SKURIDIN, G.A.

USSR/Geophysics - Seismology

FD-2586

Card 1/1 Pub. 44 16/19

Author : Skuridin, G. A.

Title : Concerning Yu. V. Riznichenko's article "Determination of the fields of intensity of seismic waves (ibid, No 1, 1954)

Periodical : Izv. AN SSSR, Ser. geofiz, Jul-Aug 55, 391-392

Abstract : Yu. V. Riznichenko proposed a method for determining the fields of intensity (more accurately, the energy density) of seismic waves (longitudingal or transverse) within the medium, if one knows the field of intensity on a certain surface R, at which is given the "so-called 'dynamic' hodograph represented by the set of functions $t_r = t(x_r, y_r, z_r)$ and E_r $E(x_r, y_r, z_r)$, where E is the intensity of the waves and t is the time field; he reduces this problem to the integration of a first-order differential equation relative to E for given boundary condition E/R = Er. The writer of this note states that Yu. V. Reznichenko, according to his faulty derivation of his formulas, is apparently unaware of the classical work of N. A. Umov (Izbr. uch. (Colleted Works), Moscow-Leningrad, 1954, pp 161-163).

Institution :

Submitted :

FD-1701

Skuridin, G. A.
USSR/Geophysics - Wave diffraction

Card 1/1 : Pub. 45-1/12

Author : Skuridin, G. A.

Title : Approximate solution to the problem of the diffraction of plane elastic wave relative to the aperture

Periodical : Izv. AN SSSR, Ser. geofiz., 3-16 Jan-Feb 1955

Abstract : The author derives an approximate solution to the problem of the diffraction of a plane elastic longitudinal wave relative to the aperture by means of the Huyghens-Kirchhoff principle for the equations of elasticity. The formulas obtained permit one to give a quantitative analysis of the diffraction field. The computations are illustrated by numerous graphs. The author acknowledges N. V. Zvolinskiy for his posing of the subject, L. P. Zaytsev for directing the work of computation, and the laboratory assistants M. A. Kuznetsov, E. V. Ushakova, and N. N. Limacheva. Fifteen references (e.g. I. S. Bernzon, "Certain problems of the kinematics of propagation of diffracted seismic waves," Trudy Geofiz. in-ta AN SSSR, No 9 (136), 1950; M. M. Fridman, "Diffraction of plane elastic wave relative to semi-infinite rectilinear rigidly divided slit," Uch. zap. LGU, ser. mat., No 114, 17, 1949).

Institution : Geophysics Institute, Academy of Sciences USSR

Submitted : February 13, 1954

SKURIDIN, G.A.

Concerning IU.V.Riznichenko's article "Determining fields of intensity of seismic waves." Izv.AN SSSR. Ser.geofiz. no.4: 391-392 Jl-Ag'55. (MLRA 8:10)
(Seismology)

SOV/124-58-4-4498

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 4, p 118 (USSR)

AUTHOR: Skuridin, G. A.

TITLE: Approximate Solution of the Problem of the Diffraction of a Plane Longitudinal Elastic Wave in Relation to a Horizontal Fault (Priblizhennoye resheniye zadachi difraktsii ploskoy uprugoy prodol'noy volny otnositel'no gorizontal'nogo sbrosa)

PERIODICAL: Tr. In-ta geofiz. AN GruzSSR, 1955, Vol 14, pp 79-90

ABSTRACT: On the basis of the integral relationship submitted by V. D. Kupradze [Granichnyye zadachi teorii kolebaniy i integral'nyye uravneniya (Boundary Problems of the Theory of Vibrations and Integral Equations). 1950] for the solution of the problem of the diffraction of a plane longitudinal elastic wave in relation to a horizontal fault, the author offers an approximate solution to the problems of the diffraction of elastic waves in a manner analogous to the method of Kirchhoff as applied to optics and acoustics. It is assumed that the value of the displacement vector v on the "illuminated" section of the surface S coincides with the value of the descending wave on the unilluminated section. The author further accepts the so-called "principle of

Card 1/2

SOV/124-58-4-4498

Approximate Solution of the Problem (cont.)

the isolated element" in accordance with which the descending longitudinal wave is reflected from the rectilinear boundary at each point in the same manner as if it were reflected from a small element of the plane surface intersecting the given point. In the author's opinion, the method developed is a generalization of the Huygens principle applied to the system of wave equations which describe the propagation of longitudinal and transverse waves. With the help of the stationary-phase method a study is made of the waves spreading over wide wave areas.

E. Ye. Khachiyan

1. Vibration--Theory 2. Mathematics

Card 2/2

SKURIDIN, G. A.

KARPENKO, A.G.; SKURIDIN, G.A.

Contemporary problems of space flight. Vest. AN SSSR 25 no.9:19-30 S '55. (MIRA 8:12)

(Space flight)

ZVOLINSKIY, N.V.; SKURIDIN, G.A.

Asymptotic solution of dynamic problems on the theory of elasticity.
Izv.AN SSSR.Ser.geofiz.no.2:134-143 F '56. (MLRA 9:7)

1.Akademiya nauk SSSR, Geofizicheskiy institut.
(Elasticity) (Waves)

SKURIDIN [redacted]

Jumps in discontinuous solutions of dynamic equations in the theory of elasticity. Izv.AN SSSR Ser.geofiz.no.6:625-633 Je '56. (MLRA 9:9)

1.Akademiya nauk SSSR, Geofizicheskiy institut.
(Elasticity) (Geophysics)

45

AUTHOR: Skuridin, G. A.

TITLE: On the theory of elastic wave scattering on curvilinear boundary. (K teorii rasseyaniya uprugikh voln na krivolineynoy granitse).

PERIODICAL: Izvestiya Akademii Nauk, Seriya Geofizicheskaya, 1957, No.2, pp. 161-183 (U.S.S.R.)

ABSTRACT: An expanded version of a paper read on July 3, 1956 at the 3rd All Union Mathematical Conference. An approximate solution of the problem of elastic wave scattering along a curvilinear boundary, calculated by on the basis of Kirchhoff's law is described. Analytical expressions are worked out for the displacement of longitudinal and transverse reflected waves and it is shown that the reflection of a plane elastic wave from a curvilinear boundary produces a longitudinal and a transverse wave with a divergence function of φ - 1/2.

Card 1/4

APPROVED FOR RELEASE: 08/24/2000 CIA-RDP86-00513R001651210015-9"

45

TITLE: On the theory of elastic wave scattering on curvilinear boundary. (K teorii rassehaniya uprugikh voln na krivolineynoy granitse).

An analysis is given of the main wave produced during the incidence of a transverse wave on a rigid curvilinear boundary and it is shown that in this case the formation of several main waves is possible. Scattering indicatrices are given of longitudinal and transverse waves and also graphs illustrating the character of weakening of these waves along the R beam. The introductory paragraph summarizes briefly work of other authors on this subject. The problem itself is formulated and solved for the incidence of a plane longitudinal wave in para.1. The solution for the incidence of a plane transverse wave is arrived at in para.2, while in para.3 an approximate evaluation is given of the integrals, and in para.4 the main wave is analyzed. The diffracted field in the wave zone during the incidence of a plane longitudinal or transverse wave on a curvilinear boundary can be expressed by eqs. (16), (17) (pp.166-167), (23), (24) (p.168) and (72) (p.179); two reflected waves are obtained, but these are no longer plane, due to the curvilinear nature of the boundary.

Card 2/4

45

TITLE: On the theory of elastic wave scattering on curvilinear boundary. (K teorii rasseyaniya uprugikh voln na krivolineynoy granitse).

PRESENTED BY:

SUBMITTED: 7/20/56

AVAILABLE: Library of Congress

Card 4/4

30-8-5/37

Rockets and Artificial Satellites for the Investigation of the Higher Atmosphere

tude of 120 km and 2 even 160 km). In White Sands also 91 rockets of the type Aero-B were launched which reached altitudes of up to 80 km. The "Aero-X" - rocket carried the record at that time and it reached 288 km. It was followed by the "Viking" with 253 km and the great event was: the two-stage-Vampyre-rocket (composed of a V-2 and a "Corporal"). It reached 400 km on February 24, 1949. A short time after, the first 3-stage rocket was built (discharge from the BBC-basis in Florida) which for the first time reached an altitude of 1200 km. Sounding of the atmosphere by means of rockets was carried out in various countries. In the Soviet-Union too, rockets are used for research-purposes. Both American and British constructors built their measuring instruments into the head of the rockets, whereas the Soviet scientists developed an other method: the case containing the measuring instruments is automatically disengaged from the rocket and parachuted. Among the numerous projects of artificial satellites there is one particularly interesting, i.e. the so called "Vanguard"-project (USA). The 3-stage-rocket which is to convey the satellite on its way, is constructed in such a way that the first two are guidable, whereas the third one stabilizes its position

Card 2/3

SKURIDIN, G.A.

26-12-2/49

AUTHORS: Skuridin, G.A., and Kurnosova, L.V., Candidates of Physico-Mathematical Sciences

TITLE: Scientific Research by Means of Artificial Satellites of the Earth (Nauchnyye issledovaniya pri pomoshchi iskusstvennykh sputnikov zemli)

PERIODICAL: Priroda, 1957, 46, No 12, pp 7-14 (USSR)

ABSTRACT: The article deals with the problem of inquiring into the phenomena beyond the atmosphere by using artificial earth satellites. The idea to build satellites originates from the Russian scientist K.E. Tsiolkovskiy who years ago suggested sending them into the space by means of rockets. The two satellites recently launched by Soviet scientists are the first of a series of new research devices which in all probability will soon be commonly used for the study of the phenomena in the universe and for solving problems of space flight. According to the authors, Soviet scientists have developed a method of calculating the length of the operational capability of a satellite and also the changes in the orbit's parameters during the time of flight. The satellites will be able to collect important data on the characteristics of the

Card 1/5

26-12-2/49

Scientific Research by Means of Artificial Satellites of the Earth

atmosphere at altitudes of up to 1,700 km, to measure the full intensity of cosmic rays and to register ultraviolet and X-rays emitted by the sun. The two satellites are equipped with instruments for the study of the short wave part of the solar spectrum (Figure 2 explains the arrangement of apparatus registering ultraviolet and X-rays of the sun) which enables the investigation of various layers of the sun's atmosphere. Cosmic rays will be observed with apparatus as shown by Figures 3 and 4, collecting the necessary material for determining nuclear showers of low intensity. Other devices will enable to register variations of cosmic rays of different kinds (lasting 24 hours, 27 days etc) which will be obtained at different points of the globe almost simultaneously. Vital data are also expected on the influence of the sun's activity on the intensity of cosmic radiation. A further object of research is the structure of the atmosphere. The most important problem of physics of the atmosphere is to what extent its composition depends on the altitude, as reliable data exist only up to heights of 100 km. The satellites are also registering the corpuscular radiation of the sun, which is of vital importance

Card 2/5

26-12-2/49

Scientific Research by Means of Artificial Satellites of the Earth

in the ionization of upper layers of the atmosphere, in the formation of polar lights and in geomagnetic disturbances. The study of the structure of the earth's magnetic field in regions above the strongly ionized layers of the upper atmosphere can probably answer the question of the earth's magnetic field and why it changes in the course of time. Microparticles of interplanetar substances moving about at high altitudes will be registered when touching the rocket's hull or special membranes as shown by Figure 6. The 2nd artificial satellite, which was launched on November 3, 1957, is described as follows. Its orbit has the shape of an elipse whose remotest point from the earth is approximately 1,700 km away. During 24 hours it circles the earth about 14 times. It carries, beside scientific equipment, 2 radio transmitters operating on frequencies of 40,002 and 20,005 megacycles respectively, electric batteries and an airtight cabin with a dog for experimental purposes. Contrary to the arrangement in the first satellite, "Sputnik No 2" carries all the equipment in the front part of the rocket's last stage. Only the radiometric measuring device is attached to the hull of the rocket.

Card 3/5

The total weight of the equipment, dog and electric batteries

26-12-2/49

Scientific Research by Means of Artificial Satellites of the Earth

included, is 508.5 kg. Figure 1 shows the devices for investigating the sun's radiations as carried by "Sputnik No 2", Figure 2 the dog in the airtight cabin before being placed in the satellite. The cabin holds food for the dog, an air conditioning system (for regeneration and temperature control), instruments for registering pulse, respiration, blood pressure, for taking electro-cardiograms and a series of sensitive cells for measuring temperatures and pressure in the cábin. A radio-telemetric equipment enables the transmission of all measurements to the earth at regular intervals according to a prearranged plan. The dog's cabin and ball-shaped container are made of aluminum alloys. Their surface is polished and specially finished to attain a certain coefficient of radiation and to absorb solar radiation. Figure 3 shows the equipment for registering cosmic rays, Figure 4 the arrangement of the containers holding the satellite's equipment, Figure 5 a diagram showing the same arrangement.

