SOV/30-58-6-16/45

Investigations on the Zodiacal Light. Provisional Results Obtained by the Observations of the Soviet Expedition in Egypt

of the diurnal firmament can attain up to 7o %. After termination of the expeditionary works, the Soviet Delegation has arranged with the Observatory of Kheluan (2o kilometers from Cairo) that their astronomers continue these observations. For this purpose they left them the electrophotometer which will be set up in the village Fayun, 7o kilometers from Cairo. The Soviet scientists delivered lectures in the Kheluan Observatory. The staff of the observatory consists of 8 astronomers and 5 seismologists, meteorologists and others. A course of lectures on the work of the Soviet Delegation in Egypt was delivered at the Cairo University.

1. Zodiacal light--Analysis 2. Astronomy 3. Photometers --Applications

Card 3/3

FESENKOV, V.G.

Evolution of stars and the origin of the solar system [with summary in English]. Izv. Astrofiz. inst. AN Kazakh. SSR 7:3-10 '58.
(MIRA 11:7)

(Cosmogony)

FESENKOV, V.G.

Star chains and dark filaments in regions of galactic nebulae [with summary in English]. Izv. Astrofiz. inst. AN Kazakh. SSR 7:11-18 '58. (MIRA 11:7)

(Nebulae)
(Stars--Distribution)

FESENKOV, V.G.

Observation of Mars on the 8" refractor of the Astrophysical Institute during the favorable opposition of 1956 [with summary in English]. Izv. Astrofiz. inst. AN Kazakh. SSR 7:19-27 '58. (MIRA 11:7)

(Mars(Planet))--Opposition, 1956)

FESENKOV, V.G.

Observation of the northern zodiacal light during the first part of July 1957 [with summary in English]. Izv. Astrofiz. inst. AN Kazakh. SSR 7:28-38 '58. (MIRA 11:7)
(Zodiacal light)

FESENKOV, V.G., akademik

The nature of zodiacal light. Vest. AN Kazakh. SSR 14 no.8: 3-9 Ag '58. (MIRA 11:10)
(Zodiacal light)

FESENKOV, V.G., akademik

Investigations of the zodiakal light; preliminary results of observations made by the Soviet expedition in Egypt. Vest. AN SSSR 28 no. 6:89-91 Je '58. (MIRA 11:7)
(Zodiacal light)

3(1)

AUTHOR: Fesenkov, V.G. SOV/33-35-2-14/21

TITLE: The Scientific Work of the Helwan Observatory (O deyatel'nosti kheluanskoy observatorii)

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 2, pp 283-288 (USSR)

ABSTRACT: The present paper contains a report on the history, the instruments, and the scientific work of the Helwan Observatory lying at the right bank of the River Nile near Cairo. There are 3 figures.

SUBMITTED: January 25, 1958

Card 1/1

24(4)

AUTHOR: Fesenkov, V.G. SOV/33-35-2-20/21

TITLE: The Expedition of Soviet Astronomers to Assuan (Egypt) for Observations of Zodiacal Light and the Optical Properties of the Atmosphere (Ekspeditsiya A N SSSR v Asuan (Yegipet) dlya nablyudeniya zodiakal'nogo sveta i opticheskikh svoystv atmosfery)

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 2, pp 305-313 (USSR)

ABSTRACT: The Soviet astronomers V.G.Fesenkov, Ye.V.Pyaskovskaya-Fesenkova, N.B.Divari, V.M.Kazachevskiy, P.N.Boyko, and two Egyptian scientists took part in an expedition to Assuan, where they observed the zodiacal light (including photometric, colorimetric, and photographic measurements with the polaroid sreens and interference filters). Furthermore the distribution of brightness and polarization of the sky was measured systematically. Solar halo phenomena were also studied; Ye.V. Fesenkova determined the coefficient of transparency by direct and indirect methods. About 30000 determinations were made. The theoretical evaluation of the data on the zodiacal light shall be published later on.
There is 1 figure.

SUBMITTED: January 15, 1958

Card 1/1

AUTHOR: Fesenkov, V.G. 33-35-3-2/27

TITLE: On the Question Concerning the Reduction of the Observations of the Zodiacal Light (K voprosu o reduktsii nablyudeniy nad zodiakal'nym svetom)

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 3, pp 323-326 (USSR)

ABSTRACT: The observations of the zodiacal light demand several reductions as is well-known. According to Blackwell [Ref 1] there exists no definite relation between the extinction for a punctiform source according to Bouguer and the extinction for an object so extended as the zodiacal light. The author investigates this question and obtains the following results. The ecliptic and the axis of the zodiacal light are assumed to be oriented normally to the horizon. A punctiform source of light with the solid angle $d\sigma$ causes the brightness

$$L d\sigma \frac{\mu}{k} f(\vartheta) \varphi(z, \zeta) \sec z$$

in an arbitrary point P, where $f(\vartheta)$ is the indicatrix of dispersion, ϑ the angular distance between P and the source, ζ and z the zenith distances of the source and of P,

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On the Question Concerning the Reduction of the Observations of the Zodiacal Light

33-35-3-2/27

$$\varphi(z,\zeta) = \frac{p^{\sec z} - p^{\sec\zeta}}{\sec\zeta - \sec z}$$

and $\frac{\mu}{k} f(\vartheta)$ the ratio of the light scattered in the direction ϑ to the light scattered in all directions. In the point (z,A) the total additional brightness caused by the zodiacal light is to be determined (the point (z,A) itself can lie in the domain of the zodiacal light). In general it holds

$$I = \frac{\mu}{k} \sec z \iint L_{\zeta,A} \sin\zeta \, d\zeta \, dA f(\vartheta) \varphi(z,\zeta)$$

where

$$\cos\vartheta = \cos z \cos\zeta + \sin z \sin\zeta \cos(A-A_o) .$$

For the visual part of the spectrum ($\lambda = 546$ mμ) according to E.V. Pyaskovskaya-Fesenkova [Ref 2] it holds

$$f(\vartheta) = 1 + 5\,(e^{-3\vartheta} - 0{,}009) + 0{,}55 \cos^2\vartheta$$

and

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33-35-3-2/27

$$\frac{\mu}{k} = \frac{1}{2\pi \int_0^{\pi} f(\vartheta) \sin \vartheta \, d\vartheta} = \frac{1}{17,4}$$

On the basis of the observations which were made by the expedition of the Academy of Sciences of the USSR in the Libyan Desert in October - November 1957, the author assumes in the calculations that the form of the isophots of the zodiacal light is somewhat compressed. Furthermore it is assumed that the coefficient of transparency amounts to 0,83. Under these suppositions for the relative brightness

$$K = \frac{\mu}{k} \sec z \, \frac{\iint L_{z,A} \sin \zeta \, d\zeta \, dA \, f(\vartheta) \varphi(z, \zeta)}{L_{z_0, A_0} \, p^{\sec z}}$$

which is generated by the zodiacal light along the alumkantarates with $z = 75^{\circ}$ there result the values

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On the Question Concerning the Reduction of the Observations of the Zodiacal Light

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A	0	10	20	30	40
K	5,84 %	7,83	11,62	15,95	30,6

From the investigation of the author it follows that, on the one hand, the large extension of the zodiacal light must be considered and, on the other hand, the additional illumination of the troposphere generated by it must be determined.
There are 5 tables, and 3 references, 2 of which are Soviet, and 1 English.

ASSOCIATION: Institut astrofiziki Akademii nauk Kaz SSR (Institute for Astrophysics of the Academy of Sciences of the Kaz SSR)

SUBMITTED: March 21, 1958

Card 4/4

AUTHOR: Fesenkov, V.G. 33-35-3-3/27

TITLE: Zodiacal Light as the Result of Desintegration of Asteroids (Zodiakal'nyy svet kak produkt drobleniya asteroidov)

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 3,pp 327-333(USSR)

ABSTRACT: There are three circumstances speaking for the fact that the zodiacal light is caused by the dust arising under the desintegration of the asteroids.

1. The density of the dust arising in the desintegration mentioned above is sufficient in order to explain the observed brightness of the zodiacal light.

2. The polarization phenomena according to the results of Pyaskovskaya - Fesenkova and others which are not yet completely worked through (expedition of the Academy of Sciences, Egypt, September - December 1957) speak also for the theory.

3. The observed form of the zodiacal light coincides well with the theoretical isophots which were calculated on the basis of the distribution of the asteroid paths with respect to the angles of inclination.

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Zodiacal Light as the Result of Desintegration of Asteroids

33-35-3-3/27

There are 2 tables, 2 figures, and 8 references, 3 of which are Soviet, 2 German, 2 American, and 1 Irish.

ASSOCIATION: Institut astrofiziki Akademii nauk Kazakh SSR(Institute for Astrophysics of the Academy of Sciences of the Kaz. SSR)

SUBMITTED: March 24, 1958

Card 2/2

3(1) SOV/33-35-4-1/25

AUTHOR: Fesenkov, V.G.

