MASHKOVICH, M.D.

AID Nr. 977-11 27 May

DIELECTRIC LOSSES AND THE DIELECTRIC CONSTANT OF SITALS (USSR)

Mashkovich, M. D. Fizika tverdogo tela, v. 5, no. 3, Mar 1963, 843-849.
S/181/63/005/003/021/046

The interrelation between relaxation polarization and the dielectric constant (ε) and loss angle (tan δ) of sitals of the cordierite system was studied in the frequency range from $4 \cdot 10^2$ to $3.7 \cdot 10^{10}$ cps. The sital samples were prepared under varying crystallization conditions (TiO_2 used as crystallization catalyst) and varying degrees of reduction. The experimental data indicate that relaxation polarization is apparently ionic in nature, is due to structural defects, and is much more sharply defined in sitals than in silicate dielectrics, which also have loss components due to the relaxation of weak ionic bonding. The frequency of natural oscillations of the relaxation oscillator was low ($\nu = 10^{10}$ to 10^{11} c p s), probably owing to extremely weak

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AID Nr. 977-11 27 May

DIELECTRIC LOSSES [Cont'd] S/181/63/005/003/021/046

bonding of the relaxation ions with the lattice, or to relaxations not of individual ions but of ion complexes. The character of the frequency and temperature dependence of ε, ε'', and tan δ, as well as the calculated parameters, agree well with Debye formulas. All samples showed a tendency towards a gradual vanishing of the maximum on the curves for tan δ (t,°C) which was even greater for ε'' (t, °C), proceeding from f_{max} in the direction of higher frequencies. It was not possible to determine the type of the relaxation ion. Polycrystalline cordierite samples containing small amounts of impurities do not show a relaxation maximum. With decreasing frequency, tan δ undergoes a monotonic increase up to 10^{-2} at 100 cps. The cordierite phase of the sitals studied may contain ionic impurities or solid solutions which result in a more intensive appearance of relaxation polarization.

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AID Nr. 977-11 27 May

DIELECTRIC LOSSES [Cont'd] S/181/63/005/003/021/046

At frequencies which are much higher than f_{max}, tan δ continues to decrease, and ε_{∞}, as determined from the Cole—Cole diagram, is much greater than ε at [redacted] cps. This may be due to the presence of another component of relaxation polarization. Further research, including detailed structural studies, is needed for a complete analysis of the nature of relaxation polarization. This work was done at the State Scientific Research Institute of Electrotechnical Glass, in Moscow. [EDW]

Card 3/3

L 18573-63 EWT(1)/EWP(q)/EWT(m)/BDS/ES(s)-2 AFFTC/ASD/ESD-3/LIP(C) Pt-4/
ACCESSION NR: AP3001303 Pq-4 WH S/0181/63/005/006/1740/1742

AUTHOR: Mashkovich, M. D. 69

TITLE: Dielectric losses in glass at wave lengths of 8 mm

SOURCE: Fizika tverdogo tela, v. 5, no. 6, 1963, 1740-1742

TOPIC TAGS: dielectric loss, glass, wave length, frequency, Si, B, Al, Ba, Ca, Pb, Na, K, Li, resonance, absorption

ABSTRACT: The author has investigated the temperature dependence of the dielectric constant and dielectric loss for wave lengths of 8 mm in a number of glasses, comparing these results with similar data for wave lengths of 3.2 cm. With increase in frequency, the dielectric constant declines somewhat and the time dependence gradually smooths out. The dielectric loss increases sharply at room temperature, and its rate of increase with temperature proves to be much greater at higher frequencies ($3.7 \cdot 10^{10}$ as compared with 10^{10} cycles). Alkali-free glasses are characterized by no increase in dielectric loss in the temperature interval 0-400C, in contrast to alkali-bearing glasses, which show a marked increase. No specimen of alkali-bearing glass investigated showed a smoothing

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L 18573-63

ACCESSION NR: AP3001303

of the temperature dependence of dielectric loss for 8 mm wave lengths relative to those of 3.2 cm. Curves for these glasses for both wave lengths are practically identical. Lead-bearing glasses show the highest frequency dependence. Curves of dielectric loss in the ultra-high-frequency range apparently represent only the beginning of the absorption band due to elastic ionic vibration in the infrared part of the spectrum. These results may be interpreted on the basis of resonance loss. By assuming that an increase in temperature leads to increased "damping" of resonance absorption and to a corresponding expansion of the absorption curve, one may understand why the temperature dependence of dielectric loss for wave lengths of 8 mm is sharper than for wave lengths of 3.2 cm. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 04Feb63 DATE ACQ: 01Jul63 ENCL: 00

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

Card 2/2

L 21718-65 EWT(d)/EWT(l)/EEC(k)-2/EEC-4/EEC(b)-2/EWA(h) Pn-4/Pe-4/Pq-4/
Pac-4/Pg-4/Peb/Pi-4/Pj-4/Pk-4/Pl-4 ASD(a)-5/AS(mp)-2/AFHD(t)/ESD(gp)/
ACCESSION NR: AP4044691 ESD(ge)/ESD(t)/0120/64/000/004/0176/0179

AUTHOR: Maslkovich, M. D.; Yermilin, K. K.; Rozenberg, N. Yu.

TITLE: Cavity resonator for measuring dielectric characteristics at elevated temperatures and 8-mm wavelength

SOURCE: Pribory i tekhnika eksperimenta, no. 4, 1964, 176-179

TOPIC TAGS: cavity resonator, dielectric characteristic, dielectric loss, dielectric constant, 8 mm wave cavity resonator

ABSTRACT: A silver-plated-brass resonator (see Enclosure 1) is a 23-mm-ID cylinder with a movable bottom (a silver plunger) whose travel is controlled by a micrometer. A Q-measuring unit consisting of 2 amplifiers, an electronic switch, a sawtooth oscillator, and a high-resolution wavemeter measures the loaded Q-factor of the resonator. The empty resonator Q-factor is 18,300 at the 9th half-wavelength point, for $\lambda = 8.13$ mm. Resonator errors are: 1% in

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L 21718-65
ACCESSION NR: AP4044691

measuring ε and $\leq$ 15% in measuring tg δ. Dielectric characteristics of quartz glass, M-7 and Cb-7 high-alumina ceramics, sapphire, and sitall (of cordierite system) measured at 400C are reported. Orig. art. has: 6 figures.