There are 7 photos, 4 diagrams and 2 references, all of which are Slavic (Russian).

Card 4/5

26-12-2/49

Scientific Research by Means of Artificial Satellites of the Earth

ASSOCIATION: Institute of Geophysics imeni O.Yu. Shmidta of the AN, USSR (Moskva) (Institut fiziki zemli imeni O.Yu. Shmidt Akademii nauk SSSR (Moskva)
Institute of Physics imeni P.N. Lebedev of the AN, USSR (Moskva) (Fizicheskiy institut imeni P.N. Lebedeva Akademii nauk SSSR (Moskva)

AVAILABLE: Library of Congress

Card 5/5

APPROVED FOR RELEASE: 08/24/2000 CIA-RDP86-00513R001651210015-9"

SKURIDIN, G.A.

49-58-2-1/18

AUTHORS: Skuridin, G. A. and Gvozdev, A. A.

TITLE: On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory. (O krayevykh usloviyakh dlya skachkov razryvnykh resheniy dinamicheskikh uravneniy teorii uprugosti.)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, 1958, Nr. 2, pp. 145-156. (USSR)

ABSTRACT: At the present time asymptotic representations are important in many branches of mathematics and theoretical physics. In Refs. 2-7 the application of the asymptotic method to the solution of dynamical problems in elasticity theory was indicated, and the fundamental equations for jumps in discontinuous solutions of the equations, both for homogeneous and for inhomogeneous media, were obtained. However, for the further development of the asymptotic method it is essential to formulate the basic boundary conditions for jumps in discontinuous solutions.

49-58-2-1/18

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

This makes it possible to solve problems immediately for jumps in displacements and velocities, without reference to the solution of Lame's system of equations. The passage to the limiting relations in these equations must be accompanied by a similar transition in the boundary conditions (Ref.2). Such a transition is absent from Refs. 4 and 5. For simplicity the authors consider the two-dimensional case with two-dimensional boundaries and plane boundaries of separation; but within the limits of applicability of "the principle of the isolated element", the conclusions remain true for curvilinear boundaries (Ref.8). The authors begin by discussing the transformation of the fundamental equations of motion in an inhomogeneous elastic medium:

Card 2/13

49-58-2-1/18

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

$$L_1 u + \rho X = -\left\{ \operatorname{div} \underline{u} \frac{\partial \lambda}{\partial x} + 2\left[\varepsilon_{xx} \frac{\partial \mu}{\partial x} + \varepsilon_{xy} \frac{\partial \mu}{\partial y} + \varepsilon_{xz} \frac{\partial \mu}{\partial z} \right] \right\},$$

$$L_2 v + \rho Y = -\left\{ \operatorname{div} \underline{u} \frac{\partial \lambda}{\partial y} + 2\left[\varepsilon_{xy} \frac{\partial \mu}{\partial x} + \varepsilon_{yy} \frac{\partial \mu}{\partial y} + \varepsilon_{yz} \frac{\partial \mu}{\partial z} \right] \right\}, \quad \text{(Eq.1)}$$

$$L_3 w + \rho Z = -\left\{ \operatorname{div} \underline{u} \frac{\partial \lambda}{\partial z} + 2\left[\varepsilon_{xz} \frac{\partial \mu}{\partial x} + \varepsilon_{yz} \frac{\partial \mu}{\partial y} + \varepsilon_{zz} \frac{\partial \mu}{\partial z} \right] \right\},$$

where L_j is Lamé's operator:

$$L_j \equiv (\lambda + \mu) \frac{\partial}{\partial x_j} \operatorname{div} + \mu \nabla^2 - \rho \frac{\partial^2}{\partial t^2} .$$

Card 3/13

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

Let

$$g_1 = \sqrt{\frac{\rho}{\lambda + 2\mu}} \quad , \quad \text{and} \quad g_2 = \sqrt{\frac{\rho}{\mu}} \quad .$$

Further, let

$$\nabla^2_\lambda \psi_1 = \nabla^2 \psi_1 + \frac{1}{\lambda + 2\mu}(\text{grad}(\lambda + 2\mu)\text{grad } \psi_1),$$

$$\nabla^2_\mu \psi_2 = \nabla^2 \psi_2 + \frac{1}{\mu}(\text{grad } \mu \text{ grad } \psi_2). \qquad \text{(Eq.8)}$$

If the auxiliary variable τ_1 is introduced by the relation

Card 4/13

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

$$g_i \frac{d}{ds_i} = \frac{d}{d\tau_i}$$

($\frac{d}{ds_i}$ denotes differentiation along a ray) and $\underline{P}$ and $\underline{Q}$ are defined by

$$\underline{P} = \underline{u}^* \exp\left\{\frac{1}{2}\int_0^{\tau_1} \nabla_\lambda^2 \psi_1 d\tau_1\right\}, \quad \underline{Q} = \underline{v}^* \exp\left\{\frac{1}{2}\int_0^{\tau_2} \nabla_\mu^2 \psi_2 d\tau_2\right\}, \quad \text{(Eq.9)}$$

then the equations for the jump discontinuities in the displacement vector $\underline{u}^*$, $\underline{v}^*$ are

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

$$2\frac{d\underline{P}}{d\tau_1} + \frac{1}{\lambda + 2\mu}\left\{(\underline{P}\ \mathrm{grad}\ \lambda)\mathrm{grad}\ \psi_1\right\} = 0,$$

$$2\frac{d\underline{Q}}{d\tau_2} + \frac{1}{\mu} \cdot \underline{Q}(\mathrm{grad}\ \mu)\mathrm{grad}\ \psi_2 = 0 \qquad \text{(Eq.10)}$$

respectively for longitudinal and transverse waves. After solving these equations the authors go on to deduce the boundary conditions for the case of reflection of elastic waves from the boundary of a half-space. It is supposed that on the boundary of the half-space there falls a longitudinal elastic wave whose wave-front in the half-space (x, y, t) is defined by the equation

Card 6/13

$$\Phi_0(x, y, t) \equiv t - \psi_0(x, y) = 0. \qquad \text{(Eq.28)}$$

[illegible]

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

After reflection there are two elastic waves described by

$$\Phi_1(x, y, t) \equiv t - \psi_1(x, y) = 0,$$
$$\Phi_2(x, y, t) = t - \psi_2(x, y) = 0. \qquad \text{(Eq.29)}$$

Denote by $\underline{u}_0(u_0, v_0)$ the displacement vector of the incident longitudinal wave; by $\underline{u}_1(u_1, v_1)$ the vector of the reflected longitudinal wave, and by $\underline{u}_2(u_2, v_2)$ the vector of the reflected transverse wave. These vectors can be represented in the form

$$\underline{u}_i(x,y,t)=\underline{u}_i^{(1)}(x,y,t)V(\Phi_i)+\underline{u}_i^{(2)}(x,y,t)V(-\Phi_i), \qquad \text{(Eq.30)}$$

where $\underline{u}_i^* = \underline{u}_i^{(2)} - \underline{u}_i^{(1)}$ is the jump in the displacement vector on the surface of discontinuity, Φ_i = const

Card 7/13 (i = 1, 2) and V(x) is Heaviside's unit function.

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

If the boundary of the half-space is rigidly fixed, then the boundary conditions for jumps in the reflected waves are (for $y = 0$)

$$u_1^*|_{y=0} = -u_0^* \frac{\frac{\partial\psi_0}{\partial x}\frac{\partial\psi_2}{\partial x} + \frac{\partial\psi_0}{\partial y}\frac{\partial\psi_2}{\partial y}}{\frac{\partial\psi_1}{\partial x}\frac{\partial\psi_2}{\partial x} + \frac{\partial\psi_1}{\partial y}\frac{\partial\psi_2}{\partial y}} \; \frac{\frac{\partial\psi_1}{\partial x}}{\frac{\partial\psi_1}{\partial x}}$$

$$v_1^*|_{y=0} = -v_0^* \frac{\frac{\partial\psi_0}{\partial x}\frac{\partial\psi_2}{\partial x} + \frac{\partial\psi_0}{\partial y}\frac{\partial\psi_2}{\partial y}}{\frac{\partial\psi_1}{\partial x}\frac{\partial\psi_2}{\partial x} + \frac{\partial\psi_1}{\partial y}\frac{\partial\psi_2}{\partial y}} \; \frac{\frac{\partial\psi_1}{\partial y}}{\frac{\partial\psi_0}{\partial y}} \qquad ([illegible])$$

[illegible] for the reflected longitudinal wave, and

49-58-2-1/18

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

$$u_2^*\Big|_{y=o} = -u_o^* \frac{\dfrac{\partial\psi_o}{\partial x}\dfrac{\partial\psi_1}{\partial y} - \dfrac{\partial\psi_o}{\partial y}\dfrac{\partial\psi_1}{\partial x}}{\dfrac{\partial\psi_1}{\partial x}\dfrac{\partial\psi_2}{\partial x} + \dfrac{\partial\psi_1}{\partial y}\dfrac{\partial\psi_2}{\partial y}} \frac{\dfrac{\partial\psi_2}{\partial y}}{\dfrac{\partial\psi_o}{\partial x}},$$

$$v_2^*\Big|_{y=o} = v_o^* \frac{\dfrac{\partial\psi_o}{\partial x}\dfrac{\partial\psi_1}{\partial y} - \dfrac{\partial\psi_o}{\partial y}\dfrac{\partial\psi_1}{\partial x}}{\dfrac{\partial\psi_1}{\partial x}\dfrac{\partial\psi_2}{\partial x} + \dfrac{\partial\psi_1}{\partial y}\dfrac{\partial\psi_2}{\partial y}} \frac{\dfrac{\partial\psi_2}{\partial x}}{\dfrac{\partial\psi_o}{\partial y}} \qquad \text{(Eq.35)}$$

for the reflected transverse wave. For these equations it is assumed that on the boundary $y = 0$ we have

Card 9/13

49-58-2-1/18

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

$$\psi_1(x, 0) = \psi_2(x, 0).$$

and that ψ_1 satisfied the equation

$$\text{grad}^2 \psi_1 = c_1^2 .$$

Corresponding equations are also derived for the case of a free boundary. Finally, the authors derive the boundary conditions for a direct wave in the case of a half-space. In Ref.13 Fridrikhs (Friedrichs) and Keller obtained expressions for a direct wave at the boundary of two fluid half-spaces by using the fact that the direct wave-front was known from considerations outwith the framework of the asymptotic method. In this paper the authors obtain the boundary conditions for direct waves at free and fixed boundaries of an elastic half-space on which a transverse wave is incident. For a fixed boundary the following expressions for the jumps in

Card 10/13

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

the displacement vector of the direct wave at the boundary $y = 0$ are obtained:

$$u_2^{(2)}\Big|_{y=o} = \frac{\frac{\partial u_1^{(1)}}{\partial y} \quad \frac{\partial \Phi_3}{\partial y}}{\frac{\partial \Phi_1}{\partial x} \quad \frac{\partial \Phi_3}{\partial x}}, \qquad \text{(Eq.57)}$$

$$v_2^{(2)}\Big|_{y=o} = \frac{\frac{\partial u_1^{(1)}}{\partial y}}{\frac{\partial \Phi_1}{\partial x}}$$

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

When the boundary is free the corresponding equations are:

$$u_2^{(2)}\Big|_{y=0} = -\frac{2\,\dfrac{\partial \varphi_1^{(1)}}{\partial y}}{\left[\left(\dfrac{\partial \Phi_3}{\partial y}\right)^2 - \left(\dfrac{\partial \Phi_3}{\partial x}\right)^2\right]}\;\frac{\partial \Phi_3}{\partial y}\,;$$

$$v_2^{(2)}\Big|_{y=0} = \frac{2\,\dfrac{\partial \varphi_1^{(1)}}{\partial y}}{\left[\left(\dfrac{\partial \Phi_3}{\partial y}\right)^2 - \left(\dfrac{\partial \Phi_3}{\partial x}\right)^2\right]}\;\frac{\partial \Phi_3}{\partial x} \qquad \text{(Eq.59)}$$

49-58-2-1/18

On Boundary Conditions for Jumps in Discontinuous Solutions of the Dynamical Equations of Elasticity Theory.

There are 4 figures and 13 references, of which 3 are English and 10 Russian.