TITLE: On the Polarization of Zodiacal Light (K voprosu o polyarizatsii zodiakal'nogo sveta)

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 4, pp 513-519(USSR)

ABSTRACT: The author comes to the result that the hypothesis of the presence of free electrons in the zodiacal light is not necessary in order to explain its polarization. He shows that the polarization caused by free electrons is equal to at most 43%, 60% or 67%, depending on the electron concentration as a function of the distance from the sun. The observed polarization of zodiacal light is at most 20-25%. This value can be well explained by the polarization caused by dust particles which is a very sensible one according to theoretical conclusions based on the theory of Mie. This fact has been confirmed by observations of atmospherical aerosoles, dust tails of comets etc. Ye.V.Pyaskovskaya-Fesenkova [Ref 12,13,15] has carried out detailed observations in the dry Egyptian desert which permit to calculate the fraction caused by atmospheric aerosoles. From these calculations it can be deduced that the polarization of zodiacal light composed of dust particles is

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On the Polarization of Zodiacal Light SOV/33-35-4-1/25

approximately equal to 27%. Observations carried out by A.V. Kharitonov and P.N.Boyko [Ref 6] at the Mountain Observatory of the Astrophysical Institute, Academy of Science, Kazakh SSR showed that the atmospherical polarization caused by a comet takes values up to 24%.
There are 3 tables, and 15 references, 6 of which are Soviet, 4 American, 2 German, 2 English, and 1 Egyptian.

ASSOCIATION: Institut astrofiziki AN Kaz SSR (Institute for Astrophysics AS Kazakh SSR)

SUBMITTED: December 25, 1957

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24(4),3(1) SOV/33-35-5-1/20

AUTHOR: Fesenkov, V.G.

TITLE: On the Composite Polarization of Light (O summarnoy polyarizatsii sveta)

PERIODICAL: Astronomicheskiy zhurnal, 1958, Vol 35, Nr 5, pp 681-686 (USSR)

ABSTRACT: Two sources of light differently polarized, the first of which has the generalized brightness I, the degree of polarization p and the corresponding orientation, and the second one having the corresponding data I_1, p_1, are observed simultaneously. If I_m and p_m denote the analogous magnitudes for the composite light, if α_1 is the angle between the orientation of polarization of the given sources, and α_o is the angle between the orientation of composite polarization and that of the first source then the author obtains

(1) $$(I_m p_m)^2 = (Ip)^2 + (I_1 p_1)^2 + 2IpI_1p_1 \cos 2\alpha_1$$

$$\operatorname{tg} 2\alpha_o = \frac{I_1 p_1 \sin 2\alpha_1}{I_1 p_1 \cos 2\alpha_1 + Ip}, \quad I_m = I + I_1.$$

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On the Composite Polarization of Light

and

$$(2) \qquad (I_1 p_1)^2 = (I_m p_m)^2 + (Ip)^2 - 2 I_m p_m Ip \cos 2\alpha_o$$

$$\operatorname{tg} 2\alpha_1 = \frac{I_m p_m \sin 2\alpha_o}{I_m p_m \cos 2\alpha_o - Ip}$$

$$I_1 = I_m - I.$$

There is 1 table, and 1 figure.

ASSOCIATION: Astrofizicheskiy institut Akademii nauk Kaz SSR (Astrophysical Institute of the AS Kazakh SSR)

SUBMITTED: July 20, 1958

FESENKOV, V.G.

IUGG/WMO OZONE SYMPOSIUM

OXFORD, JULY 1959

Summary No. 36
(Revised Version)

ON THE THEORY OF THE LUNAR ECLIPSES

By V.G. Fesenkov, Leningrad, U.S.S.R.

At the eclipses of the moon the rays of the sun pass through different strata of the earth's atmosphere producing the illumination of the moon's surface.

This can be utilised for the investigation of the total amount, and also of distribution with altitude of the atmospheric ozone, and also of the cosmical dust in the high strata of the terrestrial atmosphere.

The current method so far applied is based on the supposition that the sun is a mere point without any sensible angular dimension. This makes it possible to perform a simple sounding of the atmosphere, because in this case each area of the moon is considered to be illuminated by the solar rays passing only at quite definite height above the sea level. In reality, owing to a very sensible angular dimension of the sun in comparison with the earth as viewed from the moon, the illumination of a given lunar area is produced by the rays passing through very different strata of the atmosphere simultaneously.

Consequently this problem is much more complicated than it was considered previously. In the present paper an outline is given of the more developed theory, taking into account the finite angular dimension of the sun and the inhomogeneity of the brightness over the solar disc.

The application of the theory is certainly somewhat difficult and it requires the use of some auxiliary tables calculated for some standard constitution of the atmosphere. The comparison of the theoretical behaviour of the brightness of some area at the moon's surface, with that which is actually observed in different regions of spectrum and in different moments of time, gives the possibility to deduce the distribution of atmospheric ozone as well as of the cosmical dust at very great heights in the atmosphere.

FESENKOV, V.G.
p. 2, 4

PHASE I BOOK EXPLOITATION

SOV/3897
SOV/37-M-17

Akademiya nauk SSSR. Komitet po meteoritam

Meteoritika; sbornik statey, vyp. 17; (Meteoritics; Collection of Articles, No. 17) Moscow, 1959. 157 p. Errata slip inserted. 1,300 copies printed.

Ed.: V. G. Fesenkov, Academician; Deputy Resp. Ed.: Ye. L. Krinov; Ed. of Publishing House: I. Ye. Rakhlin; Tech. Ed.: A. P. Guseva.

PURPOSE: This publication is intended for geophysicists, meteorologists, and other scientists working in meteoritics.

COVERAGE: This is a collection of 20 articles on the origin, composition, and structure of meteorites, and the phenomena associated with their flight and fall. The origin of chondrules is examined in support of the theory that meteorites are fragments from collisions between asteroids. A description is given of the physiographic characteristics of achondrites, which are shown to have the same variety and type of changes in their chemical composition as those found in basic and ultrabasic terrestrial rocks. Results of an experimental study

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SOV/3897

Meteoritics; Collection of Articles, No. 17

conducted by A. S. Predvoditelev, Corresponding Member of the Academy of Sciences USSR, on creep fusion in solids subjected to hot high-density ultrasonic streams are presented, and spectrographic analyses of indochinites, moldavites, and rizalites to determine their cosmic or terrestrial origin are evaluated. There is an investigation of the relationship of zodiacal light and counterglow to meteoritic matter in interplanetary space, and a description of a centrifugal method used in separating maskelinite from meteoritic samples. The Tunguska, Zvonkovoye, Manych, Norton County, and Kon'ovo (Bulgaria) meteorites are discussed in detail, and a list of the meteorites known to have fallen in China is given. References accompany most of the articles.

TABLE OF CONTENTS:

Fesenkov, V. G. Air Wave Produced by the Tunguska Meteorite in 1908 3

Yavnel', A. A. Meteoritic Matter in the Area of the Fallen Tunguska Meteorite 8

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Nikolov, N. S. (Bulgaria) The Uninvestigated Bulgarian Kon'ovo Meteorite 93

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D'yakonova, M. I. Chinese Meteorites

Kirova, O. A. Utilizing the Centrifugal Method to Separate Monomineral Fractions From Stone Meteorites (Based on the Separation of Maskelinite From the Pervomayskiy Poselok Meteorite) 102

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Fesenkov, V. G. Conditions of Disintegration of Asteroids Based on the Observed Characteristics of Zodiacal Light 121

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PIKEL'NER, Solomon Borisovich; FESENKOV, V.G., akademik, otv.red.; YEFREMOV, Yu.I., red.izd-va; SUSHKOVA, L.A., tekhn.red.

[Physics of interstellar matter] Fizika mezhzvezdnoi sredy. Moskva, Izd-vo Akad.nauk SSSR, 1959. 215 p. (MIRA 12:11)
(Cosmogony)

Fesenkov, V. G.

3(1) PHASE I BOOK EXPLOITATION SOV/2464

Akademiya nauk SSSR. Komitet po meteoritam

Sikhote-Alinskiy zheleznyy meteoritnyy dozhd', tom 1 (Sikhote-Alin' Iron Meteorite Shower, Vol 1) Moscow, Izd-vo AN SSSR, 1959. 363 p. 1,200 copies printed.

Resp. Ed.: V. G. Fesenkov; Deputy Resp. Ed.: Ye. L. Krinov; Ed. of Publishing House: I. Ye. Rakhlin; Tech. Ed.: G. N. Shevchenko.

PURPOSE: This book is intended for earth scientists and astronomers interested in meteorite phenomena.

COVERAGE: The collection of articles is the first of three volumes devoted to a study of the Sikhote-Alin' iron meteorite shower which fell on February 12, 1947. Individual articles discuss the location of the fall, the types of craters formed by the impact, and the mineral composition of the meteorite fragments. Information presented in this series, including eyewitness reports, was obtained by members of the AN SSSR

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Sikhote-Alin' Iron Meteorite Shower, Vol 1 SOV/2464

Committee on Meteorites during its four expeditions made between 1947-50. Photographs accompany the text. No personalities are mentioned. No references are given.

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FESENKOV, V.G.