ASSOCIATION: none

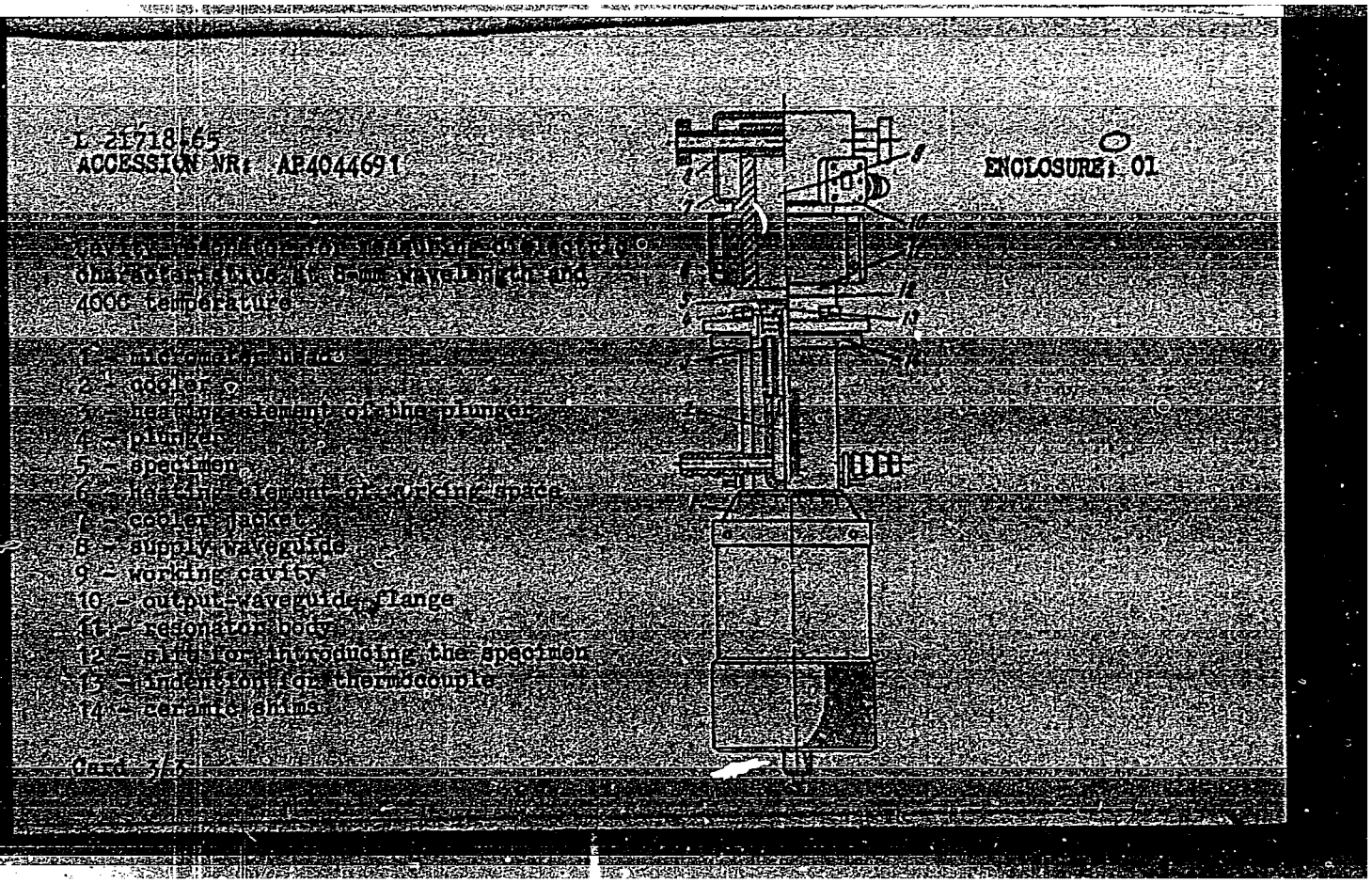
SUBMITTED: 02Sep63 ENCL: 01

SUB CODE: EC NO REF SOV: 006 OTHER: 001

Card 2/2

L 21718-65
ACCESSION NR: AP4044691

ENCLOSURE: 01



Card 2/2

ACCESSION NR: AP4039682 S/0181/64/006/006/1862/1865

AUTHOR: Mashkovich, M. D.

TITLE: Dielectric properties of glass ceramic celsian system

SOURCE: Fizika tverdogo tela, v. 6, no. 6, 1964, 1862-1865

TOPIC TAGS: dielectric property, ceramic material, crystallization temperature, dielectric constant, dielectric loss, temperature dependence, frequency dependence

ABSTRACT: The dielectric properties of glassceramic similar to celsian $BaO \cdot Al_2O_3 \cdot 2SiO_2$ containing TiO_2 as a mineralizer were measured as a function of frequency and crystallization temperature. It was found that according to the changes of the dielectric properties there were three distinct crystallization temperature regions. With increasing crystallization temperature up to ~ 1200C, there was a gradual decrease of tg δ at 10^{10} cps and a more rapid increase at 400 cps. With the transition from glass to glassceramic ε sharply increased, and in the interval 1000-1200C it remained relatively constant. In the second region 1200-1250C there was an almost discontinuous change in the properties, a significant increase in ε, and a sharp decrease in tg δ at 400 cps. In the

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ACCESSION NR: AP4039682

interval 1250-1300C ε and tg δ remained practically constant. Above 1200C there was a gradual increase in the density, as well as a sharp increase of the average crystal dimensions. Detailed investigation showed that the most pronounced dependence of tg δ on frequency and temperature was observed for glassceramic samples crystallized at 1200C. The data for glassceramics of the celsian system were compared with previously obtained data for glassceramics of the cordierite system (M. D. Mashkovich. FTT, 5, 843, 1963). The electron microscopic investigation of the samples was performed by N. M. Vaysfel'd. The samples were prepared by Ye. G. Panasyan under the guidance of L. G. Bayburt. Orig. art. has: 3 diagrams.

ASSOCIATION: Gosudarstvenny"y nauchno-issledovatel'skiy institut elektrovakuumnogo stekla Moscow (State Scientific Research Institute of Electrovacuum Glass)

SUBMITTED: 03Aug63 ENCL: 00

SUB CODE: MT, EM NO REF SOV: 004 OTHER: 000

Card 2/2

L 38532-65 EPA(s)-2/EWT(l)/EWT(m)/EEC(t)/EWP(b)/EWP(e) Pq-4/Pt-10 IJP(c)
GG/WH
ACCESSION NR: AP5005296 S/0181/65/007/002/0524/0529

AUTHOR: Pashkovich, M. D.; Udovenko, N. G. 41 40

TITLE: Dielectric porperties of glasses of the system $MeO-Al_2O_3-SiO_2$ 16 B

SOURCE: Fizika tverdogo tela, v. 7, no. 2, 1965, 524-529

TOPIC TAGS: glass, dielectric property, dielectric constant, dielectric loss angle

ABSTRACT: The dielectric constant and the tangent of the loss angle were measured at frequencies 10^6 and 10^{10} cps in glasses of the system $MeO-Al_2O_3-SiO_2$ (Me = Mg, Ca, Sr, Ba). The SiO_2, Al_2O_3, and MeO contents were 50--70, 12.0--19.5, and 10.5--33.0 molar per cent, respectively. The dielectric properties were measured with a Q-meter at 10^6 cps, and in cylindrical cavity resonators operating in the H_{01} mode at 10^{10} and 3.7×10^{10} cps. The dielectric constant at both frequencies increased

0 meters at 10^6 cps, and in cylindrical cavity resonators operating in the E_{01} mode at 10^{10} and 3.7×10^{10} cps. The dielectric constant at both frequencies increased practically linearly with increasing MgO content. The loss angle remained practically constant for all the glasses at 10^6 cps, except for the magnesium glasses, where the tangent of the loss angle increased linearly with increasing MgO. At 10^{10} cps the variation of the loss angle is more complicated. An analysis of the