ASSOCIATION: Academy of Sciences of the USSR; Institute of Earth Physics. (Akademiya nauk SSSR; Institut fiziki Zemli.)

SUBMITTED: April 22, 1957.

AVAILABLE: Library of Congress.

Card 13/13

SKURIDIN, G.A.

16(1) PHASE I BOOK EXPLOITATION SOV/2660

Vsesoyuznyy matematicheskiy s"yezd. 3rd, Moscow, 1956

Trudy. t. 4: Kratkoye soderzhaniye sektsionnykh dokladov. Doklady inostrannykh uchenykh (Transactions of the 3rd All-Union Mathematical Conference in Moscow. vol. 4: Summary of Sectional Reports. Reports of Foreign Scientists) Moscow, Izd-vo AN SSSR, 1959. 247 p. 2,200 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Matematicheskiy institut.

Tech. Ed.: G.N. Shevchenko; Editorial Board: A.A. Abramov, V.G. Boltyanskiy, A.M. Vasil'yev, B.V. Medvedev, A.D. Myshkis, S.M. Nikol'skiy (Resp. Ed.), A.G. Postnikov, Yu. V. Prokhorov, K.A. Rybnikov, P. L. Ul'yanov, V.A. Uspenskiy, N.G. Chetayev, G. Ye. Shilov, and A.I. Shirshov.

PURPOSE: This book is intended for mathematicians and physicists.

COVERAGE: The book is Volume IV of the Transactions of the Third All-Union Mathematical Conference, held in June and July 1956. The book is divided into two main parts. The first part contains summaries of the papers presented by Soviet scientists at the Conference that were not included in the first two volumes. The second part contains the text of reports submitted to the editor by non-Soviet scientists. In those cases when the non-Soviet scientist did not submit a copy of his paper to the editor, the title of the paper is cited and, if the paper was printed in a previous volume, reference is made to the appropriate volume. The papers, both Soviet and non-Soviet, cover various topics in number theory, algebra, differential and integral equations, function theory, functional analysis, probability theory, topology, mathematical problems of mechanics and physics, computational mathematics, mathematical logic and the foundations of mathematics, and the history of mathematics.

Card 23/34

SOV/49-59-1-1/23

AUTHOR: Skuridin, G. A.

TITLE: Duhamel's Principle and Asymptotic Solutions of Dynamic Equations in the Theory of Elasticity. I. (Printsip Dyuamelya i asimptoticheskiye resheniya dinamicheskikh uravneniy teorii uprugosti. I)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, 1959, Nr 1, pp 3-10 (USSR)

ABSTRACT: The asymptotic (ray) method has been applied in the study of propagation of elastic waves in uniform and non-uniform isotropic media by many workers (Refs 1-7). The present paper uses Kline's method (Refs 8,9) to solve asymptotically equations of the theory of elasticity on the basis of Duhamel's principle. Kline's results, obtained for one hyperbolic equation, are applied to a system of dynamic equations of the theory of elasticity. It is shown that, if there is a system of finite discontinuities in the pulse solution, then solutions of dynamic equations may be represented in the form of series in reciprocal powers of $i\omega$, where ω is the angular frequency. A harmonic source of vibrations is assumed in this analysis. The constants

Card 1/2

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SOV/49-59-1-1/23

Duhamel's Principle and Asymptotic Solutions of Dynamic Equations in the Theory of Elasticity. I.

which appear in the series mentioned above are "jumps" of the pulse solution and "jumps" of its derivatives with respect to time. At $\omega \to \infty$ the series obtained for the components of the displacement vector become asymptotic. The region of convergence of the series is not discussed. The paper is entirely theoretical. There are 13 references, 7 of which are Soviet, 5 English, 1 German.

ASSOCIATION: Akademiya nauk SSSR, Institut fiziki Zemli (Ac. Sc., USSR, Institute of Earth Physics)

SUBMITTED: August 20, 1957

Card 2/2

S/049/59/000/03/001/019

AUTHOR: Skuridin, G. A.

TITLE: Duhamel's Principle and the Asymptotic Solutions of Dynamic Equations of the Theory of Elasticity. II

PERIODICAL: Izvestiya Akademii nauk SSSR, Seriya geofizicheskaya, 1959, Nr 3, pp 337-343 (USSR)

ABSTRACT: The first part of this work was published in this journal, Nr 1, 1959, where it was shown that Duhamel's integral can be used to solve equations of the theory of elasticity. In Part I Duhamel's integral was used to find an asymptotic expansion (Eq 1) for a harmonic source of vibrations $f(t) = \exp(-i\omega t)$. In order to apply Eq (1) to practical cases, solution of the system of Eqs (3), which express motion in a heterogeneous elastic medium, must be found (Eqs 4-7). As an example, a homogeneous isotropic elastic medium is considered. In this case the system of Eqs (8) is derived where the

Card 1/2

APPROVED FOR RELEASE: 08/24/2000 CIA-RDP86-00513R001651210015-9"

S/049/59/000/03/001/019

Duhamel's Principle and the Asymptotic Solutions of Dynamic Equations of the Theory of Elasticity. II

region D is divided by a discontinuity on the surface $\Phi = 0$ into two regions D_1 and D_2 (Fig 1). If Eqs (8) are applied to each region separately, formulae (12) to (14) are found for D_1. By combining them with the equivalent formulae for D_2, Eq (20) can be derived which determines the component u of Eq (1). The other two components v and w are found similarly. Thus the integral (21) is obtained which in the case of longitudinal and transverse waves can be written as Eqs (22). The paper is entirely theoretical. There is 1 figure and 4 Soviet references.

ASSOCIATION: Akademiya nauk SSSR, Institut fiziki Zemli
(Ac. Sc. USSR, Institute of Physics of the Earth)

SUBMITTED: August 20, 1957
Card 2/2

67891

10.2000(A)

S/020/60/130/06/019/059
B013/B007

~~21 (7)~~

AUTHORS: Skuridin, G. A., Stanyukovich, K. P.

TITLE: An Approximate Solution of a Problem Concerning the Motion of a Conductive Plasma

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 130, Nr 6, pp 1248 - 1251 (USSR)

ABSTRACT: Several authors developed a new method for the asymptotic integration of linear partial differential equations of the hyperbolic type and by using this method they determined asymptotic solutions for the equations of acoustics and for Maxwell equations. Other authors solved the dynamic problems of the elasticity theory by means of this method. The general idea of this general method, discussed in the present paper, in a linear hyperbolic differential equation (e.g. in a wave equation) is based upon the following: The endeavor is made approximatively to satisfy the initial equations by special selection of the functions, which means the solutions are sought in the form $u(x,y,z,t) = A(x,y,z)\exp\{i\omega[t - \Phi(x,y,z)]\}$, if $\omega \to \infty$. Thus, one obtains the known relations $grad^2\Phi = 1/c^2$ and $2(grad\ A\ grad\ \Phi) + A\Delta\Phi = 0$, where $\Phi(x,y,z)$ denotes the eikonal

Card 1/3

67891

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An Approximate Solution of a Problem Concerning the Motion of a Conductive Plasma

of the wave and $A(x,y,z)$ the amplitude of the oscillation. The compression shock of the unsteady wave front and the amplitude of "geometric approximation" are found to be identical. The physical interpretation of the asymptotic method in quasilinear and linear equations is, however, no longer so easy. However, also in this case several problems may be formally solved by this method. The authors of the present paper integrate the equation of plasma oscillations by means of this method: they investigate the motion of a gas in a medium with the finite conductivity σ. The medium is here assumed to satisfy the equation of state $P = Qe^{(S-S_0)/c_v}\gamma$. The corresponding system of equations of magneto-gas-dynamics in the onedimensional case is explicitly written down. The problem is reduced to the determination of the unknown quantities P, Q, H, and u (velocity of the gas) in a sufficiently general form, which means that these equations are to contain arbitrary functions which are then determined from the initial- and boundary conditions. The calculative solution of this problem is followed step by step. For the determination of θ and u (where $\theta = (\ln A)_x$ one obtains two

Card 2/3

67891

An Approximate Solution of a Problem Concerning the Motion of a Conductive Plasma

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B013/B007

arbitrary functions T(t) and F(Θ) and an arbitrary constant B. The authors then investigate the case F(Θ) = βΘ with β = const < 0. For this case a rather lenghty expression is obtained for the magnetic field strength. Further, the final expressions for the density ρ and the pressure P are obtained. The corresponding arbitrary functions are to be determined from the boundary conditions. The concrete solution of the problem presents no difficulties. There are 10 references, 6 of which are Soviet.

ASSOCIATION: Institut fiziki Zemli im. O. Yu. Shmidta Akademii nauk SSSR (Institute for the Physics of the Earth imeni O. Yu. Shmidt of the Academy of Sciences of the USSR)

PRESENTED: November 16, 1959, by N. N. Bogolyubov, Academician

SUBMITTED: October 22, 1959

4

Card 3/3

10.2000(A)

68807

S/020/60/131/01/019/060
B013/B007

AUTHORS: Skuridin, G. A., Stanyukovich, K. P.

TITLE: The Motion of a Conductive Plasma
Under the Effect of a Piston

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol 131, Nr 1, pp 72 - 74 (USSR)

ABSTRACT: In the present paper the authors apply the general relations for the motion of a plasma determined in an earlier paper (Ref 1) to the following problem: A conductive medium (plasma) is assumed to move within a tube under the influence of a piston. The piston moves according to the law $x_p = at^2/2 \equiv \psi(t)$. In this case $u_p(t) = at \equiv \dot{\psi}(t)$ holds for the speed of the piston. After a certain time, a shock wave develops before the piston. With a sufficiently high value of a, the shock wave occurs nearly immediately and near the origin of coordinates. The region of the motion of the medium until the development of a strong shock wave is neglected, for it is small and is of no essential importance. Next, the quantities occurring in the equation

Card 1/3

68807

The Motion of a Conductive Plasma Under the Effect of a Piston

S/020/60/131/01/019/060
B013/B007

$u(x,t) = 2\varkappa \frac{x + \frac{\alpha}{B} T}{4\varkappa t + \beta} - \frac{\alpha}{B} \dot{T}$ are determined. B = const; β = const<0; $\alpha = \omega\sqrt{\varkappa}$, where ω denotes the frequency; $T(t)$ and $A_o(t)$ are arbitrary functions of time. For t = 0, x = 0 one finally obtains

$$x(t) = \frac{a}{2(7-k)(3-k)} \left\{ \frac{(k-1)\beta^2}{\varkappa^2} \left(\left[\frac{4\varkappa t + \beta}{\beta} \right]^{(k+1)/4} - 1 \right) + (k+1)t \left[3t(3-k) - \frac{(k-1)\beta}{\varkappa} \right] \right\}.$$

If only the terms which are in first order small with respect to $\varkappa t/\beta$ are retained

$$x(t) = \frac{k+1}{4} at^2 + \frac{(k^2-1)\varkappa a t^3}{12\beta}$$

follows. This expression also furnishes with sufficient accuracy the law of motion for the front of the shock wave. For the velocity of the wave front one

Card 2/3

68897

The Motion of a Conductive Plasma Under the Effect of a Piston

S/020/60/131/01/019/060
B013/B007

obtains $D_{front} = \frac{k+1}{2}at + \frac{(k^2-1)}{4\beta}\varkappa at^2$, and for the rate of flow of the gas behind the wave front $u_{back}(x,t) = at + \frac{(k-1)\varkappa at^2}{2\beta}$. For ϱ one finally finds

$$\varrho = \frac{k+1}{k-1}\sqrt{\frac{4\varkappa t + \beta}{4\varkappa t_0(z) + \beta}}\,\varrho_0.$$

Next, a rather long expression for P is determined. Thus, the problem of finding all parameters determining the motion of a conductive plasma under the influence of a piston is solved. There are 3 Soviet references.

ASSOCIATION: Institut fiziki Zemli im. O. Yu. Shmidta Akademii nauk SSSR (Institute of the Physics of the Earth imeni O. Yu. Shmidt of the Academy of Sciences of the USSR)

PRESENTED: November 16, 1959, by N. N. Bogolyubov, Academician

SUBMITTED: October 22, 1959

Card 3/3

87396

S/020/60/135/006/010/037
B019/B056

9.3140
26.1410

AUTHORS: Vakhnin, V. M., and Skuridin, G. A.