3(1) P. 2. PHASE I BOOK EXPLOITATION SOV/3238

Akademiya nauk Kazakhskoy SSR. Astrofizicheskiy institut

Izvestiya, tom VIII (News of the Astrophysics Institute, Kazakh SSR Academy of Sciences, vol. 8) Alma-Ata, Izd-vo AN Kazakhskoy SSR, 1959. 850 copies printed.

Eds.: F. Ya. Osadchiy, and Yu. N. Kuznetsov; Tech. Ed.: Z. P. Rorokina; Editorial Board: G. M. Idlis, M. G. Karimov, Z. V. Karyagina (Secretary), D. A. Rozhkovskiy, V. G. Fesenkov (Resp. Ed.).

PURPOSE: This collection of articles is intended for geophysicists and astronomers.

COVERAGE: This collection of articles in astronomy contains studies on the distribution of asteroids as revealed by zodiacal light characteristics, the distortion of the luminosity curve of a variable star, the integrals of motion of an individual star, the electromagnetic mechanism in solar prominences, sky polarization in the Libyan desert, projector research, etc. English abstracts accompany each article. References follow individual articles.

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News of the Astrophysics (Cont.) SOV/3238

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Matyagin, V. S. Transparency Coefficients of the Atmosphere in the Ultraviolet by Observing Several Stars 53

Karimov, M. G. The Yellow Coronal Line 5694A From Observations Outside Eclipse 59

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3(1) SOV/26-59-2-2/53

AUTHOR: Fesenkov, V.G., Academician (Alma-Ata)

TITLE: New Trends in the Study of Interstellar and Interplanetary Space (Novoye v izuchenii mezhzvezdnoy i mezhplanetnoy sredy)

PERIODICAL: Priroda, 1959, Nr 2, pp 4-7 (USSR)

ABSTRACT: The author describes the correlation between the formation of stars in interstellar space and the nebulosities. Interstellar space is filled with gas and dust mixed together, forming clouds and divided by spaces almost void. Interstellar space is subject to the action of gravitational forces and of the magnetic field, along the lines of force of which move electrons and ions. Hydrogen and other gases in space are in a state of ionization under the action of the radiation of a "hot" star within 100 parsecs of this star. As the ray-emission of such stars is variable, so is the volume of the ionized region. These changes are connected with a sharp change of temperature conditions in space and cause

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the motion of the substance and change its density. The corpuscular emanation of certain stars also fills space and changes its properties. V.A. Ambartsumyan and D.A. Rozhkovskiy theorize that stars are continually being formed from certain parts of nebulosities, and especially from their dark parts. The author comes to the conclusions that conditions in interplanetary space are quite different from those in the interstellar space. The large planets Jupiter and Saturn are composed mainly of light gases hydrogen and helium, and such an accumulation in interstellar space would be impossible. These planets represent the remains of primary planetary condensations. The whole Solar system was in the very remote past formed under interstellar conditions, but these conditions (nebulas and gas) evolved and disappeared long ago. The property of interplanetary space, which diffuses the light, is clearly expressed in the occurrence of the zodiacal light. The expedition of the AS of the USSR which

FESENKOV, V.

Origin of the stars and the solar system. Tr. from the Russian. p. 480

POKROKY MATEMATIKY, FYSIKY A ASTRONOMIE. (Jednota ceskoslovenskych matematiku a fysiku) Praha, Czechoslovakia, Vol. 4, no. 4, 1959

Monthly List of East European Accessions (EEAI), LC, Vol. 8, no.10, Oct. 1959
Uncl.

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SOV/31-59-6-5/18

AUTHOR: Fesenkov, V.G., Academician

TITLE: Some Research Results According to the Program of the International Geophysical Year

PERIODICAL: Vestnik Akademii nauk Kazakhskoy SSR, 1959, Nr 6, pp 36-46

ABSTRACT: The article deals with the Soviet share in international research carried out according to the program of the Third Geophysical Year. Special attention is focused on the research work of the Astrofizicheskiy institut AN KazSSR (Institute of Astrophysics of the AS KazSSR) with its Koronal'naya stantsiya (Corona Station) as well as its two affiliates, the Sektor astrobotaniki (Astrobotanical Sector) and Sektor geografii (Geographical Sector). The Kazakhskiy gidrometeorologicheskiy institut (Kazakh Hydrometeorological Institute) is also conducting research work in this direction. More than 40 scientific problems were subject to study during the period 1957-1958, with some 100 Soviet research organizations participating. The working out of only one theme, "Research on Solar

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Some Research Results According to the Program of the International Geophysical Year

Activity", requires the cooperation of 14 observatories, including the Institute of Astrophysics of the AS KazSSR. The total number of scientific stations conducting research on Soviet territory is 572. To this number, 70 observation points for artificial satellites must be added. Five special stations are registering meteorological data, earth magnetism, seismological readings, cosmic rays, aurora australis etc. in the Antarctic, and 12 special ships are conducting research on oceanic currents, relief of the sea bottom, etc. The Geographical Sector is mostly engaged in the exploration of the Maloalmatinskiye glaciers of the Zailiyskiy Alatau mountains, the glaciers of the Baskan and Sarkand mountains and those of the Dzhungarskiy Alatau mountains. Up to the present time, extensive data on the temperatures of the basement rock surface, air humidity, cloudiness, wind velocity and their direction as well as on gradient phenomena within the two-meter high

Some Research Results According to the Program of the International Geophysical Year

layer of air above the glacier surface with regard to temperature, humidity, and wind velocity was obtained. Extensive data was also obtained on direct, dispersed, reflected, and summary solar radiation as well as that penetrating the ice. Subject to study were the structure of snow, firn, and ice, their thermophysical properties, strength at various temperatures and solidity degrees, viscosity coefficient, anisotropy, and other mechanical characteristics. In addition to this, temperature conditions of the ice covering, in particular its heat conductivity, and density in accumulation and thawing areas were registered and samples for a detailed textural and structural investigation taken. The samples proved that the crystal axis direction can be put into a close connection to the direction in which a glacier moves, with basis planes serving as sliding planes. The thermophysicists of the Geographical Sector

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have been determining temperature conditions within the glaciers. For this purpose, holes of up to 25 m in depth (a hole was even as deep as 52 m) were drilled which showed that sub-glacial thawing not only occurs in summer, but in winter as well. Very interesting were seismic soundings to measure ice thickness. They showed that at a distance of 2.5 km from the glacier's end the ice was 114 m thick, whereas at a distance of 190 m, it was only 40 m thick. The Geographical Sector was the first organization to use electrometrical research in the USSR. Thus, measurements of specific electric resistance were made along with the sounding of the glaciers' thickness. The movement of ice within the glacier's mass was also determined. The latter measurement said that the ice moves 13-15 cm slower at a depth of 25 m than at its surface. The glaciologists of the above sector have prepared a schematic drawing of the permafrost region, which makes possible a

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Some Research Results According to the Program of the International Geophysical Year

determination of moraine areas susceptible to rushing spring waters. At last, hydrological conditions in the glaciers and the latter's role in supplying the rivers with water were illuminated. Recently, V.V. Vitkevich proved that the solar corona stretches for up to 15 solar radii and even more. This evidence was possible by having the corona sounded by radio emissions emanated from the "Crablike" nebula (Taurus). The Nablyudatel'naya stantsiya (Observation Station) of the Astrophysical Institute of the AS KazSSR is located on the Kamenskoye Plateau and listed under Nr 67, thus constituting one of the southern-most stations of the USSR. It is equipped with standard-type instruments, i.e., with a NAFA 30/25-type camera with a typing chronograph and other units able to record coordinates with a precision degree of about 6" of the arc. Since this camera is comparatively small-sized, it can only record satellite passages during periods of their relative brightness. Thus, the

Some Research Results According to the Program of the International Geophysical Year

above camera makes no recordings of the Soviet satellite Nr 3 which is the most distant among the artificial satellites. A high-capacity meniscus telescope located at the above institute's observatory has a much higher precision degree. It is equipped with ingenious devices developed by D.A. Rozhkovskiy at the observatory's workshop and can make recordings correct to a maximum of 0.001 sec and 1" of the arc of coordinate which is the highest precision standard to make recordings of satellite passages in the USSR and probably the world over. A.V. Kharitonov and V.S. Matyagin, coworkers of the above institute, have participated in the development of this unit and also made the most photos. Every day, a special coronagraph of the Corona Station, able to mark out the inner corona, goes around the entire solar disc and registers the lines of coronal emission at the height of 40" from the disc edge. This process is carried out under the supervision of M.G. Karimov. The

Some Research Results According to the Program of the International Geophysical Year

emission lines with the wave length of 5303 (green), 6374 (red), 6702 (red), and 5694 (yellow) are caused by the emissions of ionized atoms of Fe and Ca and their equivalent width. In other words, the intensity expressed in millionths of the brightness of the solar disc's center, is characterized by the temperature, electronic density, and concentration of corresponding atoms on the sun, i.e., by the physical condition of the solar disc at the moment given. During the International Geophysical Year, some 20,000 values of equivalent widths of coronal lines and more than 40,000 photos of the chromosphere within the red line of hydrogen were made. In addition to this, the Coronal Station analyzed the most interesting photos, with conclusions drawn on both movement and concentration of coronal "nodules" and their connection with the protuberances. Systematic observation of the nocturnal sky is carried out by standard-type spectrographs distributed among the scientific stations in the