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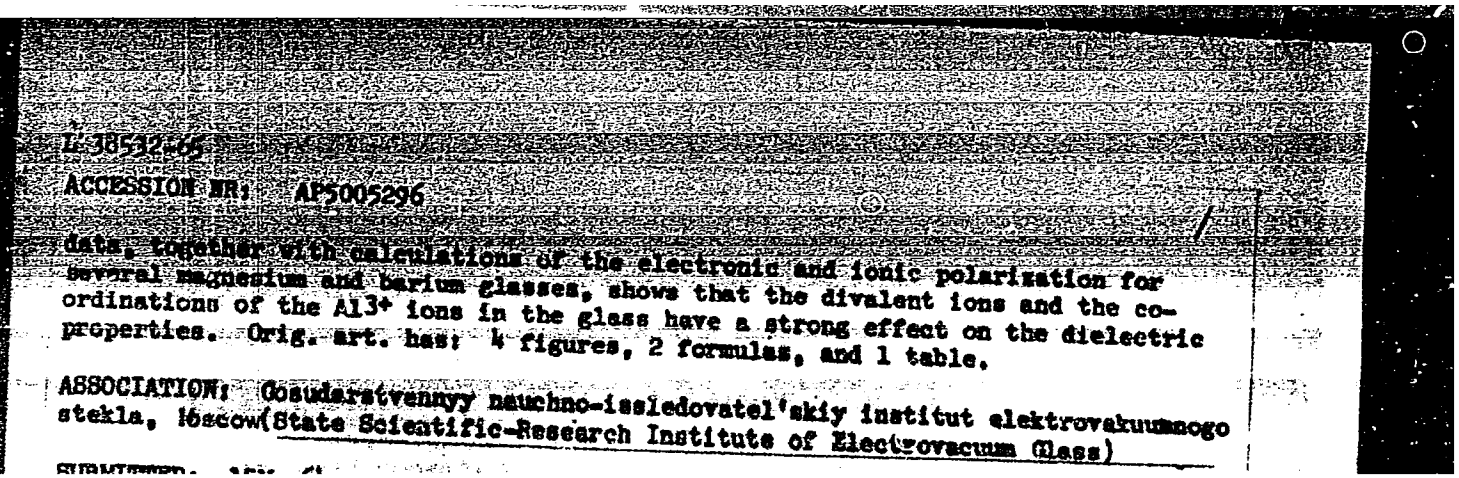
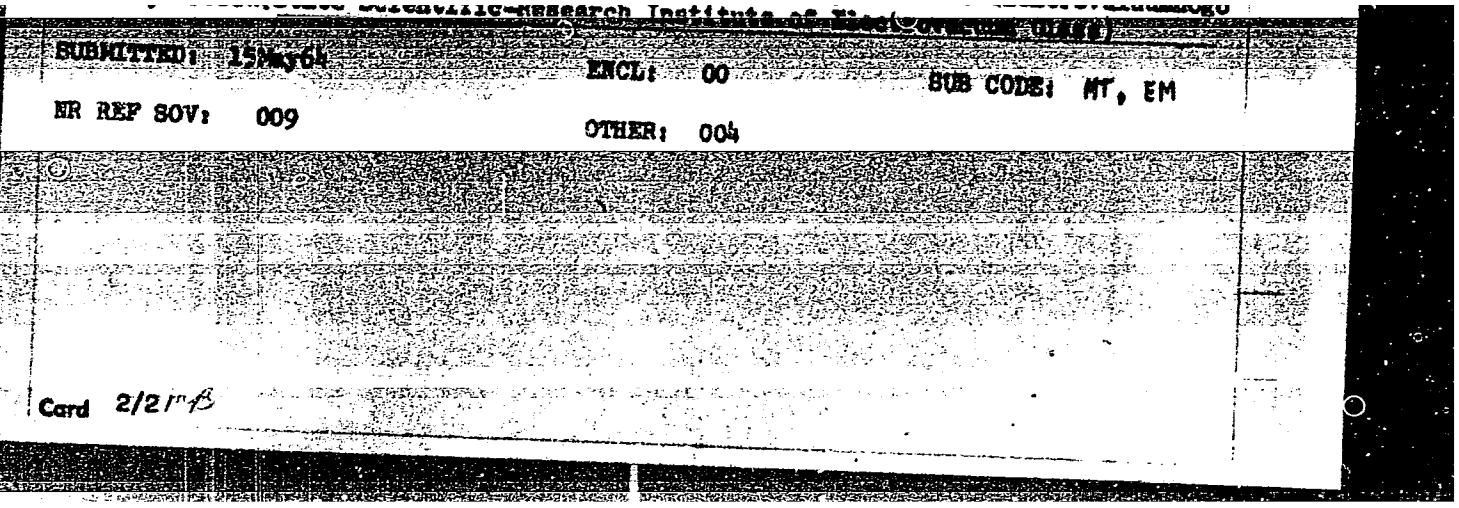


L 38532-66

ACCESSION NR: AP5005296

data, together with calculations of the electronic and ionic polarization for several magnesium and barium glasses, shows that the divalent ions and the coordinations of the Al^{3+} ions in the glass have a strong effect on the dielectric properties. Orig. art. has: 4 figures, 2 formulas, and 1 table.

ASSOCIATION: Gosudarstvennyy nauchno-issledovatel'skiy institut elektrovakuumnogo stekla, Moscow (State Scientific-Research Institute of Electrovacuum Glass)



L 51400-65 EWT(l)/EPA(s)-2/EWT(m)/EWP(e)/EWP(l)/EEC(t)/EWP(b) Pq-4/Pt-7/Pl-
IJP(c) GG/WH

ACCESSION NR: AP5010703 UR/0181/65/007/004/1008/1011

AUTHOR: Pashkovich, M. D.; Smelyanskaya, E. N.

TITLE: Measurement of the dielectric constant and dielectric loss tangent of solids at microwave frequencies at low temperatures

SOURCE: Fizika tverdogo tela, v. 7, no. 4, 1965, 1008-1011

TOPIC TAGS: alkali-free glass, dielectric loss, dielectric constant, solid dielectric, microwave loss

ABSTRACT: Apparatus is described for the measurement of the dielectric constant and the tangent of the dielectric loss angle of a solid dielectric at 3 cm wavelength in the temperature interval 100--300K. The measurements were made by a cavity method at a H_{01} load by determining the change in the Q and in the resonant length of the cavity upon introduction of the sample. The cavity was excited from a type 5I generator through a coupling aperture, and the indicator was a galvanometer. The linear dimensions of the cavity were varied with a micrometric screw and measured with a micrometer scale. Typical results are shown in Fig. 1 of the Enclosure, and indicate that the dielectric losses in alkali-free glasses have a

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L 51400-65

ACCESSION NR: AP5010703

resonant character at microwave frequencies. Orig. art. has: 2 figures and 1 table.

ASSOCIATION: Nauchno-issledovatel'skiy institut elektrovakuumnogo stekla, Moscow (Scientific Research Institute of Electrovacuum Glass)

SUBMITTED: 19Aug64 ENCL: 01 SUB CODE: EM, MT

NR REF SOV: 003 OTHER: 005

Card 2/3

L 51400-65

ACCESSION NR: AP5010703 ENCLOSURE: 01

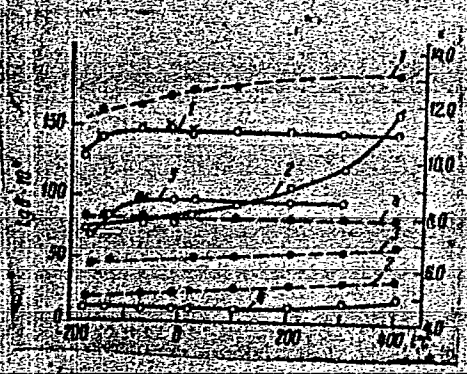

Fig. 1. Dependence of tanδ and ε of glasses on the temperature

1 - Glass 1, 2 - glass S49-2, 3 - glass 2, 4 - pyroceram; solid line - tanδ, dashed - ε