TITLE: A Possible Trapping Mechanism of Charged Particles in a Magnetic Field

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 6, pp. 1354-1357

TEXT: The equation of motion for a charged particle moving in the equatorial plane of a magnetic dipole is given as: $\frac{\rho^2 + 2\rho'^2 - \rho\rho''}{(\rho^2 + \rho'^2)^{3/2}} = \frac{a^2}{\rho^3}$ (6). If the loss in kinetic energy of the particle is neglected, the coefficient $a = \sqrt{eM/mvc}$ (M - magnetic moment of the dipole) will be constant. When a particle travels in a magnetic field, however, a radiation occurs, which decreases the kinetic energy, and at low energy losses it may be assumed that $\Delta v/v \cong -2\Delta a/a$ (7). The authors analyze (6) and, for this purpose, go

Card 1/2

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87396

A Possible Trapping Mechanism of Charged Particles in a Magnetic Field

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B019/B056

over to the phase space with the coordinates $w = \rho/a$ and $u = \frac{d\rho}{d\varphi}/a$. The differential equation $du/dw = \frac{w}{u} + 2\frac{u}{w} \mp \frac{\left\{1 + (u/w)^2\right\}^{3/2}}{uw}$ is obtained. An analysis of the phase curves with respect to the isoclinal lines of this differential equation is carried out. Schematical representations of the changes in the direction of motion of the phase point are shown. These changes are caused by the loss in kinetic energy. Herefrom, conclusions are drawn as to the motion of the particle. The authors briefly deal with the three-dimensional case in which a particle does not incide in the equatorial plane, but arbitrarily. In this case the phase space is four-dimensional: u, w, ϑ, $d\vartheta/d\varphi$, where ϑ is the meridian angle. From the investigation it follows that for any distance there exists a critical velocity at which the energy loss leads to the trapping of the particle. The authors finally state that this trapping mechanism is not the only one. There are 3 figures and 5 Soviet references.

PRESENTED: July 11, 1960, by A. Yu. Ishlinskiy, Academician

SUBMITTED: June 23, 1960

Card 2/2

AZIZYAN, A.K.; ANDRIYANOV, B.V.; BARASHEV, P.R.; BUGAYEVA, M.I.; VASIL'YEV, N.I.; DENISOV, N.N.; ZASLAVSKIY, B.Ye.; OSTROUMOV, G.N.; TYUPAYEV, A.S.; ADZHUBEY, A.I., red.; GORYUNOV, D.P., red.; IL'ICHEV, L.F., red.; SATYUKOV, P.A., red.; SIVOLOBOV, M.A., red.; SKURIDIN, G.A., red.; TOLMACHEV, A.V., red.; DANILINA, A.I., tekhn. red.

[Dawn of the outer space era] Utro kosmicheskoi ery. Moskva, Gospolitizdat, 1961. 762 p. ___ [Phonograph record "World flight to the stars. Soviet man in outer space;" report] Gramofonnaia plastinka "Vsemirnyi reis k zvezdam. Sovetskii chelovek v kosmose"; reportazh. (MIRA 14:10)

1. Redaktsiya gazety "Pravda" (for Azizyan, Denisov). 2. Komitet po radioveshchaniyu i televideniyu (for Andriyanov). 3. Redaktsiya gazety "Komsomol'skaya pravda" (for Barashev). 4. Redaktsiya gazety "Sovetskoye foto" (for Bugayev). 5. Redaktsiya gazety "Krasnaya zvezda" (for Vasil'yev). 6. Gosudarstvennoye izdatel'stvo politicheskoy literatury (for Zaslavskiy). 7. Redaktsiya gazety "Izvestiya" (for Ostroumov). 8. Telegrafnoye agenstvo SSSR (for Tyupayev).
(Astronautics)

26738
S/040/61/025/003/015/026
D208/D304

9,1300

AUTHOR: Skuridin, G.A. (Moscow)

TITLE: The approximate theory of the wave-front appearing on a cylindrical obstacle in an homogeneous elastic medium

PERIODICAL: Akademiya nauk SSSR. Otdeleniye tekhnicheskikh nauk. Prikladnaya matematika i mekhanika, v. 25, no. 3, 1961, 490 - 497

TEXT: In this work the wave-front is investigated which appears on collision of the plane elastic wave with a rigidity fixed circular cylinder. Only the exposed (illuminated) part is investigated as in the "shadow" a diffraction pattern occurs which is more complex. A plane transverse elastic wave of direction x (Fig. 1) meets a cylinder of radius h. The wave is

$$\Psi_0(x, t) = e^{i\omega t}e^{ik_2 x}. \tag{1.1}$$

Card 1/7

26738
S/040/61/025/003/015/026
D208/D304

Reflected potentials near the cylinder are

$$\varphi(x, y, t) = Ae^{-i\omega t}e^{ik_1(\alpha_1 x+\beta_1 y+\gamma_1)}, \quad \psi_1(x, y, t) = Be^{-i\omega t}e^{ik_2(\alpha_2 x+\beta_2 y+\gamma_2)} \qquad (1.2)$$

Components of displacement vector are by (1.1) and (1.2),

$$u = \frac{\partial\varphi}{\partial x} + \frac{\partial\psi^*}{\partial y}; \quad v = \frac{\partial\varphi}{\partial y} - \frac{\partial\psi^*}{\partial x} \quad (\psi^* = \psi_0 + \psi_1) \qquad (1.3)$$

On the cylinder u = v = 0 (1.4) hence

$$\alpha_1 = \varepsilon\sin^2\chi - \cos\chi\sqrt{1-\varepsilon^2\sin^2\chi}, \quad \alpha_2 = 1 - 2\cos^2\chi$$
$$\beta_1 = -(\varepsilon\cos\chi + \sqrt{1-\varepsilon^2\sin^2\chi})\sin\chi, \quad \beta_2 = -2\sin\chi\cos\chi \qquad (1.5)$$
$$\gamma_1 = h(\varepsilon\cos\chi + \sqrt{1-\varepsilon^2\sin^2\chi}), \quad \gamma_2 = 2h\cos\chi$$

$$A(\chi) = -\frac{2\varepsilon\sin\chi\cos\chi}{\varepsilon\sin^2\chi + \cos\chi\sqrt{1-\varepsilon^2\sin^2\chi}} \quad \left(\varepsilon = \frac{k_2}{k_1} > 1\right) \qquad (1.6)$$
$$B(\chi) = -\frac{\varepsilon\sin^2\chi - \cos\chi\sqrt{1-\varepsilon^2\sin^2\chi}}{\varepsilon\sin^2\chi + \cos\chi\sqrt{1-\varepsilon^2\sin^2\chi}}$$

26738
S/040/61/025/003/015/026
D208/D304

The approximate theory of ...

To determine the field at P (1.2) at P is expressed by Kirchhoff's formula as

$$\varphi(P) = \frac{1}{4\pi}\int_S \left\{\varphi(Q)\frac{\partial}{\partial n}\frac{e^{ik_1r}}{r} - \frac{e^{ik_1r}}{r}\frac{\partial\varphi}{\partial n}\right\} dS \quad (1.7)$$

$$\psi_1(P) = \frac{1}{4\pi}\int_S \left\{\psi_1(Q)\frac{\partial}{\partial n}\frac{e^{ik_2r}}{r} - \frac{e^{ik_2r}}{r}\frac{\partial\psi_1}{\partial n}\right\} dS$$

where $S = S_0 + S_1 + S_2 + S_3 + S_\omega$ (Fig. 2). Now $I_{s1} = 0$ ($I_s = \int_S$) (shadow region). I_{s2} and I_{s3} cancel each other. $I_{s\omega} \to 0$ as $R_\omega \to \infty$. Hence (1.7) is of the form: $dS_0 = hd\chi\, d\zeta$, $r = \sqrt{\rho^2 + \zeta^2}$. By the fact that $h \ll R$, it can be assumed that $\rho \approx R$, $-\frac{\pi}{2} \ll \chi \ll \frac{\pi}{2}$. Equations are then found for the displacements in the longitudinal reflected wave and in the reflected transverse wave. Approximate determination of the integrals is then undertaken. The method of

Card 3/7

26738
S/040/61/025/003/015/026
D208/D304

The approximate theory of ...

stationary phase is used. Displacement of the longitudinal reflected wave is

$$u_1(P) \approx ik_1 \cos\chi_0 U_1(\chi^{(1)}, R), \qquad v_1(P) \approx ik_1 \sin\chi_0 U_1(\chi^{(1)}, R) \tag{2.6}$$

where
$$U_1(\chi^{(1)}, R) = \sqrt{\frac{h}{2R}} A(\chi^{(1)}) Q(\chi^{(1)}) \exp[ik_1(R + hf(\chi^{(1)}))]$$

and in the transverse wave

$$u_2(P) \approx ik_2 \sin\chi_0 U_2(\chi_0, R), \qquad v_2(P) \approx -ik_2 \cos\chi_0 U_2(\chi_0, R) \tag{2.7}$$

where
$$U_2(\chi_0, R) = \sqrt{\cos\frac{\chi_0}{2}\frac{h}{2R}} B\left(\frac{\chi_0}{2}\right) \exp\left[ik_2\left(R - 2h\cos\frac{\chi_0}{2}\right)\right]$$

The appearance of the wave-front is then investigated and the condition is found to be

$$\sin\chi^* = b/a = \theta \tag{3.1}$$

Card 4/7

26738
S/040/61/025/003/015/026
D208/D304

and it is shown that a complete transverse wave consists of two component parts

$$U_i^* = u_i + u_i^* \quad (i = 1, 2),$$

where u_i can be determined from Eq. (2.7) while u_i^* can be found by integration along the cut Γ. (Fig. 9) The author finally obtains

$$D_{-3/2}(\xi + i\xi) \approx \exp(-1/2\, i\xi^2) \frac{\exp(-3/8\, i\pi)}{\xi^{3/2}(\sqrt{2})^{3/2}} \quad (3.8)$$

resulting in

$$u^*(P) \approx \sin\chi_0 U^*(\psi, R), \quad v^*(P) \approx -\cos\chi_0 U^*(\psi, R)$$

where

Card 5/7

26738
S/040/61/025/003/015/026
D208/D304

The approximate theory of ...

$$U^*(\psi, R) = -\frac{(\sqrt{1-\theta^2})^{1/2}\cos\psi}{2^{1/2}\sqrt{Rh}}\frac{\exp\{ik_2[R-2h\cos{}^1/_2\chi_0\cos\psi+{}^1/_2\pi]\}}{L^{1/2}}F(\eta) \quad (3.9)$$

$$F(\eta) = \eta^{1/2}\exp\frac{-3i\pi}{8}\exp\frac{-i\eta^2}{2}D_{-1/2}(-\eta+i\eta), \quad L=\theta\cos{}^1/_2\chi_0\sin\psi \quad (3.9)$$

$$\psi = \tfrac{1}{2}\chi_0 - \chi^*$$

$F(\eta)$ can be expanded into an asymptotic series for both, small and large η. The above formulas describe the displacement field of the wave front for $\chi_0/2 > \chi^*$, where χ = arc sind θ. For a non-viscous fluid (θ = 1), u* = v* = o and the wave front does not appear. There are 9 figures and 23 references: 22 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: B. Baker and E. Copson, The matem. theory of Huyghens principle, Oxford. London, 1950.

SUBMITTED: August 12, 1960

Card 6/7

S/026/63/000/001/002/007
A004/A126

AUTHOR: Skuridin, G. A. (Moscow)

TITLE: Space physics

PERIODICAL: Priroda, no. 1, 1963, 3 - 15

TEXT: This article presents the main results obtained by Soviet scientists in their investigations of outer space. The collection "Iskusstvennyye sputniki Zemli" (Artificial Earth Satellites), published by the Academy of Sciences USSR treats these problems in detail. The author first comments on the observation of Earth satellites and space rockets and enumerates various methods of obtaining data on the flight path of space vehicles. He then describes methods and instruments for measuring the density, pressure and the composition of the upper atmosphere. Next he presents the results of studying the ionosphere which Soviet scientists under the supervision of K. I. Gringauz started in 1954 with the aid of rockets. The author gives a detailed description of the Earth's radiation belts and the interplanetary plasm and presents the results of investigations of Soviet scientists based on the observations by rockets and satellites. The results

Card 1/2

Space physics

S/026/63/000/001/002/007
A004/A126

of studying primary cosmic radiation are enumerated and some information is given on the measurements of the magnetic fields of the Earth and the moon. The last two chapters are devoted to the short-wave optical radiation of the sun and to studies of meteoric substance. There are 6 figures.

Card 2/2

ACCESSION NR: AP4009622 S/0293/63/001/003/0387/0402

AUTHOR: Pletnev, V. D.; Skuridin, G. A.