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Some Research Results According to the Program of the International Geophysical Year

USSR. Until February 1959, the above institute's observatory made 217 long-exposed spectra of the nocturnal sky. The luminiscence of the long-wave section of the nocturnal sky was subject to regular recording from as early as December 1957. Apart from the ordinary emission lines caused by undue changeovers of atomic oxygen 5577, 6300, and 6364, and the yellow line 5893 (sodium), a multitude of oscillatory strips of the molecule of hydroxyl OH was also identified. The rotary structure of these strips can be easily recognized by an SP-48-type spectrograph used for this purpose. The observatory also investigated the earth's capacity to reflect sunlight - the earth's albedo. During a period of 9 months, 38 series of albedo observations were carried out by Dzhasybekova and Kharitonov, which showed that the earth reflects about 40% of the sunlight received. The Astrophysical Institute of the KazSSR developed into an institution specializing in the

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Some Research Results According to the Program of the International Geophysical Year

investigation of zodiacal light. In addition to this, it discovered a similar phenomenon, the so-called mock zodiacal light, through its expedition sent to the Balkhash Lake and the mountainous regions of the Kazakhstan. An additional expedition has been dispatched to Egypt - into the southern part of the Libyan desert. Its task was also the study of zodiacal light and that of the optical properties of the earth atmosphere. In this connection, Ye.V. Pyaskovskaya-Fesenkova was the first to point out that cosmic aerosols set free by the earth atmosphere can cause considerable polarization - a phenomenon which could not be yet explained.

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FESENKOV, V.G.

Conditions of the desintegration of asteroids revealed by observed characteristics of the zodiacal light. Izv. Astrofiz. inst. AN Kazakh. SSR 8:3-12 '59. (MIRA 13:3)
(Planets, Minor) (Zodiacal light)

FESENKOV, V.G.

Zodiacal twilight. Izv. Astrofiz. inst. AN Kazakh. SSR 8:13-18 '59.
(MIRA 13:3)
(Zodiacal light)

FESENKOV, V.G.

AVROV, P.Ya.; AYTALIYEV, Zh. A.; AUEZOV, M.O.; AKHMEDSAFIN, U.M.; BATISHCHEV-TARASOV, S.D.; BAZANOVA, N.U.; BAISHEV, S.B.; BAYKONUROV, A.B.; BEKTUROV, A.B.; BOGATYREV, A.S.; BOK, I.I.; BORUKAYEV, R.A.; BUBLICHENKO, N.L.; BYKOVA, M.S.; ZHILINSKIY, G.B.; ZYKOV, D.A.; IVANKIN, P.F.; KAZANLI, D.N.; KAYUPOV, A.K.; KENESBAYEV, S.K.; KOLOTILIN, N.F.; KUNAYEV, D.A.; KUSHEV, G.L.; LAVROV, V.V.; MASHANOV, O.Zh.; MEDOYEV, G.TS.; MONICH, V.K.; MUKANOV, S.; MUSREPOV, G.; MUKHAMEDZHANOV, S.M.; PARSHIN, A.V.; POKROVSKIY, S.N.; POLOSUKHIN, A.P.; RUSAKOV, M.P.; SERGIYEV, N.G.; SEYFULLIN, S.Sh.; TAZHIBAYEV, P.T.; FESENKOV, V.G.; SHLYGIN, Ye.D.; SHCHERBA, G.N.; CHOKIN, Sh.Ch.; CHOLPANKULOV, T.Ch.

Sixtieth birthday of Academician Kanysh Imantaevich Satpaev. Vest. AN Kazakh. SSR 15 no.4:58-61 Ap '59. (MIRA 12:7)
(Satpaev, Kanysh Imantaevich, 1899-)

3(1)

AUTHOR: Fesenkov, V.G. SOV/33-36-2-1/27

TITLE: On the Optical State of the Earth Atmosphere Under Twilight Illumination

PERIODICAL: Astronomicheskiy zhurnal,1959,Vol 36,Nr 2,pp 201-207 (USSR)

ABSTRACT: The author presents a method for the determination of the trajectories of solar rays which pass through the atmosphere in different heights and of their refraction and extinction. The numerical tables given in the paper were calculated according to this method, partly by L.N. Tulenkova. These tables can be applied e.g. in the theory of twilight phenomena.
There are 5 tables and 2 non-Soviet references, 1 of which is English and 1 French.

ASSOCIATION: Institut Astrofiziki AN Kaz SSR (Institute for Astrophysics, AS Kaz SSR)

SUBMITTED: February 2, 1959

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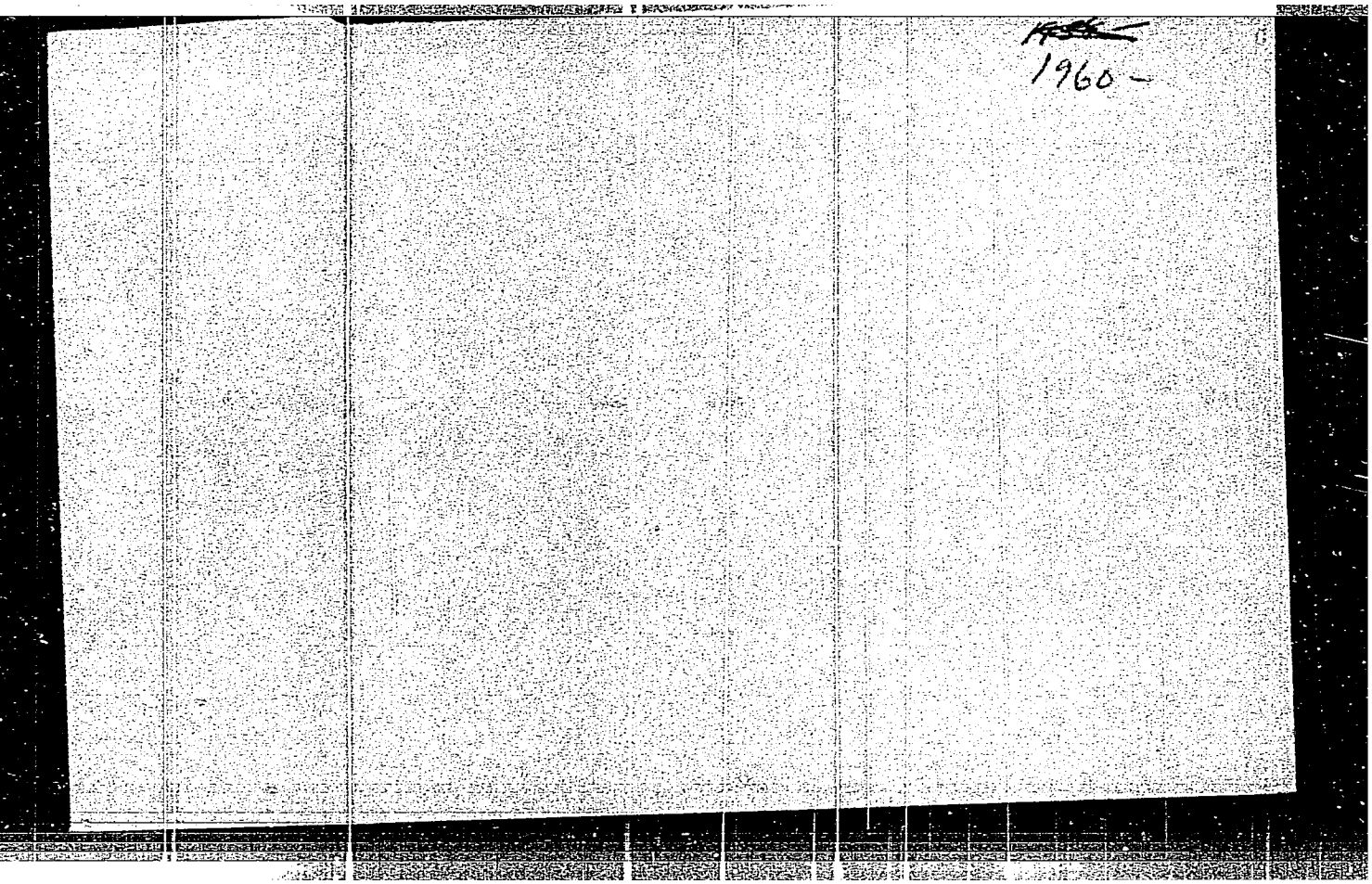
EARLIER PUBLICATIONS FOR THIS AUTHOR ARE AVAILABLE IN THE INACTIVE FILE -- WE WILL PULL THEM UPON REQUEST.



FESENKOV, Vasiliy Grigor'yevich, akademik; ARSENT'YEV, V.V., red.; STRELKOVA, M.A., red.izd-va; SAVCHENKO, Ye.V., tekhn.red.

[What the results of observations on the origin of the solar system tell us] Chto govoriat dannye nabliudenii o proiskhozhdenii solnechnoi sistemy. Moskva, Izd-vo "Znanie," 1960. 47 p. (Vsesoiuznoe obshchestvo po rasprostraneniiu politicheskikh i nauchnykh znanii. Ser.9, Fizika i khimiia, no.1) (MIRA 13:1)
(Solar system) (Cosmogony)

FESENKOV, V. G.