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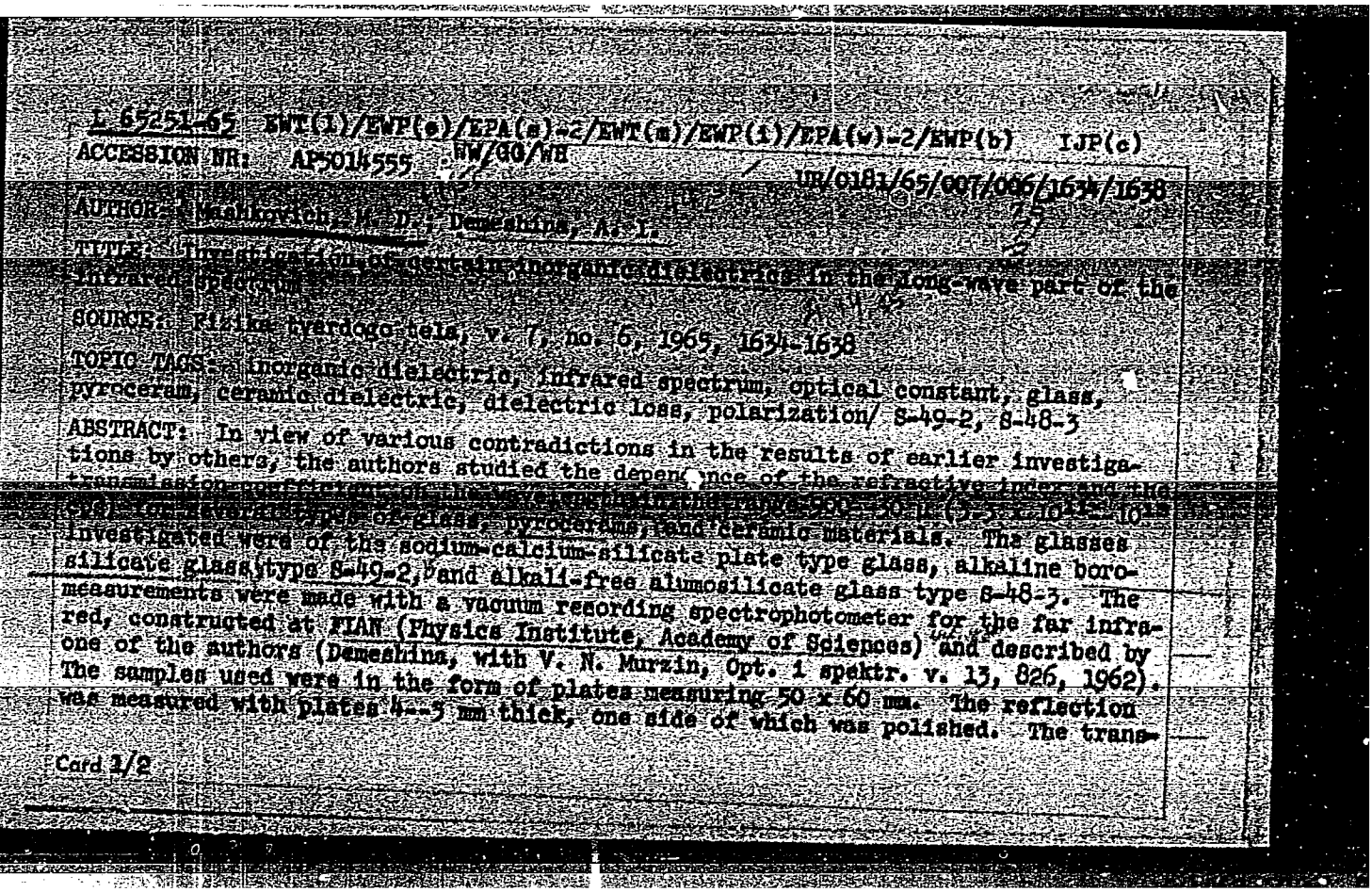

L 65251-65 EWT(l)/EWP(e)/EPA(s)-2/EWT(m)/EWP(l)/EPA(w)-2/EWP(b) IJP(c)
ACCESSION NR: AP5014555 MW/GG/WH UR/0181/65/007/006/1634/1638

AUTHOR: Mashkovich, M. D.; Demeshina, A. I.

TITLE: Investigation of certain inorganic dielectrics in the long-wave part of the infrared spectrum

SOURCE: Fizika tverdogo tela, v. 7, no. 6, 1965, 1634-1638

TOPIC TAGS: inorganic dielectric, infrared spectrum, optical constant, glass, pyroceram, ceramic dielectric, dielectric loss, polarization/ S-49-2, S-48-3

ABSTRACT: In view of various contradictions in the results of earlier investigations by others, the authors studied the dependence of the refractive index and the [illegible] for several types of glass, pyrocerams, and ceramic materials. The glasses investigated were of the sodium-calcium-silicate plate type glass, alkaline borosilicate glass type S-49-2, and alkali-free aluminosilicate glass type S-48-3. The measurements were made with a vacuum recording spectrophotometer for the far infrared, constructed at FIAN (Physics Institute, Academy of Sciences) and described by one of the authors (Demeshina, with V. N. Murzin, Opt. i spektr. v. 13, 826, 1962). The samples used were in the form of plates measuring 50 x 60 mm. The reflection was measured with plates 4--5 mm thick, one side of which was polished. The trans-

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L 65251-65
ACCESSION NR: AP5014555

parency was determined in samples of different thickness ranging from 0.1 to 4.5 mm. The results are presented in the form of plots of the transparency and of the reflection and absorption coefficients against the wavelength. These results, supplemented with data on the dielectric properties at microwave frequencies, are discussed from the point of view of the nature of the dielectric losses. It is deduced from the decrease in the absorption and in the losses at 900--500 μ, and the increase in the losses at microwave frequencies, that in the frequency range 4×10^{10}--3×10^{11} the absorption has at least one maximum, and the nature of this maximum is discussed. Among the mechanisms proposed for the absorption are deformation and elastic ionic polarization, and the relative contributions of these mechanisms are estimated. Orig. art. has: 5 figures and 1 formula.

ASSOCIATION: Gosudarstvennyy nauchno-issledovatel'skiy institut elektrovakuumnogo stekla, Moscow (State Scientific Research Institute of Electrovacuum Glass)

SUBMITTED: 02Nov64 ENCL: 00 SUB CODE: MT, OP

NR REF SOV: 009 OTHER: 009

Card 2/2

MASHKOVICH, M.I.; FIRSOV, A.I.

Heat conductivity of semiprocessed chemical products of wood. Gidrolis. i lesokhim. prom. 16 no.6:22-23 '63. (MIRA 16:10)

1. TSentral'nyy nauchno-issledovatel'skiy i proyektnyy institut lesokhimicheskoy promyshlennosti.

MASHKOVICH, O.N.

Efficient parameters of earthmoving machinery for transportation construction. Transp. stroi. 15 no.4:40-42 Ap '65.
(MIRA 18:6)

1. Zamestitel' rukovoditelya laboratorii TSentral'nogo nauchno-issledovatel'skogo instituta svyazi.

MASHKOVICH, O.M., inzh.

Interchangeable leveling equipment for drag-line excavators. Transp. stroi. 10 no.9:30-32 S '60. (MIRA 13:9)
(Excavating machinery--Equipment and supplies)

MASHKOVICH, O.N., inzh.