TITLE: The adiabatic invariants of the movement of a charged particle in a stationary, non-uniform magnetic field

SOURCE: Kosmicheskiye issledovaniya, v. 1, no. 3, 1963, 387-402

TOPIC TAGS: magnetism, magnetic field, motion, electrostatus, adiabatic invariant, Hamiltoman, stationary field

ABSTRACT: The movement of a charged particle in a stationary non-uniform magnetic field is described by the equation

$$\frac{dv}{dt} = F + \frac{e}{mc}[v \times H], \quad \frac{dr}{dt} = v, \qquad (1.1)$$

where $F = eE/m$ - the force acting upon the particle in the electrical field; v - the velocity of the particle; H - the magnetic field. The authors point out that the strict solution of this system of equations presents considerable mathematical difficulties, because of which, at the present time, a number of methods have been developed for its approximate solution. One of these methods, which has won wide acceptance, is the so-called "averaging method". The physical sense of this method

ACCESSION NR: AP4009622

is described and it is shown that, in essence, it is one of the methods of the classical theory of disturbances (perturbations). The authors indicate that one of the consequences of the use of this method is the approximate conservation of the magnetic moment of the charged particle $\mu = {}^2/2H$, which constitutes, in this case, the adiabatic invariant. The conditions for the preservation of μ, as well as the degree of accuracy of its preservation, follow directly from the classical mechanics of the motion of conditionally periodic systems and of systems close to conditionally periodic. For this reason, the authors state, within the framework of the area of applicability of the averaging method it becomes advisable to study the character of the movement of charged particles in a non-uniform magnetic field on the basis of the theory of adiabatic invariants developed in classical mechanics. In the present article, the movement of a charged particle in a non-uniform magnetic field is considered on the basis of a study of the preservation of all adiabatic invariants which correspond to the spatial symmetry of the magnetic system; that is, an analysis is made of the conditions for the conservation of the first, second and third motion invariants of a charged particle in a spatial magnetic system. Since this movement of a particle in a magnetic field is not, strictly speaking, conditionally periodic, in principle there may arise a divergence of the adiabatic approximation, connected with the indivisability of the variables employed in the Hamilton-Jacobi equation. Finally, there is a discussion of estimation problems with respect to the degrees of accuracy in the preservation of the second

ACCESSION NR: AP4009624

S/0293/63/001/003/0414/0435

AUTHOR: Vakhnin, V. M.; Skuridin, G. A.; Shvachunov, I. N.

TITLE: The movement of charged particles in the field of a magnetic dipole, considering energy dissipation

SOURCE: Kosmicheskiye issledovaniya, v. 1, no. 3, 1963, 414-435

TOPIC TAGS: magnetic dipole, magnetism, charged particle, charged particle motion, magnetic field, energy dissipation

ABSTRACT: The authors have analyzed the movement of charged particles in a magnetic field by the phase plane method both in a conservative approximation and with consideration of losses of their kinetic energy due to radiation, thus providing a qualitative picture of the influence of kinetic energy losses on the particle trajectory. These losses were considered in the form of small dissipation perturbations of the conservative approximation. The authors succeeded in demonstrating the existence of certain critical trajectories, at which particle seizure by the magnetic field occurs at arbitrarily small energy losses. (It is obvious that at small, but finite, energy losses, seizure may also occur in the case of other trajectories, close to critical.) The phase plane method was found to be particularly convenient when studying the movement of the particle in a complex

Card 1/3

ACCESSION NR: AP4009624

field, containing a dipolar and homogeneous (external) component. The authors considered conservative approximations and their dissipation perturbations for three idealized situations: a) magnetic dipole with no external magnetic field present; b) magnetic dipole in space with uniform magnetic field parallel to the magnetization vector of the dipole's magnetic field and located in its equatorial plane; and c) magnetic dipole in space with uniform magnetic field antiparallel to the magnetization vector of the dipole's magnetic field and located in its equatorial plane. The analysis was conducted in the magnetic plane of the dipole. In the first case (movement of a charged particle in the field of a magnetic dipole in the absence of an external magnetic field), the differential equation for the "phase trajectory" of the motion of the charged particle was discussed. Following this, "isoclines" and a "field of directions" were constructed in the phase plane in a conservative approximation. Phase trajectory behavior was considered at large and small values of u and w, as well as the trajectories of charged particles in a magnetic field which correspond to the phase trajectories, both with and without consideration of energy dissipation. With few exceptions, this treatment was also followed in the case of the other two ideal hypotheses. Orig. art. has: 19 figures and 43 formulas.

ASSOCIATION: none

Card 2/3

S/040/63/027/001/013/027
D251/D308

AUTHORS: Levitin, L.B., Skuridin, G.A. and Stanyukovich, K.P. (Moscow)

TITLE: On the oscillations of an elastic inhomogeneous layer with a curvilinear boundary lying on an elastic inhomogeneous half-space

PERIODICAL: Prikladnaya matematika i mekhanika, v. 27, no. 1, 1963, 116-125

TEXT: An approximate solution is sought of the above problem which is of considerable importance to seismic investigations. The elastic layer is taken to be of variable height, and transverse elastic oscillations in a vertical plane through the layer are discussed. The boundary conditions are expressed in terms of Lame parameters. The solutions of equations of the oscillations are sought by means of the asymptotic method. It is shown that the solutions will be of the form

$$u_1(x,v,t) = A(x,v,\omega) \cos [\alpha(x)(v \mp h)] e^{i\omega S(x,t)} \quad (1.6)$$

Card 1/2

... functions. Series ... values for $A(x,v,\omega)$ and ... hence an infinite system of second-order differential equations is obtained. A suitable solution is found by the usual recurrence-relationship methods and from the boundary conditions. The general form of the approximating functions ... iteration methods, and contains polynomials, trigonometrical functions, and rational functions and their derivatives. The geometrical optics of the propagation of Love's waves is discussed in connection with the above solution, and an alternative method of solving the basic equation is given. There are 2 figures.

SUBMITTED: October 30, 1962

Card 2/2

SKURIDIN, G., doktor fiz.-matem. nauk

Present state and the future of astronautics. Av. i kosm. 46 no.12:26-35 D '63. (MIRA 17:1)

SKURIDIN, G. A. (Moskva)

Cosmic physics. Prioroda 52 no.1:3-15 '63. (MIRA 16:1)

(Cosmic physics)

SKURIDIN, G. A.; SHABANSKIY, V. P.;

"Hypothesis of the formation of radiation belts."

Report submitted for the COSPAR Fifth International Space Science Symposium, Florence, Italy, 8-20 May, 1964.

ACCESSION NR: AP4026234 S/0293/64/002/001/0051/0063

AUTHOR: Pletnev, V. D.; Skuridin, G. A.

TITLE: Motion of a charged particle in a stationary magnetic field in a mean drift approximation

SOURCE: Kosmicheskiye issledovaniya, v. 2, no. 1, 1964, 51-63

TOPIC TAGS: magnetic field, stationary magnetic field, nonuniform magnetic field, magnetic mirror, charged particle motion, adiabatic invariant, mean drift approximation

ABSTRACT: The author discusses the motion of a charged particle in a stationary non-uniform magnetic field in a drift approximation, averaged for the period of oscillations of a particle between magnetic mirrors. Derivation of the corresponding equations of motion is by the Volosov method. It is shown that the mean drift approximation corresponds to the approximation of the adiabatic invariant of longitudinal effect (longitudinal invariant). The rate of deviation of this invariant in the mean drift approximation is found. The full system of equations for the motion of charged particle in the mean drift approximation has the form:

ACCESSION NR: AP4026234

$$\frac{d\bar{x}_2}{dt} = -\frac{\mu c}{eT_{\text{кол}}} \oint_{T_{\text{кол}}} \frac{1}{H}\frac{\partial H}{\partial x_3} dt,$$

$$\frac{d\bar{x}_3}{dt} = \frac{mv^2 c}{eT_{\text{кол}}} \oint_{T_{\text{кол}}} \frac{1}{H^2}\frac{\partial H}{\partial x_2} dt - \frac{\mu c}{eT_{\text{кол}}} \oint_{T_{\text{кол}}} \frac{1}{H}\frac{\partial H}{\partial x_2} dt,$$

$$\frac{d\bar{C}}{dt} = \frac{\varepsilon}{T_{\text{кол}}} \oint_{T_{\text{кол}}} \left(\frac{\partial \Phi}{\partial x_2} X_1^{(1)} + \frac{\partial \Phi}{\partial x_3} X_1^{(2)} + \frac{\partial \Phi}{\partial x_1} Y_1\right) dt,$$

$$\frac{d\alpha_1}{dt} = \Omega + \varepsilon\left(\frac{\partial \theta_1}{\partial x_2} X_1^{(1)} + \frac{\partial \theta_1}{\partial x_3} X_1^{(2)} + \frac{\partial \theta_1}{\partial x_1} Y_1\right).$$

In system (1) $\varepsilon X_1^{(1)} = dx_2/dt$, $\varepsilon X_1^{(2)} = dx_3/dt$, $Y_1 = 0$ in the drift approximation. Φ is determined, like θ_1, by previously derived expressions. System (1), whose full derivation is given, makes it possible to estimate the mean changes in such values as the period of oscillation t_{osc}, amplitude of oscillation A, frequency Ω and the adiabatic invariant J, in the mean drift approximation. "The authors wish to thank Candidate of Physical and Mathematical Sciences B. A. Tverskoy for useful discussions of this paper and valuable comments made during its preparation." Orig. art. has: 43 formulas.

Card 2/3

ACCESSION NR: AP4026234 S/0293/64/002/001/0051/0063

ASSOCIATION: None

SUBMITTED: 25Dec63 DATE ACQ: 16Apr64 ENCL: 00

SUB CODE: AS NO REF SOV: 003 OTHER: 001

Card 3/3

APPROVED FOR RELEASE: 08/24/2000 CIA-RDP86-00513R001651210015-9"

L 6653-65 EWG(j)/EWT(l)/EWT(m)/EWG(v)/AR/K/FCC/EEC-4/EEC(t)/T/EWA(h)
Po-4/Pe-5/Pq-4/Pi-4/Pae-2/Pb-4 AFWL/SSD/AFMDC/BSD/AFETR/ESD(gs)/IJP(c) 86
ESD(t) GW/WS

S/0293/64/002/005/0724/0762

ACCESSION NR: AP4046778

AUTHOR: Grigorov, N. L.; Rapoport, I. D.; Savenko, I. A.; Skuridin, G. A.

TITLE: Some problems and possibilities in the field of cosmic ray research 19

SOURCE: Kosmicheskiye issledovaniya, v. 2, no. 5, 1964, 724-762

TOPIC TAGS: upper atmosphere, cosmic ray, ionization calorimeter, cosmic ray intensity, gamma radiation, photon, photoemulsion

ABSTRACT: In this lengthy paper, the authors discuss basic problems involved in the operation of an ionization calorimeter, an instrument for measuring the energy of cosmic ray particles and the dependence of the principal parameters of the ionization calorimeter on the conditions of its use. Also discussed are the possibilities of the use of the ionization calorimeter for the study of a number of the characteristics of interaction between atomic nuclei and cosmic ray particles with energies of 10^{11}--10^{13} ev, for study of the composition of primary cosmic ray particles with high energies (10^{11}--10^{14} ev) and for the study of the electron component of primary cosmic rays and high-energy gamma radiation. In the introduction it is shown that presently used methods are completely unsuitable for solution of problems involved in the measurement of particle energies up to 10^{15} ev. The ionization calorimeter, proposed by N. L. Grigorov, is regarded as the only pre-

Card 1/3

L 6653-65
ACCESSION NR: AP4046778

sently available method for solving this problem; at least in the Soviet Union it has now become the basic tool in cosmic ray research at high-mountain stations. The ionization calorimeter is a flexible tool: with equal accuracy it makes it possible to measure the energy of charged and neutral particles and it can be combined with various other kinds of apparatus, such as Wilson chambers, spark chambers and even nuclear photoemulsions. This is the first detailed description of the ionization calorimeter in the literature. The article is divided into two chapters, each with a number of sections: I. Ionization calorimeter: 1. Principle of operation. 2. Parameters of the ionization calorimeter. 3. Selection of material for the absorber. 4. Methods of recording ionization. 5. Role of nuclear spallations in energy losses and accuracy of measurement of the energy of a single particle. 6. Selection of ionization detectors. 7. Parameters of the ionization calorimeter for work in the upper part of the atmosphere and beyond its limits. 8. Recording of ionization bursts from a large number of detectors. II. Possible applications of the ionization calorimeter: 1. Study of the chemical composition of primary cosmic radiation in the region of high and superhigh particle energies. 2. Study of the characteristics of the nuclear interaction of high-energy primary cosmic particles. 3. Study of elementary nuclear processes by the photoemulsion method. 4. Study of high-energy electrons and photons in primary cosmic rays. The following are among the significant diagrams

Card 2/3

L 6653-65
ACCESSION NR: AP4046778

accompanying the text: Fig. 9 -- simple variant of the ionization calorimeter with scintillators for work in the upper part of the atmosphere; Fig. 10 -- apparatus for study of the processes of generation of π°-mesons by cosmic ray particles with energies of 10^{12}--10^{13} ev by the nuclear photoemulsion method; Fig. 11 -- instrument for registering high-energy electrons in primary cosmic rays; Fig. 12 -- instrument for study of the energy spectrum of primary γ-rays and search for local sources of γ-quanta. Orig. art. has: 85 formulas, 12 figures and 3 tables.