PHASE I BOOK EXPLOITATION SOV/5424

Tsiolkovskiy, Konstantin Eduardovich

Put' k zvezdam; sbornik nauchno-fantasticheskikh proizvedeniy (Journey to the Stars; Science Fiction Collection) Moscow, Izd-vo AN SSSR, 1960. 351 p. 50,000 copies printed.

Ed.-Comp.: B. N. Vorob' yev; Ed. of Publishing House: V. A. Boyarskiy; Tech. Ed.: T. P. Polenova.

PURPOSE: This science fiction collection is intended for the general reader.

COVERAGE: The book is a complete collection of the science fiction writings of K. E. Tsiolkovskiy. In these accounts many problems connected with the investigation and conquest of space are presented. Cosmic rocket travel and original apparatus to guarantee the survival of men, animals, and plants inside such rockets are described. Tsiolkovskiy speculates

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on the effect of the gravity of celestial bodies on the size of any possible inhabitants, etc. He sketches the vastness of space and trips to the planets of the solar system. In the preface of the book Academician V. G. Fesenkov provides a critique of Tsiolkovskiy' s science fiction writings, reviewing his ideas and pointing out some errors. A still more detailed appreciation and history of Tsiolkovskiy' s science fiction is given in the summary by B. N. Vorob' yev. The book is concluded by three appendixes and a number of reproductions of Tsiolkovskiy' s sketches. No personalities are mentioned. There are no references.

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Fesenkov, V. G.

PHASE I BOOK EXPLOITATION SOV/4290
SOV/37-S-38

Akademiya nauk SSSR. Komitet po meteoritam

Meteoritika; sbornik statey, vyp. 18 (Meteoritics; Collection of Articles, No. 18) Moscow, AN SSSR, 1960. 1,200 copies printed.

Ed.: V.G. Fesenkov, Academician; Deputy Resp. Ed.: Ye.L. Krinov; Ed. of Publishing House: I.Ye. Rakhlin; Tech. Ed.: A.P. Guseva.

PURPOSE: This publication is intended for astrophysicists, astronomers, and geologists, particularly those interested in the study of meteorites.

COVERAGE: This collection of 26 articles on problems in meteoritics includes the Transactions of the Eighth Meteoritic Conference which took place in Moscow, June 3 - 5, 1958. An introductory article reviews recent progress in the field, particularly in the matter of determining the age of meteorites. Individual articles discuss the fall, physical and chemical properties, and age of meteorites. The danger presented by meteors to artificial earth satellites is discussed. V.G. Fesenkov describes the theory and adduces computations for

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determining the distribution of ozone in the atmosphere during lunar eclipses. References accompany individual articles.

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S/169/60/000/010/012/013
A005/A001

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Translation from: Referativnyy zhurnal, Geofizika, 1960, No. 10, pp. 210-211, # 13212

AUTHOR: Fesenkov, V.G.

TITLE: Polarization of the Zodiacal Light According to Observations in Egypt. (Assuan, October - November, 1957).

PERIODICAL: Izv. Astrofiz. in-ta. AN KazSSR, 1959 (1960), Vol. 9, pp. 3-9 (English summary)

TEXT: Results are presented of measurements of the polarization degree and the orientation of the polarization vector, which were obtained from observations carried out with a binocular visual photometer with wedge in October - November 1957 in Assuan (Egyptian region of the United Arab Republic). Polarization was determined from the brightness of the zodiacal light at three positions of the polaroid turned through 60°. The observation results are presented in a table which shows the average values of the polarization degree and the angle of the polarization vector direction for October 24, 26, 27, and November 1, 16, 20. It

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A005/A001

Polarization of the Zodiacal Light According to Observations in Egypt. (Assuan, October - November, 1957)

was discovered that the polarization degree decreases with the angular distance from the Sun. The polarization vector is directed towards the Sun, if the ecliptic position is nearly vertical. But, when the ecliptic is considerably inclined to the horizon, the polarization vector direction strongly deviates from the direction to the Sun. The author is of the opinion that this latter result is in need of an especial checking.

N.B. Divari

Translator's note: This is the full translation of the original Russian abstract.

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A166/A029

B,2300

AUTHOR: Fesenkov, V.G., Academician

TITLE: Space Ships and Astrophysics

PERIODICAL: Priroda, 1960, No. 9, pp. 6 - 9

TEXT: Future space flight offers great possibilities for more accurate astrophysical observations. From a space ship orbiting at about 500 km from the earth and inclined 65° to the plane of the equator, the distribution of ozone at different heights could be determined by photographing the extinction of the sun's light in the green and yellow band at sunset (which is caused almost entirely by the Chapuy ozone band). This could be done with an ordinary camera fitted with a telephoto lens and suitable filters. As the ship orbits the earth, the distribution of ozone at various latitudes could be determined. Space observation of twilight phenomena on earth could give valuable data (e.g., the density or optical properties) on the structure of the earth's atmosphere at heights up to 150 km without the otherwise distorting effect caused by light-scattering in the troposphere. Such studies would show how the earth's atmosphere diverges from true spherical symmetry and what form this would take at different altitudes. From

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A166/A029

Space Ships and Astrophysics

space it would also be possible to make a spectrographic study of the ionosphere's emission spectrum on the dark side of the earth and to trace the intensification or weakening of the various emission lines depending on the time of prior direct solar irradiation of definite ionospheric layers. There is reason to believe that the natural luminescence of the ionosphere constitutes a weak continued component of unknown nature. Photos of the ionosphere from above would aid in the solution of this problem. The earth's surface would not, of course, be completely black due to the light from the stars, but this effect could be allowed for by measuring the contrastability between the continents and oceans on the earth's surface. N.N. Pariyskiy has recently established that counter-radiance has a continuous spectrum and, with progressive shift to the west, is deformed into "false" zodiacal light very reminiscent of true zodiacal light, which shows brightly before dawn in the east. Space observations could determine the nature of counter- radiance by looking for counter-radiance on the side opposed to the sun before the sun is concealed behind the earth's disc. If there is no counter-radiance present, this means that the scattering properties of interplanetary space play no part in the phenomenon. If counter-radiance appears only when the sun has well and truly disappeared behind the earth, the phenomenon is definite-

ly connected with the earth's atmosphere, stretched out for a considerable distance in the direction opposed to the sun. The main hindrance for the earthbound observer, i.e., the bright background of the luminescent ionosphere, is thus eliminated. Counter-radiance could be traced throughout the night and checked for disappearance with the sun and the anti-sun at a maximum distance of 20 - 25° from the edge of the earth's disc. From a space ship it should be possible to study the properties of zodiacal light between the solar corona to an angular distance of 30° from the sun. The transition between zodiacal light and the solar corona could be traced using a 2-channel polarimeter and a device for automatically recording the results. Space observations could give data on solar eruptions which can be observed from the earth only indirectly from concomitant phenomena. The observing port would be of homogeneous plane-parallel glass with, outside, an adjustable circular screen capable of blocking off the sky around the sun at various angular distances as required. This would shield the camera against direct sun rays and the bright areas of the inner corona. The structure of the corona could then be explored at distances of tens of degrees with a wide-angle lens, with particular emphasis on the corona's polarization and emission properties. Space observations could be used to check reports that there are notable increases

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Space Ships and Astrophysics

in the intensity of the inner zodiacal light due to intense solar eruptions. This, if true, would indicate the appearance of considerable cloud formations ejected by the sun. By the use of suitable filters it should be possible to record the distribution in the solar corona and the rest of the firmament of hydrogen radiation lines in the primary Laymanov series of the spectrum. Photon counter, carried in rockets, have revealed extensive hydrogen nebulae and even the radiation of Lα emission hydrogen lines from the earth. There is 1 Soviet reference.

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FESENKOV, V.G.

Methods for reducing photometric observations of the zodiacal light. Izv.Astrofiz.inst.AN Kazakh.SSR 9:35-39 '60.
(MIRA 13:5)

(Zodiacal light)

S/030/60/000/012/005/018
B004/B056

AUTHORS: Fesenkov, V. G., Academician, Krinov, Ye. L.