Trench digger on the ETU-353 excavator. Transp. stroi. 12 no.2:33-35 F '62. (MIRA 15:7)

(Excavating machinery)

FEDOROV, D.I., kand.tekhn.nauk; MASHKOVICH, O.N., inzh.

Introduce continuous-action earth-working machinery into construction for the transportation industry. Transp. stroi. 12 no.5:12-16 My '62. (MIRA 15:6)
(Excavating machinery)

FEDOROV, D.I.; SHUBIN, M.A.; NEDOREZOV, I.A.; MASHKOVICH, O.N.; LUR'YE, G.K.

Basis for the prospective typification of earthmoving machines in the construction of transportation systems. Transp. stroi. 15 no.9:43-45 S '65. (MIRA 18:11)

1. Vsesoyuznyy nauchno-issledovatel'skiy institut transportnogo stroitel'stva.

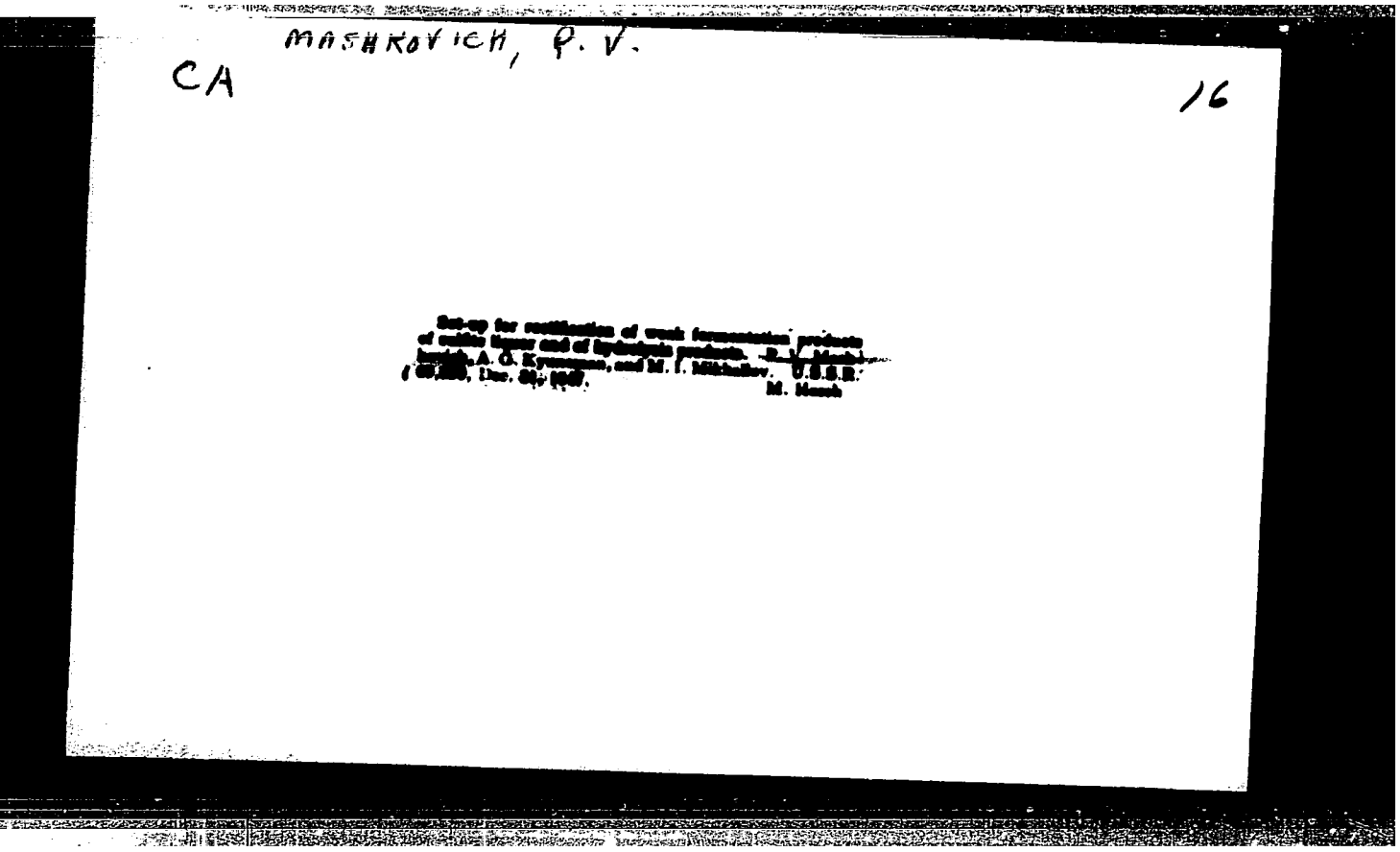
TROYANOVSKIY, A.V.; MASHKOVICH, P.S., inzhener, retsenzent; KOLDASHOV, V.A., redaktor; MAUMOV, V.I., redaktor; MIKHAYLOVA, V.V., tekhnicheskiy redaktor.

[Economizing on electric energy in the electrolysis of zinc and copper; basic electric characteristics of the processes and electric equipment used] Ekonomiia elektroenergii pri elektrolize tsinka i medi; osnovnye elektricheskie kharakteristiki protsessov i elektrooborudovaniia. Moskva, Gos. nauchno-tekhnicheskoe izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1954. 166 p. (MLRA 8:1)
(Electrolysis) (Zinc--Electrometallurgy) (Copper--Electrometallurgy)

MASHKOVICH, P. V.

CA

16



MASHKOVICH, P. V.

4 Oct 1947

"132. Concerning the Membership of the Collegium of the Main Administration of Hydrolytic and Sulphite-Alcohol Industry of the Soviet of Ministers of the USSR" 1 p

"Sobraniye Postanovleniy Sovmin SSSR" No 7

Decree No 2999, 26 Aug 1947, calls for the confirmation of the collegium of the Main Administration of Hydrolytic and Sulphite-Alcohol Industry of the Soviet of Ministers composed of: V. S. Chayenkov, P. V. Grigor'yev, S. V. Chapigo, V. Ya. Leontkin, and P. V. Mashkovich.

LC 10089

Mashkovich, S. A.

8.11-166 551.513:551.501.7

Bykov, V. V. and Mashkovich, S. A. O kharakteristike zonal'noi tsirkuliatsii atmosfery. [Characteristics of the zonal circulation of the atmosphere.] *Meteorologiia i Gidrologiia*, Leningrad, No. 2:3-9, Feb. 1956. 3 figs., 6 tables, 8 refs., 4 eqs. DWB, DLC—The author develops an expression in which the index of zonal circulation is represented physically as the angular velocity of rotation of the atmosphere related to the earth and describes a procedure for calculating the index of zonal circulation and also for describing the velocity of west-east transport over any part of the Northern Hemisphere. Tables and graphs are presented giving the mean monthly values of the index of zonal circulation at 500 mb and 700 mb surface for each of six years, mean monthly index of zonal circulation at levels of 500, 700 and 1000 mb, and at different altitudes and the seasonal values of the index of circulation at different levels. The greatest intensity of zonal circulation is at the level between 10 and 13 km. West-east transport constitutes the predominant condition of the atmosphere at 19 km height during the cold season, while during the summer an opposite zonal circulation prevails. The annual variation of the zonal circulation is similar at all levels in the troposphere and lower stratosphere. *Subject Headings:* 1. Zonal circulation 2. Zonal index.—*I.L.D.*

MASHKOVICH, S.A.