ASSOCIATION: none

SUBMITTED: 09Jun64 ENCL: 00 SUB CODE: AA, NP

NO REF SOV: 017 OTHER: 001

Card 3/3

L 34720-65 EWT(1)
ACCESSION NR: AP4045710 S/0208/64/004/005/0848/0870

AUTHOR: Dubrovskiy, V. A. (Moscow); Skuridin, G. A. (Moscow)

TITLE: Asymptotic expansions in wave mechanics

SOURCE: Zhurnal vy*chislitel'noy matematiki i matematicheskoy fiziki, v. 4, no. 5, 1964, 848-870

TOPIC TAGS: asymptotic expansion, wave equation, Schroedinger equation, Klein Gordon equation, Dirac equation, Hamilton equation, Cauchy problem, perturbation theory

ABSTRACT: An asymptotic method analogous to those used in acoustics, electrodynamics, theory of elasticity, and magnetohydrodynamics is applied to the study of quantum mechanics equations written in five-dimensional space. (In addition to variables x, y, z, and t, the action variable s is introduced.) Five-dimensional Schroedinger, Klein-Gordon and Dirac wave equations describing the behavior of particles are written, and it is shown that equations of their characteristics coincide with the classical Hamilton-Jacobi equation. Asymptotic solutions of the above-mentioned equations are constructed, and the Cauchy problem

L 34720-65

ACCESSION NR: AP4045710

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(the scattering problem) for these equations is solved. The relation between the asymptotic method and the perturbation theory is established. It is shown that the expansion constructed in the theory of perturbations is only a part of the asymptotic expansion and can be used as an approximation in calcula ing wave mechanics problems. In the case of the Schroelinger equation, it is shown that the motion of a bounded impulse is described by a certain equation which, when the dimensions of the impulse tend to zero (point impulse), becomes the Hamilton equation of classical dynamics. Orig. art. has: 94 formulas.

ASSOCIATION: none

SUBMITTED: 02Nov63 ENCL: 00 SUB CODE: MA

NO REF SOV: 012 OTHER: 011

Card 2/2

SAVENKO, I. A.; GRIGOROV, N. L.; NESTEROV, V. Ye.; RAPOPORT, I. D.; SKURIDIN, G. A.

"Investigation of Primary Cosmic Rays from the Scientific Space Station Proton-I."

report presented at the 16th Congress, Intl Astronautical Federation, Athens, 12 Sept 1965.

APPROVED FOR RELEASE: 08/24/2000 CIA-RDP86-00513R001651210015-9"

SKURIDIN, G.A., otv. red.; AL'PERT, Ya.L., red.; KRASOVSKIY, V.I., red.; SHVAREV, V.V., red.

[Studies of outer space; transactions] Issledovaniia kosmicheskogo prostranstva. Moskva, Nauka, 1965. 622 p. (MIRA 18:12)

1. Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva, Moscow. 1965.

L 1281-66 EWT(1)/FCC/EWA(h) GS/GW

ACCESSION NR: AT5023599 UR/0000/65/000/000/0285/0314

AUTHOR: Pletnev, V. D.; Skuridin, G. A.; Shalimov, V. P.; Shvachunov, I. N.

TITLE: How solar particles break through into the earth's magnetosphere, the mechanisms by which these particles are captured and accelerated, and the part played by these processes in the dynamics of the geomagnetic trap

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 285-314

TOPIC TAGS: geomagnetic field, solar wind, solar radiation, geomagnetism, charged particle, particle motion, magnetic storm

ABSTRACT: The authors consider the interrelationship between geophysical phenomena which take place in outer space in the vicinity of our planet with regard to the dynamics of the geomagnetic trap. The classical Störmer method is used for analyzing the motion of charged particles in the magnetospheric field. It is found that solar particles cannot break through into the magnetosphere in the central region on the daylight side even in the initial phase of a magnetic storm, but that these particles

Card 1/3

easily penetrate deeply into the geomagnetic trap during the main phase of such a storm. A theory is proposed for penetration of the magnetosphere by charged particles in the vicinity of neutral points. It is found that since there is no magnetic reflection in this case, particles with a constant positive velocity can penetrate the magnetosphere, the greatest probability being for particles moving in the plane $x = 0$. The distribution of drift currents is determined for particles inside the magnetosphere. Experimental data are given which confirm the theory proposed in this paper for penetration of the magnetosphere by charged particles. "The authors take this opportunity to express their gratitude to Sh. Sh. Dolginov, Ye. G. Yeroshenko, L. N. Zhuzgov, K. I. Gringauz, V. L. Vaysberg, I. A. Savenko and B. I. Savin for the experimental data given in this paper, and also for discussing the proposed theory. The authors are also grateful to Ya. L. Al'pert, B. R. Chirikov, M. Z. Khokhlov, B. A. Tverskiy, V. I. Krasovskiy, Yu. I. Gal'perin, V. V. Temnyy and others who took part in discussing this work while it was being prepared for the press. The authors also thank L. A. Kazenova for her great assistance in analyzing the materials and in the final layout of the article." Orig. art. has: 8 figures, 2 tables, 24 formulas. [14]

ASSOCIATION: none

APPROVED FOR RELEASE: 08/24/2000 CIA-RDP86-00513R001651210015-9"

L 1281-66
ACCESSION NR: AT5023599 0

SUBMITTED: 02Sep65 ENCL: 00 SUB CODE: ES, NP

NO REF SOV: 009 OTHER: 030 ATD PRESS: 4102

Card 3/3

APPROVED FOR RELEASE: 08/24/2000 CIA-RDP86-00513R001651210015-9"

L 3234-66 EWT(1)/FCC/EWA(h) GS/GW

ACCESSION NR: AT5023625 UR/0000/65/000/000/0485/0486

AUTHORS: Grigorov, N. L.; Rapoport, I. D.; Savenko, I. A.; Skuridin, G. A.

TITLE: Problems and potentials of studying cosmic-ray particles of high and very high energies

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 485-486

TOPIC TAGS: cosmic ray particle, high energy particle, calorimeter, ionization, spark camera, nuclear emulsion, Cerenkov counter

ABSTRACT: Cosmic ray particles with energies up to about 10^{19} ev have been detected, but quantitative measurements are uncertain because the flux of high-energy cosmic particles is small at stations in high mountains and at sea level where they are observed and because no method of measuring individual particles has been available. Theory and experiment show a very weak dependence of interaction among high-energy particles on the energies of the primary particles. Most problems yet unsolved relative to nuclear interaction of high-energy particles and relative to the astrophysical aspect of cosmic rays require an ability to

Card 1/2

L 3234-66

ACCESSION NR: AT5023625

measure the energy of each individual particle in order for a solution to be reached. The authors point out that the use of an ionization calorimeter in combination with various recording devices (nuclear photoemulsions, spark cameras, Cerenkov gas counters) permits detailed study of interaction processes of particles with energies of 10^{12}—10^{13} ev; study of the electron component of cosmic rays up to high energies, and a wide search for local sources of high-energy gamma quanta. By means of a large ionization calorimeter with an area of 10 m^2, raised beyond the atmospheric boundary, it would be possible to make direct measurement of compositions and energy spectra of primary cosmic rays in the energy range up to 10^{16} ev. [04]

ASSOCIATION: none

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

NO REF SOV: 002 OTHER: 000 ATD PRESS: 4106

Card 2/2

L 61001-65 EWT(1)/EWG(v)/FCC/EEC-4/EWA(h) Po-4/Pe-5/Pq-4/Pae-2/Peb/Pi-4 GW

ACCESSION NR: AP5018435 UR/0384/65/000/003/0018/0026 49 B

AUTHOR: Skuridin, G. A. (Doctor of physico-mathematical sciences); Pletnev, V. D. (Candidate of physico-mathematical sciences); Shalimov, V. P.; Shvachunov, I. N.

TITLE: Solar wind, magnetosphere, and the Earth's radiation belt

SOURCE: Zemlya i Vselennaya, no. 3, 1965, 18-26

TOPIC TAGS: solar wind, earth magnetosphere, magnetic storm generation, geomagnetic field perturbation, aurora

ABSTRACT: This is the first part of a study in which, on the basis of experimental data from Soviet and US satellites, the authors advance the hypothesis that all the complex geophysical effects such as the aurora polaris, magnetic storms, dynamics of the radiation belt, and the dynamics of the geomagnetic field, are basically determined by the interaction of the solar corpuscular flows with the Earth's magnetic field. A survey is made of the available experimental and theoretical data on the solar wind and the Earth's magnetosphere. Orig. art. has: 7 formulas and 9 figures.

ASSOCIATION: None

SUBMITTED: 00 ENCL: 00 SUB CODE: ES

NO REF SOV: 000 OTHER: 000

Card 1/1 llc

L 3494-66 EWT(1)/EWP(m)/FS(v)-3/FCC/EWA(d)/EWA(h) GW

ACCESSION NR: AP5024184 UR/0384/65/000/004/0012/0022

AUTHORS: Skuridin, G. A. (Doctor of physico-mathematical sciences); Pletnev, V. D. (Candidate of physico-mathematical sciences); Shalimov, V. P.; Shvachunov, I. N.

TITLE: Solar wind, magnetosphere, and Van Allen belts of the earth

SOURCE: Zemlya i vselennaya, no. 4, 1965, 12-22

TOPIC TAGS: solar wind, Van Allen belt, magnetosphere, high energy electron, magnetic field, magnetic trap

ABSTRACT: The structure of the earth's Van Allen belts was studied in some detail. In order to understand the trapping of charged particles by the earth's magnetic field the fundamental principles of orbit theory are reviewed and the significance of adiabatic invariants discussed. Using a model for the magnetosphere, the various charged particle drifts are analyzed in nonhomogeneous magnetic field traps. It is shown that the Van Allen belts are divided into inner and outer zones with altitudes at the equator ranging from 600 km in the western hemisphere to 1600 km in the eastern hemisphere. This discrepancy is due to the inhomogeneity

L 3494-66

ACCESSION NR: AP5024184

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in the earth's magnetic field. In the inner zone, electrons possess the highest energies (600 kev for 10^8 particles/cm^2/sec). The outer zone has two maxima, the first of which occurs at three earth radii with proton energies of 150 kev to 4.5 Mev. The second maximum occurs at 4.5 earth radii with 40 kev electrons. During magnetic storms, the trapping field strength increases because of compression of lines of force. As a consequence of this, particle energy increases and the location of energy maxima move closer to the earth's surface. The interaction of cosmic rays with the terrestrial atmosphere generates yet a third type of particle--the neutron, which eventually decays into a proton and an electron. Although this decay contributes to the number of trapped particles in the Van Allen belts, it does not explain the overall charged particle injection process into the magnetic traps. To explain this phenomenon, a new hypothesis is presented where charged particle injection is associated with a betatron acceleration during the reverse phase of a magnetic storm. Orig. art. has: 16 figures.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: ES

NO REF SOV: 000 OTHER: 000

Card 2/2 BP

L 3055-66 EWT(d)/FSS-2/EWT(1)/FS(v)-3/EPA(sp)-2/FCC/EWA(d)/EWA(h)/EEC(k)-2

ACCESSION NR: AP5022130 AST/TT/GW UR/0030/65/000/008/0003/0018
629.198.3 62 60 B

AUTHOR: Skuridin, G. A. (Doctor of physico-mathematical sciences)

TITLE: Investigations with the Cosmos and Elektron satellites

SOURCE: AN SSSR. Vestnik, no. 8, 1965, 3-18

TOPIC TAGS: satellite system, satellite instrumentation/Cosmos satellite, Elektron satellite

ABSTRACT: A review of the instrumentation and findings of the Cosmos and Elektron series is presented. Both series were intended to obtain information on conditions in near space which would be useful for manned space flights. The first Cosmos satellite was launched in 1962, and the Elektron series was initiated in 1964.

