy institut mer i izmeritel'nykh priborov (Moscow State Institute of Measures and Measuring Instruments) October 1, 1955; VNIIFTRI - Vsesoyuznyy nauchno-issledovatel'skiy institut fiziko-tekhnicheskikh i radiotekhnicheskikh izmereniy (All-Union Scientific Research Institute of Physicotechnical and Radio-engineering Measurements) in Moscow; KhGIMIP - Khar'kovskiy gosudarstvennyy institut mer i izmeritel'nykh priborov (Khar'kov State Institute of Measures and Measuring Instruments); and NGIMIP - Novosibirskiy gosudarstvenyy institut mer i izmeritel'nykh priborov (Novosibirsk State Institute of Measures and Measuring Instruments). No personalities are mentioned. There are no references.

Electric and Magnetic Measurements (Shramkov, Ye.D., Editor, Professor)

AVAILABLE: Library of Congress

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