Seasonal changes of jet streams. Meteor.i gidrol.no.6:14-21 Je '56.
(Atmosphere) (MLRA 9:9)

SOV/124-57-7-8035

Translation from: Referativnyy zhurnal. Mekhanika, 1957, Nr 7, p 85 (USSR)

AUTHOR: Mashkovich, S. A.

TITLE: Concerning the Problem of Calculating Vertical Currents in the Atmosphere (K voprosu o raschete vertikal'nykh tokov v atmosfere)

PERIODICAL: Tr. Tsentr. in-ta prognozov, 1956, Nr 43 (70), pp 29-33

ABSTRACT: To determine a vertical velocity in the atmosphere the author uses the vorticity equation, writing it in terms of the spherical coordinates

$$\frac{\partial \zeta}{\partial t} + \frac{v_\vartheta}{a}\frac{\partial \zeta}{\partial \vartheta} + \frac{v_\lambda}{a \sin \vartheta}\frac{\partial \zeta}{\partial \lambda} - \frac{2\omega \sin \vartheta}{a} v_\vartheta = \frac{2\omega \cos \vartheta}{\rho}\frac{\partial \rho w}{\partial z} \quad (1)$$

wherein: ζ is the vertical vorticity component; v_ϑ, v_λ, and w are the velocity components along the axes ϑ, λ, and z, respectively; t is the time; ρ is the density; ω is the angular velocity of rotation of the earth; and a is the earth's radius. In evolving his formula for the calculation of a vertical velocity the author makes the following assumptions: 1) The air temperature in the troposphere decreases linearly with increasing altitude, but remains uniform throughout the

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Concerning the Problem of Calculating Vertical Currents in the Atmosphere

thickness of the stratosphere; 2) the vertical velocity in the friction layer is determined from the surface-pressure field, i. e., is found by means of the well-known A. F. Dyubyuk formula [Dyubyuk, A. F., K vychisleniyu vertikal'nykh skorostey po polyu davleniya (On the Calculation of the Vertical Velocities From the Pressure Field). Tr. NIU GUGMS, ser. II, 1947, Nr 24]. A working equation for calculation of the vertical velocity (in mm/sec) at the H = 5 km level is adduced by the author in the following form:

$$w|_{z=H} = 0.70\, w_h + 0.79 \times 10^{-5} \Delta(\phi, \bar{\phi}) + 2.51 \times 10^{-6} [(\bar{\phi}, \Delta\phi) + (\phi, \Delta\bar{\phi})] - \quad (2)$$

$$- 2.84 \times 10^{-4} \frac{\partial \bar{\phi}}{\partial \lambda} - 1.53 \times 10^{-4} (\bar{\phi}, \Delta\bar{\phi})$$

wherein ϕ and $\bar{\phi}$ designate, respectively, the elevation of the 500-mb constant-pressure surface and the thickness of the 500-to-1000-mb constant-pressure-difference interval, w_h is the vertical velocity at the upper boundary of the friction layer h, and wherein, in the calculation of the corresponding Jacobians (which is done by the method of finite differences), the unit of length adopted is 1,000 km. An example is adduced of calculation of a vertical velocity, wherein the calculated ascending

SOV/124-57-7-8035

Concerning the Problem of Calculating Vertical Currents in the Atmosphere

motions of the air are compared with the observed positions of actual precipitation areas.

V. V. Bykov

Card 3/3

Mashkovich, S. A.

AUTHOR: Mashkovich, S. A.

TITLE: Forecasting of Terrestrial Pressure by Means of Rapid Electronic Computers (Prognoz nazemnogo davleniya s pomoshch'yu bystrodeystvuyushchikh elektronnykh vychislitel'nykh mashin)

PERIODICAL: Meteorologiya i Gidrologiya, 1957, Nr 1, pp 8-18 (U.S.S.R.)

ABSTRACT: Report is devoted to the problem of forecasting the pressure at sea level by the utilization of high speed computers. The application of the Fridman equation which describes the changes in vertical component of the velocity vortex in a given part of the air and the Green function which is expressed through elementary transcendental functions, is explained. In order to compute the pressure, it is necessary to know the condition of the atmosphere in the entire space. The solution of the problem through the utilization of data for several (four or five) atmospheric levels can be obtained by the BESM computer but the calculations in this case would be very complicated and time-consuming. For this purpose, the author employed a much simpler and quite reliable model of polytropic atmosphere. In a polytropic atmosphere, the geopotential height of any isobaric surface is expressed through the geopotentials of two arbitrary selected surfaces, consequently it is possible to operate with geopotentials of only two isobaric surfaces. The evening of Oct. 13, 1954 was used as an example for the forecasting.

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Forecasting of Terrestrial Pressure by Means of Rapid Electronic Computers

Basic terrestrial pressure charts are shown in Figs.2a and 2b resp. The actual terrestrial pressure chart for evening of 10/14 is shown in Fig.2v. The synoptic processes for the given period are explained by the rapid shift of the cyclone from the North Sea region toward Finland and its consolidation with the great depression existing in that region. The entire calculation including printing of results took 40 minutes of work of the BESM computer. It is pointed out that improper selection of a certain δt value may result in mathematical instability, the solution loses its physical aspect and the process will be described incorrectly. A comparison of manual calculating methods with that of modern computers showed the great advantage of the latter.
12 Charts.

ASSOCIATION:

PRESENTED BY:

SUBMITTED:

AVAILABLE:

Card 2/2

SOV/124-58-11-12786

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 11, p 123 (USSR)

AUTHOR: Mashkovich, S. A.

TITLE: Contribution to the Consideration of the Effect of the Nonlinear Terms in Short-range Pressure and Temperature Forecasting Equations (K uchetu effekta nelineynykh chlenov uravneniy pri reshenii zadachi o prognoze davleniya i temperatury maloy zablagovremennosti)

PERIODICAL: Tr. Tsentr. in-ta prognozov, 1957, Nr 60, pp 22-31

ABSTRACT: Several methods are offered for the approximate solution of the nonlinear equations for the forecasting of metorological elements. In particular, the author examines the solution of the problem of the forecasting of the pressure at the "mid-level" of the atmosphere [i. e., that level at which thermal advection does not result in pressure changes; generally close to the 700-mb level. Transl. Ed. Note] over the northern hemisphere. Here the author follows Ye. N. Blinova who employs the equation of the transfer of vorticity on a spherical Earth for the solution of this problem. The solution of the linearized equation (linearized with respect to the zonal motion) of the vorticity is obtained in the form of a series of spherical

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Contribution to the Consideration of the Effect of the Nonlinear Terms (cont.) SOV/124-58-11-12786

functions with coefficients determined from the initial values of the stream function ψ

$$\psi_1 = \sum_{n,m} C_n^m \sin(\sigma_n^m t + m\lambda + \phi_n^m) P_n (\cos\theta) \qquad (1)$$

where

$$\sigma_n^m = \frac{2(a+\omega)}{n(n+1)} m - a m$$

This equation, it is proposed, is now to be refined with the aid of corrections pertaining to the nonlinearity of the vorticity equation. One of the proposed methods for the determination of the corrections ψ_2 consists of the following steps. The nonlinear terms of the vorticity equation (which are disregarded in the linearized approximation) are placed on the right side of the equation. In these components the desired function ψ is replaced by the solution of the linearized equation as provided by the series (1). The product of series obtained is transformed into a series in terms of spherical functions. As a result the problem reduces to the

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Contribution to the Consideration of the Effect of the Nonlinear Terms (cont.)