Cosmos Series. The following measuring equipment was carried on board the Cosmos series (see Fig. 1 of Enclosure) satellites: diffraction scanning spectrometer for measuring the energy distribution in the spectrum of the Earth's thermal radiation; UV spectrometer operating at 2200—3100 Å; calorimeter with interchangeable narrow- and wide-band filters; Mayak transmitter, operating at fixed frequencies of 20.005, 30.0075, and 90.0225 Mc; ion traps for measuring ion concentrations; Langmuir probes for measuring electron temperature and concentration; honeycomb ion traps for meas-

Card 1/6

L 3055-66

ACCESSION NR: AP5022130

uring ion temperature; scintillation counters for registering electrons of E_e = 50 to 180 kev and protons of E_p > 5.4 Mev and 8.5 Mev; gas-discharge counter for registering primary cosmic radiation; ionization chamber; shielded and unshielded gas-discharge counters; counter arrays for the study of cosmic ray variations; cesium iodide scintillation counter for $E_e \sim$ 100—500 kev; externally mounted CsI counter with shielding of about 2 mg/cm^2 for E_e > 100 kev; externally mounted scintillation counter with minimum shielding of 180 mg/cm^2 for E_e > 600 kev; internally mounted scintillation counter for $E_e \sim$ 200—500 kev; spherical analyzer for $E_e \sim$ 1 kev and protons; internal Geiger counter for $E_e \sim$ 1 Mev and cosmic rays; triple coincidence counter; sodium iodide scintillation counter for E_p = 30 Mev, E_e = 2 and 5 Mev, and γ-quanta of E_γ = 20 kev, 50 kev, and 3.3 Mev; STS-5 Geiger counter for E_p = 40 Mev, E_e = 3.5 Mev, and E_γ = 30 kev; CsI scintillation counter for E_p = 500, 550, and 600 kev and 5.5 and 8.5 Mev, E_e = 30, 60, and 160 kev and 5.4 and 8.5 Mev, and E_γ = 5.45 and 160 kev and 5.4 and 8.5 Mev; proton magnetometers for global magnetic measurements in the range of 1.8 x 10^4—5 x 10^4 γ; geophysical instrumentation for recording soft, corpuscular radiation, ion concentration, and micrometeors; NaI scintillation counter for E_e > 100 kev and E_p > 10 Mev; n-p transducer for E_p = 0.4—7 Mev and 3—8 Mev; Geiger counters for electron-energy thresholds of 40 kev, 600 kev, and 2 Mev; and biomedical instrumentation and animal and plant biocapsules (recoverable specimens).

Card 2/6

L 3055-66

ACCESSION NR: AP5022130

Elektron Series. The Elektron system consisted of two satellites — Elektron-1 and Elektron-2 — placed in different orbits with a single launch vehicle. The Elektron satellites are shown in Fig. 2. Instrumentation for Elektron-1 was as follows: counter for E_e = 40 kev—200 Mev and E_p = 2—200 Mev; counter for E_e > 5 kev and E_p > 150 kev; micrometeorite detector with sensing surface of 0.03 m^2 (minimum particle mass registered, 10^{-8} g); mass spectrometer for investigation of the ionic composition of the atmosphere; equipment for registering atomic mass (1—34 amu); Mayak transmitter, operating at 20.005, 30.0075, and 90.0225 Mc. Instrumentation for Elektron-2 was as follows: counters for E_e = 40 kev—40 Mev and E_p = 2—200 Mev; spherical electrostatic analyzer for E_e and E_p of 100, 200, and 400 ev and 1, 2, 4, and 10 kev; two magnetometers for measuring three mutually perpendicular magnetic field components in the 2—1200-γ band; x-ray counters for solar x-ray emission within 2—8 Å and 8—18 Å; counters for the investigation of cosmic-ray components, registering nuclei of Z > 2, Z > 5, and Z > 15 and particles with energies exceeding 600 Mev/nucleon; equipment for registering cosmic radio emission at 725 and 1525 kc; charged-particle trap for registering ions in the terrestrial plasma envelope and protons of solar corpuscular streams; and mass spectrometer for investigation of ionic composition of the atmosphere, registering masses of 1—34 amu. Elektron-3 and Elektron-4 instrumentation was roughly the same as that of Elektron-1 and Elektron-2. Orig. art. has: 11 figures and 2 tables. [CS]

Card 3/6

L 3055-66
ACCESSION NR: AP5022130

ENCLOSURE: 01
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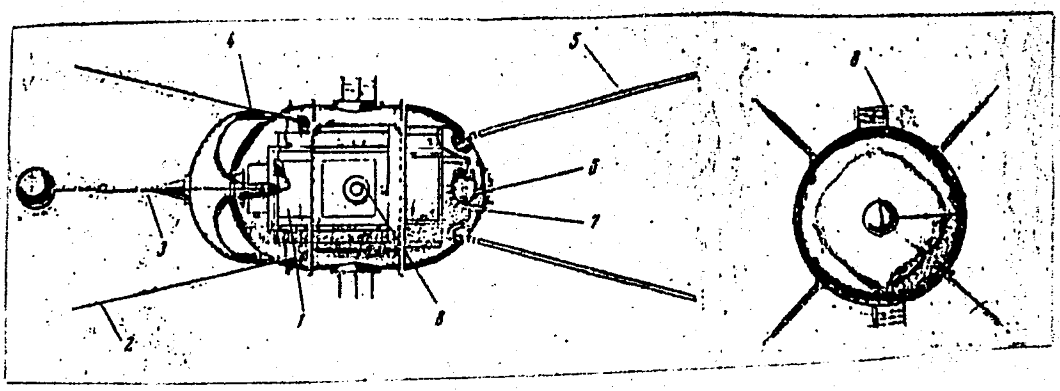

Fig. 1. A Cosmos satellite

1 - Instrumentation module; 2 - telemetry antenna; 3 - magnetometer; 4 - radiator for the thermal control system; 5 - command system antenna; 6 - timing mechanism; 7 - power supply; 8 - orbital-control system antenna.

Card 5/6

L 3055-66

ACCESSION NR: AP5022130

ENCLOSURE: 02

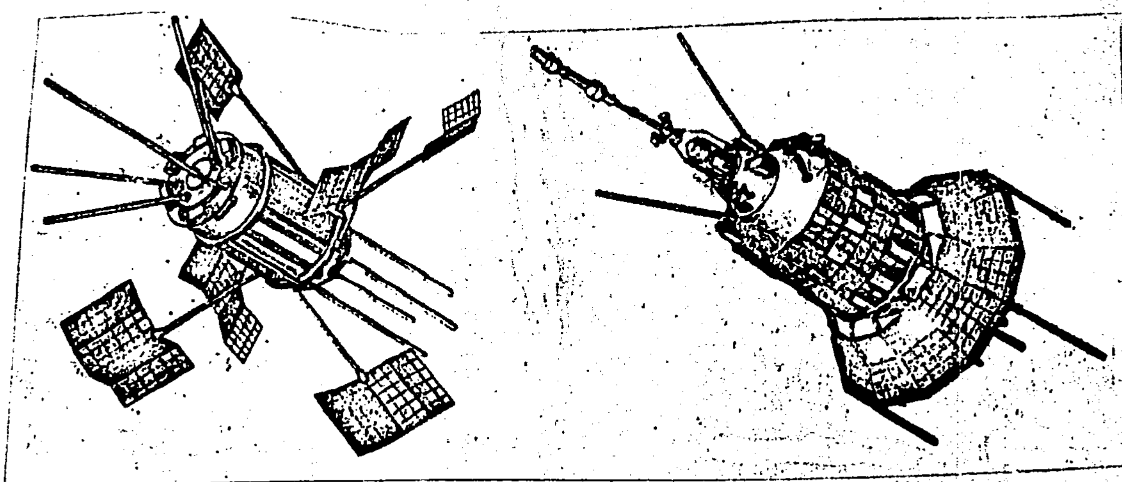

Fig. 2. Elektron satellites

Card 6/6

L 29253-66 EWT(1)/FCC/FSS-2 TT/GW

ACC NR: AP6019306 SOURCE CODE: UR/0030/65/000/009/0103/0105

AUTHOR: Al'pert, Ya. L. (Doctor of Physicomathematical Sciences); Skuridin, G. A. (Doctor of Physicomathematical Sciences)

ORG: none

TITLE: New results of study of space physics (All-union conference)

SOURCE: AN SSSR. Vestnik, no. 9, 1965, 103-105

TOPIC TAGS: atmospheric radiation, IR radiation, flow kinetics, solar x radiation, ionosphere, artificial earth satellite, radiation belt, hydrogen plasma, physics conference

ABSTRACT: The First All-Union Conference on Space Physics was held in Moscow during the period 10-16 June. More than 100 reports were presented. The following were among the results reported. An earlier unknown stratified distribution of the intensity of infrared atmospheric radiation has been discovered in the spectral region 0.8-40 microns with a maximum at heights of 280, 420 and 500 km. Data were presented indicating the existence of a dust layer around the earth at a height of about 19 km. It was reported also that above 1,000-1,200 km the ionosphere consists primarily of protons — ionized hydrogen atoms. The ionized helium discovered earlier at heights of 700-1,000 km was discovered in 1964 measurements with the "Elektron" in only insignificant

Card 1/2

L 29253-66

ACC NR: AP6019306

quantity. Several reports were devoted to theoretical consideration of the interaction of artificial satellites with the ionosphere. The theory of kinetic flow around bodies in plasma plays an important part in investigations using satellites. It makes it possible to study the effects occurring near the body. Without taking these effects (angular distribution of particles, influence of electrical and magnetic fields) into account it is impossible to correctly interpret the results of many measurements of different parameters of unperturbed plasma. Friction of electromagnetic character also becomes appreciable at heights of 700-800 km or more. It was demonstrated in many reports that there is a close relationship between the behavior of the radiation belts and a number of geophysical phenomena; unfortunately, at present there is no fully developed theory of these phenomena. The results of investigation of solar X-radiation gave a rather clear picture of the properties and energy spectrum of this radiation in the period of the quiet sun. Obviously, sin e about a hundred reports were presented at the conference only generalized information and fragmentary data can be given in the report cited below. Authors are not listed and titles of papers are not cited. [JPRS]

SUB CODE: 04, 20, 22 / SUBM DATE: none

Card 2/2

L 45258-66 FSS-2/EWT(1)/EWT(m)/FCC/T JKT/TT/JT/GW 65 59 B

ACC NR: AP6016330 (N) SOURCE CODE: UR/0026/65/000/012/0007/0015

AUTHOR: Grigorov, N. L.; Nesterov, V. Ye.; Rapoport, I. D.; Savenko, I. A.; Skuridin, G. A.

ORG: none

TITLE: Nuclear laboratory in space

SOURCE: Priroda, no. 12, 1965, 7-15

TOPIC TAGS: high energy particle, primary particle, cosmic ray, high energy electron, electron spectrum, interplanetary space, earth atmosphere, gamma ray quantum /Proton-1 satellite, Proton-2 satellite, SEZ-12 spectrometer, SEZ-14 spectrometer, GG-1 gamma ray quantum spectrometer

ABSTRACT: The author discusses various efforts made to study the microcosm from the interaction of high-energy particles and add that since no construction of accelerators of higher energies than those in operation now is foreseen for the next 10-15 yr, cosmic rays will be for a long time the only source of information on the interaction of high-energy particles. In this connection Soviet efforts in various

Card 1/3

L 45258-66

ACC NR: AP6016330

high-level observation stations are mentioned. Problems to be solved are the very small density of cosmic ray fluxes, the need to measure the energy of primary particles, and the fact that they are usually mixed with secondary particles unless measured outside the atmosphere. The authors state that artificial earth satellites have opened the way to the use of cosmic rays for the study of super-high energies. They then describe the appearance and structure of the Proton-1 space station and the instruments it carries. They also give a detailed description of the ionization calorimeter used on Proton 1 to study high-energy particles, designed in 1954 by Professor N. L. Grigorov and produced and studied in the cosmic-ray laboratory of Moscow State University in the late fifties- and early sixties. The authors then describe the structure and operation of the SEZ-14 spectrometer for energies and charges, as well as its proportional counter and interaction detector. In order to remedy the lack of information on the energy spectrum of primary electrons, the Proton 1 carries a SEX-12 instrument to register high-energy electrons and their energy spectra. A GG-1 instrument was also installed on Proton 1 to study gamma astronomy. This study of gamma rays will facilitate obtaining information not only on sources of cosmic rays, but also on the astrophysical characteristics of interplanetary space. Information on cosmic rays in the Megagalaxy can be obtained

Card 2/3

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ACC NR: AP6016330

at present only by measurement of intensity and spectra of gamma-quanta of an energy exceeding 50 Mev. The author concludes that the heavy Earth satellites Proton 1 and the recently launched Proton 2 are pioneers in the study of interactions of energies at 10 to 1000 gev. Orig. art. has: 9 figures. [GC]

SUB CODE: 03, 04, 20/ SUBM DATE: none/

Card 3/3

SKURIDIN, G.A., doktor fiziko-matematicheskikh nauk; PLETNEV, V.D., kand. fiziko-matem. nauk; SHALIMOV, V.P.; SHVACHUNOV, I.N.