TITLE: News About the Tunguska Meteorite

PERIODICAL: Vestnik Akademii nauk SSSR, 1960, No. 12, pp. 32 - 35

TEXT: The Tunguska meteorite came down on June 30, 1908. The first investigations by Soviet scientists are mentioned: L. A. Kulik, V. I. Vernadskiy, and A. Ye. Fersman (1927): aerial photography with the participation of Academician O. Yu. Shmidt (1937-1938). A close study was planned to be carried out after the war by the Komitet po Meteoritam Akademii nauk SSSR (Committee of Meteorites of the Academy of Sciences, USSR), but was delayed by the investigation of the iron meteorite rain in February 1947 in the Sikhote-Alin' Range (Soviet Far East). The investigation was started only in 1958 by a comprehensive expedition. Fig.2 shows the map which was drawn on the basis of data supplied by this expedition. The aerial photographs made in 1937-1938 are being dealt with at the Moskovskiy institut inzhenerov geodezii, aeros"yemki i kartografii (Moscow Institute of Engineers of Geodesy, Aerial Photography and Cartography) and

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will be completed on 1961. In spite of the high energy of the cosmic body which came to earth (10^{28} erg) and its mass of about 1 million tons, no larger fragments but only magnetite- and silicate spheres with a diameter of from 30 - 40μ were found in the central region of the incidence. The data of the trajectory of this body make it clear that it approached the earth with great velocity, and that its orbit was directed inversely to that of the solar system. Herefrom the conclusion is drawn that it was not a meteorite at all but a comet, which had no massive central core but consisted of a compact cloud of dust. It was the purpose of further research to determine the region in which the explosion took place in the atmosphere on the basis of the data of various observatories, and to study the propagation and interference of the wave of the explosion. For this purpose, the collaboration of other Institutes of the Academy of Sciences of the USSR is necessary, such as that of the Institut geokhimii i analiticheskoy khimii (Institute of Geochemistry and Analytical Chemistry), Institut fiziki Zemli (Institute of the Physics of the Earth), Institut khimicheskoy fiziki (Institute of Chemical Physics), Institut merzlotovedeniya (Institute of Permafrost Study), Pochvennyy institut

(Institute of Soil), Botanicheskiy institut (Botanical Institute), and Glavnyy botanicheskiy sad (Main Botanical Garden), and further of the Moscow Institute of Engineers of Geodesy, Aerial Photography and Cartography), and of the Ministerstvo Geologii i okhrany nedr SSSR (Ministry of Geology and the Protection of Soil Sources of the USSR). The Presidium of the Academy of Sciences approved an expedition to take place in the summer 1961 and also provided the necessary means for this purpose. As in this case it is not merely intended to collect meteorite fragments as was done in the Ivanovo oblast' in December 1958 by students, but as this time the fall of a comet is concerned, this problem can be solved only by qualified experts by modern methods of investigation. There are 3 figures.

Text to Fig.2: Map of the region of the fall of the Tunguska meteorite according to data of the expedition of the Committee of Meteorites (1958). A: Projection of the trajectory according to Astapovich; K: ditto according to Krinov; the arrows indicate the zone of the uprooted trees and the direction in which the trunks of trees lay. This zone is encircled by a line. Ю.Б. : Yuzhnoye boloto (Southern Swamp). Б : Base of the Expedition; 1: Podkamennaya Tunguska River; 2: Chamba; 3: Vanavara.

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D228/D302

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AUTHOR: Fesenkov, V. G.

TITLE: The theory of lunar eclipses

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 1, 1962, 9-10, abstract 1B74 (V sb. Meteoritika, no. 18, M., 1960, 125-135)

TEXT: The phenomenon of lunar eclipses may be used for optical probing of the atmosphere, in particular for studying the distribution of ozone and cosmic dust with altitude. The separation of both factors influencing the brightness of lunar eclipses is possible owing to the fact that absorption by ozone is centered in the Shapui belt, and that the heights of the maximum concentration of ozone and cosmic dust are different (20 - 50 and 80 - 100 km, respectively). The corresponding theories for the brightness of lunar eclipses (Barbier, Shalonge, Vassi) proceed from incorrectly simplified assumptions about the fact that: 1) The sun is mistaken for the point source, and 2) the dispersion in the pencil of rays which

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The theory of lunar eclipses

have passed through the atmosphere is considered to be independent of the wavelength. The bases of a suitable approximate theory for the brightness of lunar eclipses are adduced. Considering the sun as a disc with an arbitrary disposition in respect of the earth's disc (from the point of view of a lunar observer), a precise theory is stated for the refraction of solar rays by the atmosphere. According to the measure of approach to the earth's disc the deformation of the solar disc comes to its transformation, at first in the tapering segment and then in the thin ring. Even at the time of a central eclipse, however, the solar rays refracted by the atmosphere reach the moon. Subsidiary tables of horizontal refraction and absorption (without taking ozone into account) for different heights (h_3) of the atmospheric layer, corresponding to the maximum approach of a ray to the earth's surface, were compiled on the basis of known models of the atmosphere. A formula is introduced for the light flow I falling in the lunar-surface element from the whole of the solar disc:

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The theory of lunar eclipses

$$I = 2 \int_{d-\delta_0}^{d+\delta_0} dr \int_{0}^{\varphi_{max}} \frac{(R + h_0)}{1 - \frac{d(2Refr)}{dh_0}} (abs) j(\delta) d\varphi \qquad (1)$$

where d is the angular distance between the centers of the discs of the earth and sun; δ_0 and R are the angular radii of these discs; φ_{max} is the angle at the center of the earth's disc between the center line and tangent to the solar disc; (abs) is the coefficient of absorption; j (δ) is the brightness of the solar-disc element $d\delta$, situated at a distance δ from the sun's center; Refr is the horizontal refraction; and r is the angular distance of element $d\delta$ from the earth's center. The dependence of Refr and r on h_0 is established. The limits of the atmosphere's effective layer and the

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The theory of lunar eclipses

angular width of the solar segment illuminating the moon are calculated for different values of d. It is shown that on the transition from a central eclipse (d = 0) to a tangency of the solar and terrestrial discs ($d = R + \delta_0$) the lower limit of h_0 varies from 1.2 to 10.0 km, whereas the upper limit rapidly grows from 5.6 to 12.08 km. As a result of dispersion (the course of which is shown in a graph), however, the influence of the lower atmospheric layers decreases strongly. Graphs of the subintegral function in formula (1) are adduced as a function of h_0 for $r_{max} - R = -1'.48$, $0'$, and $0'.63$. An estimate is made on the influence of ozone absorption in the Shapui belt on the course of the curves expressing the X-raying of atmospheric layers by solar rays. The influence of ozone is especially great in the first case (a total eclipse), although here, too, the semithickness of the layer of translucence amounts to ~8 km, which is not very suitable for determining the altitudinal distribution of ozone. [Abstractor's note: Complete translation.]

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S/033/60/037/03/010/027
E032/E314

AUTHOR: Fesenkov, V.G.

TITLE: Photometric Properties of the Moon

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol 37, Nr 3, pp 496 - 500 (USSR)

ABSTRACT: It has long been known that the Moon has rather peculiar photometric properties which differ from those of other planetary bodies in the solar system. Thus, at full-moon each detail of the Moon has a maximum brightness and there is no systematic change in the brightness with distance from the centre of the disc. On either side of the zero phase the brightness of the positive edge of the Moon, and the integral brightness, rapidly decrease; the reflection functions are roughly the same, both for the mountain regions and for the "seas". They are very drawn out in the direction of the incident light and more so for the "seas" than for the mountain regions. It is shown in the present paper that these properties can be accounted for by the rather simple Lommel-Seeliger formula. According to this formula, the amount of light reflected per unit solid angle from a matte opaque surface is given by:

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E032/E314

Photometric Properties of the Moon

$$qds = \Gamma\, ds \frac{\cos i \cos \varepsilon}{\cos i + \cos \varepsilon}$$

where i is the angle of incidence, ε is the angle of reflection and the coefficient Γ is given by

$$\Gamma = L\, \mu/k$$

where L is the illumination and μ and k are the scattering and extinction coefficients, respectively. Thus, the formula includes only one function which is determined from observation, namely, the relative brightness of the positive edge of the lunar crescent. A physical interpretation of the formula is possible only if it is assumed that the surface layer is a combination of comparatively large grains, weakly bound with each other and capable of scattering light, mainly in the backward direction, thus partly shadowing each other.

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6,4780 (also 1051, 1106)

S/033/60/037/005/001/024
E032/E514

AUTHOR: Fesenkov, V. G.

TITLE: On the Presence of Elliptical Polarization in the Light of the Day Sky

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol.37, No.5, pp. 785-793

TEXT: In general, the polarization of light is described by the four independent Stokes parameters. The first three of these determine the total intensity, the degree of polarization and the direction of polarization. They can be determined with the aid of the usual Nicol prism or a polaroid. The fourth parameter determines the degree of elliptical polarization and requires more complicated devices for its determination. The aim of the research reported in the present paper was to determine to what extent the latter complication should be taken into account in the design of polarimeters intended for the analysis of the polarization of the light of the day sky. Chandrasekhar (Ref.1) considers that the first three parameters are sufficient to describe the polarization of the light of the day sky. However, he gives no direct proof of this assumption and it is, therefore, desirable to verify it

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On the Presence of Elliptical Polarization in the Light of the Day Sky

experimentally. The two-channel polarimeter described by the present author (Fesenkov, Ref.3) can be used for this purpose and the present paper describes modifications of this polarimeter which have to be introduced in order to measure the degree of partial elliptical polarization of the light of the day sky. In particular, an account is given of the theory of quarter-wave plates used as detectors of the degree of partial elliptical polarization in conjunction with polaroids. Measurements carried out with the above two-channel polarimeter, working in conjunction with quarter-wave plates, show that the light of the day sky is not elliptically polarized or, alternatively, if elliptical polarization is present it must be negligible (experimental errors are not given). There are 3 figures, 1 table and 3 references: 1 Soviet, 1 translation from English and 1 English.