solution of a nonhomogeneous linear equation with a known right-hand side. The right-hand side is found in the form of the sum of paired products of the coefficients of the initial field of ψ. Yet another method for the solution of the equation for the nonlinear corrections is proposed. More specifically, the nonlinear combination of the derivatives of ψ with respect to the coordinates, which has been placed into the right-hand side of the equation, is not re-expanded into a series with spherical functions, but is considered as a time function Φ that is known from the results of the linear solution. The values of that function at various points of the map can be determined from the field of the stream function computed in the linear approximation, for example, by means of numerical differentiation. Furthermore, the function Φ can be represented in the form of a series in terms of spherical functions with coefficients that are functions of the time t. A nonhomogeneous equation is obtained for the determination of the nonlinear correction ψ_2. Its solution can be expressed, in particular, by means of an integral containing the influence function

$$\psi_2 = -\int_0^t \int_0^{2\pi} \int_0^{\pi} G(\theta', \lambda-\lambda', t-\tau)\, \Phi(\theta', \lambda', \tau)\, d\theta'\, d\lambda'\, d\tau \qquad (2)$$

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Contribution to the Consideration of the Effect of the Nonlinear Terms (cont.)

where

$$G = \sum_n \frac{2n+1}{4\pi n(n+1)} \sin\theta' \, P_n(\cos\gamma_n)$$

$$\cos\gamma_n = \sin\theta \sin\theta' \cos[\sigma_n(t-\tau) + (\lambda-\lambda')] + \cos\theta\cos\theta'$$

$$\sigma = \frac{2a+\omega}{n(n+1)} - a$$

(The method of the solution of the vorticity equation by means of the influence function was proposed by Ye. N. Blinova. In particular, she reduced the solution (1) of the linearized vorticity equation to that form). The computation of the higher-order (third) derivatives of ψ for the determination of Φ can be replaced by the computation of the first derivatives. For that purpose solution (2) is transformed accordingly by means of bi-quadratic integration by parts. Thereupon we obtain a new set of influence functions which contain second-order derivatives of G. Application of the given method has afforded a refinement of the forecasts

Contribution to the Consideration of the Effect of the Nonlinear Terms (cont.)

obtained within the framework of linear theory. In conclusion an examination is performed of the numerical solution of the nonlinear dynamics of the atmosphere (short-range forecasting) without preliminary linearization. Here the forecasting problem is solved in a quasigeostrophic approximation on a "flat" Earth. The atmosphere is considered to be polytropic. The solution of the corresponding system of equations of the partial first derivative of the geopotential with respect to time $\partial H/\partial t$ is taken in the form proposed by N. I. Buleyev and G. I. Marchuk, namely, in the form of space integrals containing the temperature advection and vorticity advection multiplied by the corresponding Green functions. The polytropy hypothesis here permits expressing the pressure and temperature throughout the entire space in terms of the pressures at two reference levels. As a result the expression for $\partial H/\partial t$ reduces to a surface integral evaluated over the two reference levels. The 500-mb and 1,000-mb levels are selected for that purpose. The basic data are taken from these two levels and the forecast of H is obtained for the same two levels. The integration interval with respect to time is divided into a number of steps δt. The geopotential H in the time function is found by Euler's method (method of tangents) provided the values of $\partial H/\partial t$ can be computed for any desired moment. In the computation of the derivatives and integrals with respect to the horizontal

Contribution to the Consideration of the Effect of the Nonlinear Terms (cont.)

coordinates x and y, corresponding difference approximations are introduced. The programming for the high-speed electronic computer is set up for the solution of the problem. The computer yields a 24-hour forecast of the sea-level altitudes of the 500-mb and 1,000-mb surfaces for Europe and Western Siberia in about 40 minutes.

S. L. Belousov

Card 6/6

SOV/124-58-11-12788

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 11, p 124 (USSR)

AUTHORS: Mashkovich, S. A., Kheyfets, Ya. M.

TITLE: Operational Forecasting Experience Relative to the Mean Monthly Surface-temperature Anomaly Using the Method of Ye. N. Blinova (Opyt sostavleniya operativnykh prognozov srednemesyachnoy anomalii nazemnoy temperatury po metodu Ye. N. Blinovoy)

PERIODICAL: Tr. Tsentr. in-ta prognozov, 1957, Nr 60, pp 37-43

ABSTRACT: The authors adduce the results of the compilation of operational forecasts relative to the mean monthly surface-temperature anomaly according to the method of Ye. N. Blinova. The calculations were performed on electric "Mercedes-Euklid" calculating machines. The fundamental forecasting equation for the nonzonal and nonstationary portions of the temperature has the form

$$\left(\frac{\partial}{\partial t} + a\frac{\partial}{\partial \lambda}\right) T - \frac{k''}{a^2}\Delta T - \frac{\partial}{\partial z}\left(k' \frac{\partial T}{\partial z}\right) = \frac{1}{a^2 \sin\theta} \frac{d\overline{T}}{d\theta} \frac{\partial \psi}{\partial \lambda}$$

Here T and ψ are the nonzonal, nonstationary portions of the temperature and stream functions, respectively; t is the time,

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Operational Forecasting Experience Relative to the Mean Monthly (cont.)

λ is the longitude of the locality; ϕ is the geographic latitude; $\theta = 0.5\pi - \phi$; a is the radius of the Earth; z is the vertical coordinate; Δ is the twodimensional Laplace operator in spherical coordinates; k' is the turbulent thermal diffusivity coefficient in the vertical direction; k'' is the horizontal large-scale mixing coefficient; ω is the relative angular velocity of the atmosphere relative to the Earth; $\overline{T}$ is the zonal temperature, assumed to be given by the formula $\overline{T} = T_0 + M \sin^2 \theta$; T_0 is the temperature at the pole; and M is the temperature difference between the pole and the equator. The following initial and boundary conditions were assumed in the solution of the problem: At the starting moment the temperature is to be a known function of the coordinates θ, λ, and z. At the ground surface the condition of heat balance is fulfilled. Here the nonstationary portion of the temperature of the underlying surface is determined separately from the equation of heat conductivity, assuming that it is known at the starting moment. In addition it is assumed that the temperature varies continuously in the transition from the soil into the atmosphere. (The process is assumed to be a steady-state one). The forecasting formula for the prognostic computation of the mean monthly surface-temperature anomaly proposed by Ye. N. Blinova has the following appearance

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Operational Forecasting Experience Relative to the Mean Monthly (cont.)

$$\tilde{T} = \frac{2M}{a^2(\alpha+\omega)} \Sigma [a_m(\theta) \cos m\lambda + b_m(\theta) \sin m\lambda]$$

where

$$a_m(\theta) = \Sigma C_n^m Z_{1n}^m(\theta) - D_n^m Z_{2n}^m(\theta), \quad b_m(\theta) = \Sigma D_n^m Z_{1n}^m(\theta) - C_n^m Z_{2n}^m(\theta).$$

Here $\omega = 7.20 \times 10^{-5}$ sec^{-1} is the angular velocity of the rotation of the Earth; C_n^m and D_n^m are determined by means of the coefficient of the expansion of the initial field of altitudes of the 500-mb surface; and $Z_{1n}^m(\theta)$ are certain standard functions that contain as parameters the circulation index (α/ω) and other constants which characterize the physical properties of the soil and the air. Using this method, starting in 1952, the Dynamic Meteorology Section of the Tsentral'nyy institut prognosov (Central Forecasting Institute) has prepared forecasts of the mean monthly surface temperature for the Eurasian land mass. The solution obtained in the referenced work depends essentially on the circulation index which is variable both in space and in time; that quantity must be obtained first. Just how great the importance of the correct determination of that parameter is has been shown by computations in which the values of the actual circulation

Operational Forecasting Experience Relative to the Mean Monthly (cont.)

index were used. The attached tabulation shows the results of computations for 1952, 1953, 1954, and 1955. The operational forecast verification of the mean monthly surface temperature over the territory of the USSR (in percent) is shown as follows: I, Long-range Forecasting Section; II, Dynamic Meteorology Section; III, Dynamic Meteorology Section utilizing the actual circulation index.