Solar wind, magnetic shell and radiation belt of the earth. (conclusion). Zem. i vsel. 1 no.4:12-22 Jl-Ag '65. (MIRA 18:12)

L 20951-66 EWT(1)/EWT(m)/EPF(n)-2/T IJP(c)
ACC NR: AP6005874 SOURCE CODE: UR/0367/65/002/004/0691/0704

AUTHORS: Rylov, Yu. A.; Skuridin, G. A.

B 71 73

ORG: Matematics Institute, Academy of Sciences SSSR (Matematicheskiy institut Akademii nauk SSSR)

TITLE: Contribution to the theory of the ionization calorimeter

SOURCE: Yadernaya fizika, v. 2, no. 4, 1965, 691-704

TOPIC TAGS: ionization, calorimetry, cosmic ray particle, cosmic ray measurement, elementary particle, detection probability, particle detector, measurement

ABSTRACT: The authors investigate the accuracy with which the energy of superhigh energy primary cosmic-ray particles can be determined by means of an ionization calorimeter. The calorimeter itself was proposed by N. L. Grigorov et al. (Kosmicheskiye issledovaniya [Cosmic Research] v. 2, no. 5, 724, 1964). The accuracy estimate is based on the evaluation of the distribution of the ionization produced in each row of detectors comprising the ionization calorimeter by a pri-

Card 1/2

L 20951-66
ACC NR: AP6005874

mary particle with specified energy E_0, ranging from 10^{11} to 10^{15} eV. It is shown that the problem reduces to a system of integro-differential equations for the mean number of the different types of particles in the cosmic rays, expressed in terms of the conditional probability density of the detector readings, which in turn are described in terms of elementary quantities such as the average number of particles at a given depth, the fluctuation in the number of particles, and the correlation between the numbers of particles at different depths. It is concluded that specified concrete values of the accuracy can be obtained if sufficient information is available on the interaction of the shower particles with the absorber, and if the general expression for the average number of particles can be solved in the concrete case. The simpler case of a normal ionization distribution, restricted to ionization moments of order not higher than the second, is considered in detail. Authors thank N. L. Grigorov, N. M. Gerasimov, I. L. Rozental', and I. A. Savenko for active participation during all stages of the work. Orig. art. has: 41 formulas.

SUB CODE: 20/ SUBM DATE: 05Feb65/ ORIG REF: 004/ OTH REF: 005

PLETNEV, V.D.; SKURIDIN, G.A.; SHALIMOV, V.P.; SHVACHUNOV, I.N.

Dynamics of the geomagnetic trap and the origin of the earth's radiation belts. Kosm.issl. 3 no.2:336-340 Mr-Ap '65. (MIRA 18:4)

L 62103-65 EWT(1)/FCC/EEC(t) Po-4/Pi-4 GW

ACCESSION NR: AP5015669 UR/0293/65/003/003/0408/0425
550.385.41(047)

31
B

AUTHORS: Pletnev, V. D.; Skuridin, G. A.; Chesalin, L. S.

TITLE: Dynamics of the geomagnetic trap. I

SOURCE: Kosmicheskiye issledovaniya, v. 3, no. 3, 1965, 408-425

TOPIC TAGS: geomagnetic field, dynamic behavior, magnetic storm, radiation belt, aurora, space probe / Pioneer I, Pioneer V, Explorer XVIII, Explorer X, Explorer XII, Explorer XIV

ABSTRACT: The basic experimental data and the theoretical concepts concerning the geophysical phenomena occurring in space around the earth are considered. It is shown that such phenomena as magnetic storms, the aurora, radiation belts, and the finite sphere of the earth's magnetic field must be studied from some common viewpoint, since they are all intimately related. This complex of geophysical phenomena is called the dynamics of the geomagnetic trap. The present paper, containing only the first part of the study, is devoted to experimental data on the interaction of charged particles and the geomagnetic field and to some theoretical aspects of solving this problem. In seeking to define the shape of the earth's

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ACCESSION NR: AP5015669

magnetic field, the authors consider data supplied from artificial satellites and space probes. They first consider measurements on the stationary geomagnetic field, determined within the field and at the boundary of the field. The boundary data and space data come from measurements made with the several space probes, particularly the Pioneer and Explorer probes. The next consideration involves streams of charged particles as they move into and through this field. Thirdly, the authors examine the time variation of the field and the closely related variation in intensity of corpuscular streams. In investigating the interaction between charged particles and the geomagnetic field, consideration is given to the total effect on the magnetic field of moving nonreacting particles within and at the boundary of the geomagnetic field, the effect associated with the collective action of external streams of rarefied magnetized plasma on the magnetic field, and the connection between processes outside and inside the field when charged particles break through. Orig. art. has: 10 figures, 2 tables, and 7 formulas.

ASSOCIATION: none

SUBMITTED: 18Feb65 ENCL: 00 SUB CODE: ES, AA

NO REF SOV: 012 OTHER: 032

Card 2/2

L 10590-66 FSS-2/EWT(1)/FS(v)-3/FCC/EWA(d) TT/GW

ACC NR: AP6000304 SOURCE CODE: UR/0293/65/003/006/0854/0876

AUTHORS: Pletnev, V. D.; Skuridin, G. A.; Chesalin, L. S.

ORG: none

65
63
B

TITLE: The dynamics of the geomagnetic trap. 2

SOURCE: Kosmicheskiye issledovaniya, v. 3, no. 6, 1965, 854-876

TOPIC TAGS: geomagnetic field, geomagnetism, magnetic field, magnetic field plasma effect, solar magnetic field

ABSTRACT: Various hypotheses on the boundary forms of the magnetosphere 12 are studied, as a continuation of the authors' previous work (Kosmicheskiye issledovaniya, 3, No. 3, 408, 1965). A useful mathematical relationship is the condition of magnetostatic equilibrium obtained from the equation of plasma motion in a magnetic field

$$\rho \frac{dv}{dt} = -\operatorname{grad} p + [j, H],$$

where ρ is the mass density of the plasma, v is the velocity of the particle stream, p is pressure, H is the magnetic field potential, and j is the stream density. Under certain assumptions (dv/dt = 0), it can be shown that the limit of the magnetosphere corresponds to the condition

$$p = \frac{H^2}{8\pi}.$$

UDC: 550.385.41 (047)

Card 1/2

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ACC NR: AP6000304

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The authors divide the existing approaches to the problem into three basic categories. Authors of the first group reviewed do not consider the magnetization of interplanetary plasma flowing around the magnetosphere of the earth. A second group considered a magnetohydrodynamic shock wave flowing around the earth's atmosphere. The third approach is that of combining the study of the solar magnetic field and the structure of the geomagnetic field in the boundary region. The first two approaches are reviewed with development of principal working equations and sketches of the magnetosphere limits. A detailed discussion is given on the computation of neutral points and on the topic of solar stream penetration of the magentosphere. Several plots of the magnetic field in relation to neutral points and with respect to various sections (e.g., meridianal) of the earth are shown. Additional discussion of the structure of the earth's magnetic tail is given along with sketches of the shape of the tail in two planes. A total of 57 different technical works are mentioned in the review, and use is made of data collected in the OGO, IMP, Explorer, and Electron satellite series. Orig. art. has: 18 figures and 35 equations.

SUB CODE: 08/ SUBM DATE: 18Aug65/ ORIG REF: 006/ OTH REF: 051

Card 2/2

DUBROVSKIY, V.A.; SKURIDIN, G.A.

Propagation of weak perturbations in magnetohydrodynamics. Geomag. i aer. 5 no.2:234-250 Mr-Ap '65. (MIRA 18:7)

L 65296-65 EWT(1)/FCC/EWA(h) GW

ACCESSION NR: AP5020992 UR/0203/65/005/004/0626/0644
550.388.2

AUTHORS: Pletnev, V. D.; Skuridin, G. A.; Shalimov, V. P.; Shvachunov, I. N.

TITLE: Dynamics of the geomagnetic trap and the origin of earth's radiation belts

SOURCE: Geomagnetizm i aeronomiya, v. 5, no. 4, 1965, 626-644

TOPIC TAGS: magnetic field, Van Allen belt, magnetic trap, geomagnetic field, charged particle concentration, magnetic storm, solar burst

ABSTRACT: The interaction of solar corpuscular streams with the geomagnetic field is discussed with explanations about the formation of the earth's magnetosphere and the mechanism of charged particle penetration into the magnetosphere. The scalar potential of the geomagnetic field inside the earth's magnetosphere is expressed in spherical harmonics, and the solar particle stream--geomagnetic field interaction is described by the model shown in Fig. 1 on the Enclosure. In order to analyze the possibility of particle penetration into the magnetosphere, the following equation is solved numerically

$$\frac{\rho}{r^3} - \alpha\rho + \frac{2\gamma}{\rho} = \pm 1$$

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L 65296-65

ACCESSION NR: AP5020992

24

where γ is the Störmer integration constant,

$$\alpha = \frac{M_1}{2M_0} \frac{1}{r_0^3},$$

and M is the magnetic moment of the earth's dipole. It is shown that the only particle penetration occurs in the vicinity of the neutral points AA', in the diurnal side of the magnetosphere. This penetration creates gradient and radius of curvature drift of charged particles, resulting in the formation of magnetic field neutral layers and a plasma wake in the equatorial plane in the night side. Data are reported from the Electron-2 artificial satellite in support of this argument. These trapped particles are shown to be responsible for auroral phenomena and magnetic storms. The inverse phase of the magnetic storm is connected with the sharp drop in solar particle emission at the magnetosphere boundary and a decay in trapped particle drift currents on the geomagnetic trap boundaries. This magnetic decay causes particle drifts into the magnetic trap with a corresponding particle acceleration. This explains the experimental observation of increased intensity of high-energy particle flow in the outer regions of the trap during the reverse phase of magnetic storms. "The authors express their gratitude to Sh. Sh. Dolginov, Ye. G. Yeroshenko, L. N. Zhuzgov, O. L. Vaysberg, K. I. Gringauz, K. Z. Khokhlov, I. A. Savenko, and B. I. Savin for providing the experimental results and evaluating

Card 2/4

L 65296-65

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this work. The authors thank also Ya. L. Al'pert, B. A. Tverskiy, B. V. Chirikov, V. I. Volosov, V. I. Krasovskiy, Ya. I. Gal'perin, V. V. Temnyy, and other colleagues for taking part in evaluating this work and also L. A. Kazenova for reviewing this material and for formulating this paper." Orig. art. has: 22 formulas, 14 figures, and 1 table.

ASSOCIATION: none

SUBMITTED: 06Apr65 ENCL: 01 SUB CODE: ES, AA

NO REF SOV: 026 OTHER: 012

Card 3/4

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ACCESSION NR: AP5020992

ENCLOSURE: 01

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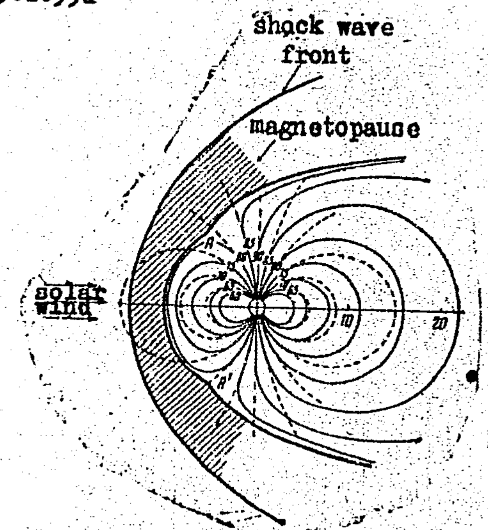

Fig. 1

Card 4/4