ASSOCIATION: Institut astrofiziki Akademii nauk KazSSR
(Institute of Astrophysics, Ac. Sc., KazSSR)

SUBMITTED: July 15, 1960

84927

S/033/60/037/005/002/024
E032/E514

6,4780 (also: 1051, 1106)

AUTHOR: Fesenkov, V. G.

TITLE: On the Polarization of Emission Lines in the Light of the Night Sky

PERIODICAL: Astronomicheskiy zhurnal, 1960, Vol.37, No.5, pp. 794-798

TEXT: It is argued that emission lines in the light of the night sky may have a weak natural polarization. If such a polarization exists, it should appear in the zenith and be associated with the Earth's magnetic field. It is assumed that each element $d\sigma$ of the ionosphere which is at a large distance from the scattering troposphere, may be looked upon as an external and unpolarized source of light whose intensity j depends only on the zenith distance ζ and corresponds to a certain effective altitude h so that

$$j \sim \frac{1}{\sqrt{1 - \frac{R^2}{(R+h)^2} \sin^2 \zeta}} \qquad (1)$$

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On the Polarization of Emission Lines in the Light of the Night Sky

where R is the Earth's radius (R = 6370 km, h ≈ 200 km). The dependence of j on h is relatively weak. In the first part of the paper a calculation is given of the total brightness of the troposphere illuminated by the ionosphere at a certain chosen point M with a zenith distance z. Each isolated element dσ having a zenith distance ζ produces at the point M which is at an angular distance ϑ from it, an intensity which is given by

$$J \sim f(\vartheta) \sec z \frac{p^{\sec z} - p^{\sec \zeta}}{\sec \zeta - \sec z} d\sigma$$

where

$$f(\vartheta) = 1 + 5.5 \left(e^{-3\vartheta} - 0.009\right) + 0.55 \cos^2 \vartheta \qquad (2)$$

The latter is a typical scattering function in the troposphere (Pyaskovskaya-Fesenkova, Ref.1) Moreover,

$$\cos \zeta = \cos \vartheta \cos z + \sin \vartheta \sin z \cos t,$$

On the Polarization of Emission Lines in the Light of the Night Sky

where t is the position angle measured from the circle MZ. In summing over the sky, the angular distance ϑ of the element $d\sigma$ from the point M, and the angle t which the arc ϑ makes with the vertical M, are chosen as the independent variables. Thus,

$$J_m = \iint J \, d\sigma$$

where

$$J = jf(\vartheta) \sec z \frac{p^{\sec\zeta} - p^{\sec z}}{\sec z - \sec\zeta} \qquad (3)$$

For large ζ, $\sec\zeta$ can be replaced by the atmospheric mass, e.g. when $\zeta = 90°$ the atmospheric mass is about 40. The quantity p is the transparency coefficient given by $p = \exp(-\tau_o)$. For green light one can take $\tau_o = 0.2$ say, and hence $p = 0.819$. In order to calculate the total polarization at the point M, one can use the expression given in Ref.2 for the resultant of two vectors IP and I_1P_1 making an angle of α with each other, i.e. the

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resultant is given by

$$(I_m P_m)^2 = (IP + I_1 P_1 \cos 2\alpha)^2 + (I_1 P_1 \sin 2\alpha)^2 .$$

The angle α can be measured from any direction, i.e. one can take

$$(I_m P_m)^2 = \left[IP \cos 2\alpha_o + I_1 P_1 \cos (2\alpha + 2\alpha_o) \right]^2 + \left[IP \sin 2\alpha_o + I_1 P_1 \sin (2\alpha + 2\alpha_o) \right]^2 \quad (4)$$

It follows that the required quantity $I_m P_m$ represents the geometrical sum of two vectors at an angle 2α to each other. This geometrical sum can be obtained by projecting each vector IP onto two arbitrary and mutually perpendicular axes, provided one then takes the cosines of twice the angles between each vector and the corresponding axis. Each element $d\sigma$ gives rise to a polarization P (at the point M) given by

$$P = \frac{K \sin^2 \vartheta}{1 + \cos^2 \vartheta} \quad (5)$$

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where the constant coefficient K for a real troposphere lies in the range 0.80-0.85. The intensity due to this element at the point M is I dσ. The direction of polarization (preferred direction of vibrations) is perpendicular to the circle ϑ. It follows that in general

$$(I_m P_m)^2 = \left(\int IP \cos 2t \, d\sigma\right)^2 + \left(\int IP \sin 2t \, d\sigma\right)^2 \qquad (6)$$

and the angle between the direction of polarization and the vertical at M is given by

$$\tan (2t_m) = \frac{\int IP \sin 2t \, dt}{\int IP \cos 2t \, dt} \qquad (7)$$

It follows from symmetry considerations (provided the brightness of the ionosphere is independent of the azimuth) that the total polarization vector should be parallel to the vertical at M or make a right-angle with it, in which case $\tan(2t_m) = 0$ and $I_m P_m = \int IP \cos 2t \, d\sigma$. Knowing I_m and calculating $I_m P_m$ as

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shown above, one can finally find P_m, i.e. the required polarization of the emission line at the zenith distance z, which is due to tropospheric scattering. The paper is concluded with a numerical application of the above theory. The functions $f(\vartheta)$ and j are calculated from Eqs. (2) and (1) and are given in Tables 1 and 2. As can be seen from these tables, owing to the high position of the effective layer of the ionosphere responsible for the glow of the night sky, the quantity j does not vary very much. For a particular case $z = 60°$, the polarization should not exceed 2%. Different zones traced around this point at different angular distances produce very different polarization, from 15% negative at angular distances of about 60° to 10% positive at greater distances, thus nearly cancelling each other when the whole sky is considered. Since the light due to the ionosphere itself and also other sources (zodiacal light, integral stellar light) are superimposed on this effect, the observed polarization of emission lines of the night sky can hardly exceed 0.2% and, therefore, can only be detected with exceedingly sensitive

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FESENKOV, V. G.

Twilight as a Method of Investigation of the atmospheric optical properties.

report submitted in connection with the Symposium on Radiation, Vienna, Austria, 14-19 Aug 1961.

FESENKOV, V.G.

Certain problems of the meteorite studies.

Concerning the nature of the "Tungussk Pleteorite." 40

"METEORITKA" (Meteorites-Studies) Issue no. 20 - 1961, sponsored by the "Committee on Meteorites" of the Soviet Academy of Sciences - Moscow - 1961, 208 pages, and containing Collected Works("Trudy") of the "9th Meteorite Conference Organized by the Committee on Meteorites of the Soviet Academy of Sciences" and Held in KIEV on 2-4 June 1960.

FESENKOV, V., akademik

Meteorite? Space ship? Comet? Starsh.-Serzh. no.1:23 Ja '61. (MIRA 14:7)

(Podkamennaya Tunguska Valley--Comets--1908)

S/169/62/000/009/112/120
D228/D307

3.5150

AUTHOR: Fesenkov, V. G.

TITLE: Photometric zodiacal light observations carried out with a binocular photometer in the Lybian Desert in autumn 1957

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 9, 1962, 18, abstract 9G140 (Tr. Astrofiz. in-ta AN KazSSR, 2, 1961, 3-51)

TEXT: An expedition of the Astrofizicheskiy institut AN KarSSR (Astrophysics Institute, AS KazSSR) conducted photometric observations of the zodiacal light (east and west branches) and the counterglow in the United Arab Republic from October 19 to November 24, 1957. These were carried out by means of a visual binocular photometric-wedge photometer, whose readings were recorded on tape and converted into absolute brightnesses. Photometric profiles were made along the almacantars h = 10°, 20°, and 30° over 10° in azimuth and also along the zodiacal light axis. The observational

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D228/D307

Photometric zodiacal light ...

results are tabulated. A table is given, too, for measurements of the atmospheric transparency factor, which were carried out by means of a halo photometer with a green filter for all days of observations, before and after noon. [Abstracter's note: Complete translation.]

V/C

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21733

S/026/61/000/003/002/006
A166/A127

3.2310 (2205)

AUTHOR: Fesenkov, V. G., Academician

TITLE: Zodiacal Light

PERIODICAL: Priroda, no. 3, 1961, 5-8

TEXT: Soviet studies of the interplanetary medium which gives rise to zodiacal light indicate that it is made up of matter, not from the Sun, but from asteroids from the solar system which have disintegrated upon collision or from comets which disintegrate into meteor streams of fine dust particles. Ye. V. Pyaskovskaya-Fesenkova found in 1957 that dry dust suspensions can polarize light up to 40%. Similar polarization has been noted in the heads and neighboring parts of the dust tails in recent bright comets, where there can be no question of heightened electron activity. Assuming that the particles of the interplanetary medium have the same polarization qualities, this would easily explain the phenomenon of zodiacal light and makes unnecessary the hypothesis, advanced in recent

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Zodiacal Light

years, that the phenomenon is due to the scattering of light on free electrons. Zodiacal light, then, is due to the scattering of light on interplanetary dust particles. The concentration of free electrons at the distance of the earth's orbit from the sun must be not more than 30-40 per cm^3, and not 600-800 as has previously been assumed. The interplanetary medium represents a stationary balance between matter derived from disintegrated comets and matter which falls into the sun. Absorption in the denser regions of the interplanetary medium may strip solar radiation occurring during strong eruptions, of its α-component so that it reaches the earth consisting almost solely of protons. On the other hand, corpuscular radiation renders the dust particles flocculent so that they are arrested in the extreme upper layers of the earth's atmosphere and settle slowly to the surface. The annual precipitation of such dust is about 5,000 tons. Calculations indicate that there are about 2.10^{-8} grams of dust per km^3 of interplanetary space at a distance of the earth's orbit from the sun. This amounts to 1.4 dust grains

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Zodiacal Light

of 10 micron radius per m^3. Estimates based on the intensity of zodiacal light place the density of zodiacal matter at roughtly 2 dust grains of 10 micron radius per m^3. There is 1 graph and 1 Soviet reference.

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S/026/61/000/006/001/003
D045/D114

AUTHOR: Fesenkov, V.G., Academician

TITLE: The beginning of a new era in space research

PERIODICAL: Priroda, no. 6, 1961, 3-5

TEXT: The author discusses several problems of space phenomena and emphasizes the important part to be played by manned spacecraft in the solution of these problems. Firstly, he states that an astronaut, flying even at a close distance to the earth, can see whether the gegenschein phenomenon is connected with the interplanetary medium or whether it is actually a dust formation surrounding the earth. In the same way, valuable information on the nocturnal glow phenomena, and, particularly, the nature and intensity of the continuous part of its atmospheric content can be obtained by the astronaut who can clearly see the distinction between the components of the earth's atmosphere and those of space. Before the first manned space flight, the earth, photometrically speaking, could only be indirectly compared with other planets. The problems of twilight phenomena can be easily solved by the astronaut, since he can very simply register the properties of the atmospheric layers in the pure state and can determine the ozone distribu-

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D045/D114

tion in the earth's atmosphere according to height and latitude. It can be assumed that one of the first tasks of a space observatory rotating near the earth will be to study the optical properties of the interplanetary medium, which appears as the zodiacal light. In discussing meteorite problems, the author states that types of meteorites other than those already known may exist - meteorites with much greater friability and originating from the surface layers of asteroids. Spaceships could possibly be used for the direct collection of cosmic matter. There is no doubt that a part of this matter, especially that which becomes part of the earth's cloud, will move at a very low speed relative to the spaceship and can, therefore, be collected by corresponding devices. Discussing the inter-relationship of the earth and the moon, the author states that, on the basis of data obtained from artificial satellites, the earth is surrounded by a dust cloud extending, for a considerable part and perhaps similar to a comet's tail, to the radius of the lunar orbit. The density in the inner parts of this cloud enormously exceeds the average density of dust material in the interplanetary space between the earth and the sun. The origin of this cloud is unknown. The theory is being advanced that certain processes on the moon, probably connected with the fall of heavy meteorite masses causing the dispersion of atomized matter, are the source of this dust. It apparently must be assumed that

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similar processes are caused by tektites, the cosmic nature of which can be established by the presence of radioactive isotopes Al^{26} and BE^{10}. An interesting idea is now being put forward that tektites, due to lunar explosions, could be expelled from the moon to the earth in compact clusters and cover only very limited areas of the earth's surface. The author states that, before actually landing on the moon, it will be possible to fly around the moon from its opposite side and observe its structural characteristics from close range. By finding the reason for the formation of craters on the moon, - whether they are created by volcanic phenomena or by the fall of heavy meteorites or asteroids - the basic problem of the moon's evolution will be solved. The author emphasizes the part played by a space observatory in studying various solar phenomena and solar radiation, and points out that a direct study of the sun in the resonant lines of the Lyman series will enable the physical conditions on the sun and adjacent interplanetary space to be determined. There are 2 Soviet-bloc references.

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41270
S/035/62/000/010/013/128
A001/A101

AUTHOR: Fesenkov, V. G.

TITLE: Twilight as a method of studying the atmosphere

PERIODICAL: Referativnyy zhurnal, Astronomiya i Geodeziya, no. 10, 1962, 22-23, abstract 10A199 ("Izv. Astrofiz. in-ta AN KazSSR", 1961, v. 12, 3 - 14, English summary)

TEXT: The author describes his method of singling out the primary twilight by measuring the brightness of twilight sky at two points of the sun's vertical, 70° zenith distant to both sides from the zenith. Assuming a certain system of isophotes for primary twilight, it is possible to calculate the ratio of brightnesses of secondary twilight at the considered points of the sun's vertical using the isophotes of day sky, known from observations, and applying them to individual points of the primary twilight segment. If the brightness at a point in the region of Earth's umbra is measured, where only secondary twilight is effective, then, using the above-mentioned ratio, one can determine the brightness of secondary twilight at the point located at the same zenith distance on the solar side of the vertical. Subtracting the brightness of secondary

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Twilight as a method of studying the atmosphere

twilight, determined in this way, from the observed brightness, it is possible to single out the component of primary twilight which is directly related to optical properties of the atmosphere at high altitudes. The main difficulty of the indicated method consists in the necessity of cumber-some calculations of brightness ratios of secondary twilight. An approximate estimate yields for this ratio the value close to 2.0 at points with 70° zenith distance. The method described is applicable at sufficiently great solar depressions, when primary twilight is absent in the side opposite to the Sun. At small depressions, primary twilight can be singled out by polarization observations of twilight at the pole of the world. As measurements conducted by means of a two-channel polarimeter, designed by the author, have shown, the polarization plane of twilight radiation at the world pole follows exactly the direction of the solar declination circle at depressions less than 5°. (The same pattern takes place for radiation of day sky). This fact is interpreted by the author as an evidence of the circumstance that tropospheric scattering does not produce an additional polarization, but has a depolarizing effect at small solar depressions (less than 5°) and also under daily conditions. This furnishes the possibility of singling out very simply the brightness of first-order twilight using the measured brightness and polarization of twilight radiation. The method described is best applicable to

Twilight as a method of studying the atmosphere

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A001/A101

observations at a point located at 70° zenith distance and 90° angular distance from the Sun. The observations carried out have shown that polarization degree of twilight radiation at the world pole increases after sunset, attaining a maximum at solar depression of 5°, after which it drops rather rapidly. When twilight illumination disappears, polarization degree is negligibly low. There are 6 references.

N. Divari

[Abstracter's note: Complete translation]

Card 3/3

S/503/61/012/000/001/[illegible]
E032/E514

AUTHOR: Fesenkov, V.G.

TITLE: On the conditions of observation of zodiacal light during solar eclipse

SOURCE: Akademiya nauk Kazakhskoy SSR. Astrofizicheskiy institut. Izvestiya. v.12, 1961, 15-20

TEXT: The first part of this paper is concerned with the observation of zodiacal light at small angular distances from the sun. The intensity of zodiacal light at an angular distance ℓ from the sun and a latitude b relative to the plane of the ecliptic is stated to be given by

$$J(b,\ell) = \int_0^\infty \frac{e^{-5\frac{t}{r}\sin b} f(\vartheta)}{r^3}\, dt \qquad (1)$$

where $f(\vartheta)$ is the scattering indicatrix. This function is not known in advance since it depends on the nature of the scattering particles. For example, Ye. V. Pyaskovskaya-Fesenkova (Ref.2: DAN SSSR, v.123, no.6, 1958) has used observations carried out in

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the Libyan Desert to show that

$$f(\vartheta) = 11.1\, e^{-3\vartheta} + 0.9001 \qquad (2)$$

Substitution of this function into Eq.(1) yields the following numerical results

ℓ^o	8.0	11.5	16.2	20.0	23.0	25.8	28.4	30.7	32.8	36.8
J	142.0	66.8	33.2	21.5	15.8	12.3	10.0	8.36	7.19	5.6

It is therefore clear that at an angular distance of 8° from the sun the intensity of zodiacal light may be greater by a factor of 25 than at a distance of 37°. Another method of predicting the intensity of zodiacal light at a small angular distance from the sun is based on the use of a simple interpolation curve connecting the brightness of the solar corona with zodiacal light. It is pointed out that this may lead to an over-estimate of the required intensity, since the corona consists of two components, namely, electrons and dust particles, while zodiacal light is probably due to the dust component only. Another important property of

zodiacal light is its appreciable polarization even in the immediate neighbourhood of the sun. In order to derive the degree of polarization, the scattering indicatrix must be split into two terms.

$$f(\vartheta) = f_1(\vartheta) + f_2(\vartheta)$$

where f_1 and f_2 determine the intensity of light-vibrations in two mutually perpendicular planes, namely, in the plane of scattering and the perpendicular plane. The degree of polarization is then given by

$$p = \frac{\int_e^{\pi} [f_1(\vartheta) - f_2(\vartheta)] \sin\vartheta d\vartheta}{\int_e^{\pi} [f_1(\vartheta) + f_2(\vartheta)] \sin\vartheta d\vartheta} \qquad (3)$$

If one assumes Rayleigh scattering, then

$$f_1(\vartheta) = a \text{ and } f_2(\vartheta) = a\cos^2\vartheta$$