Year	1952	1953	1954	1955	Four-year Mean
I	74.0	74.4	77.7	71.8	74.5
II	76.2	72.0	78.4	77.0	75.0
III	83.8	80.3	82.3	80.1	81.5

Sh. A. Musayelyan

Card 4/4

MASHKOVICH, S.A

PA - 2098

AUTHOR: MAŠKOVIČ, S.A.

TITLE: On the Numerical Prediction of Atmospheric Pressure by Means of a High Speed Electronic Computer. (O prognoze atmosfernogo davlenija s pomošč'ju bystrodejstbyjuščich elektronnych vyčislitelnych masin, Russian)

PERIODICAL: Doklady Akademii Nauk SSSR, 1957, Vol 112, Nr 2, pp 245-248 (U.S.S.R.)

Received: 3 / 1957 Reviewed: 4 / 1957

ABSTRACT: The investigations carried out by I.A.KIBEL', N.I.BULEEV, G.I.MARCUK et al. permit the formulation of the problem of the short-term prognosis of meteorological elements. However, before the production of high-speed computers the methods of solving this problem could not be employed. The present work describes a method based upon the use of modern computing devices. The problem of the short-term prognosis of meteorological elements above the "plane" earth can be reduced to the solution of a system of 4 equations, which have the following significance and by which the following is described: a) The change of the vertical component of the rotation of velocity in a given part (domain ?) of the air, b) An adiabatic process is investigated, c) A formula for geotrophic wind. The equations are obtained by a simplification of the equations of motion, d) The static equation permits the elimination of temperature

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On the Numerical Prediction of Atmospheric Pressure by Means of a High Speed Electronic Computer.

from the equation b). After some further transformations the following equation is obtained for H:

$$\frac{\partial}{\partial \zeta}\left(\zeta \frac{\partial^2 H}{\partial t}\right) + \frac{c^2 \partial \Delta H}{l^2 \partial t} = \frac{c^2}{l^2}\left[\frac{1}{l}(H, \Delta H) + \beta \frac{\partial H}{\partial x}\right] - \frac{1}{l}\frac{\partial}{\partial \zeta}\left[\zeta^2 (H, \frac{\partial H}{\partial \zeta})\right]$$

The following basic conditions are taken into account: 1) Vertical velocity on the surface of the earth is equal to zero. 2) On the upper boundary the flow of the mass in vertical direction is equal to zero. 3) A solution which is limited at $\sqrt{x^2+y^2} \to \infty$ is sought. When solving the above equation $\partial H/\partial t$ is selected as the required function and the derivations of H according to the coordinates are considered to be known. The problem is then reduced to the solution of an elliptical equation with the aforementioned boundary conditions. From the value of H which is valid for the time t the value for $t+\delta t$ can then be found.

The author based the prognosis-scheme worked out by him upon this method of computation. In this way the problem can be

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On the Numerical Prediction of Atmospheric Pressure by Means of a High Speed Electronic Computer.

solved only by means of high-speed computers. The author selected the machine of the BESM (= ?) of the Academy of Sciences. Two further simplifications were assumed: 1) The model of the polytropic atmosphere, 2) Only the data for Europe and Northern Siberia were used. After some trial computations δT = 22,5 min was selected. The computing time necessary for "one period of time" δt amounts to 35 sec and the time needed for the computation of a prognosis for 24 hours is 40 minutes including the introduction of data and printing of results. In the case of a forecast actually carried out a cyclon was, e.g. correctly predicted.

ASSOCIATION: Not given
PRESENTED BY:
SUBMITTED:
AVAILABLE: Library of Congress

Card 3/3

MASHKOVICH, S. A.

3(7) PHASE I BOOK EXPLOITATION SOV/2115

Tsentral'nyy institut prognozov

Voprosy dinamicheskoy meteorologii (Problems of Dynamic Meteorology) Moscow, Gidrometeoizdat (Otd-niye), 1958. 110 p. (Series: Its: Trudy, vyp. 78) 1,300 copies printed.

Sponsoring Agency: USSR. Glavnoye upravleniye gidrometeorologicheskoy sluzhby.

Resp. Ed.: Ya. M. Kheyfets; Ed.: Yu. V. Vlasova; Tech. Ed.: I.M. Zarkh.

PURPOSE: This collection of articles is intended for research workers in dynamic meteorology. It may also be of interest to advanced students in the field.

COVERAGE: These articles deal with hydrodynamic methods of a short-range forecasting of meteorologic elements, the theory of climate,

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Problems of Dynamic Meteorology

and questions of general atmospheric circulation. The article by by S.A. Mashkovich discusses the formation and retention of zonal circulation heat under the influence of the incoming solar heat for given albedo values of the earth's surface. Ye.M. Dobryshman presents a linear theory for long-term humidity forecasting. S.L. Belousov explains the errors occuring in solving forecasting problems for a mean atmospheric level by replacing differential equations with difference equations. V.V. Bykov offers a solution of the spatial problem in forecasting meteorologic elements assuming quasi-solenoidal motion. V.P. Sadokov presents a forecasting method (a spatial problem) adapted for a fast electronic computer. There are 47 references: 30 Soviet, 13 English, and 4 German.

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Problems of Dynamic Meteorology

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8-13-59

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3 (7)
AUTHOR: Mashkovich, S. A. SOV/50-59-3-23/24

TITLE: All-Union Conference on the Theory of Pressure Variation and of Processes of Cyclo- and Anticyclogenesis (Vsesoyuznoye soveshchaniye po teorii izmeneniya davleniya i protsessov tsiklo- i antitsiklogeneza)

PERIODICAL: Meteorologiya i gidrologiya, 1959, Nr 3, pp 63 - 64 (USSR)

ABSTRACT: The All-Union Conference dealing with problems arising from the theory of atmospheric pressure variation and of processes of cyclo- and anticyclogenesis was held in Moscow in December 1958. The Conference had been organized by the Tsentral'nyy institut prognozov (Central Forecasting Institute). It was attended by delegates of the following organizations: Gidrometeosluzhba SSSR (Hydrometeorological Service of the USSR), Institut fiziki atmosfery AN SSSR (Institute for Atmospheric Physics of the AS USSR), Moskovskiy gosudarstvennyy universitet (Moscow State University), Leningradskiy gidrometeorologicheskiy institut (Leningrad Hydrometeorological Institute), et al. A total of 30 lectures was heard, most of them being devoted to hydrodynamic forecasting methods, some of these combined with the use of electro-

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nic computers. The problems discussed were essentially the following: 1) Pressure forecast in the middle troposphere by the aid of a barotropic model; 2) Forecasting of pressure areas on various levels (different variants of the baroclinic model); 3) The influence deriving from the circumstance that observation data and artificial limit conditions are not elucidated upon the accuracy of the forecast; 4) Consideration of the circumstance, when making the forecast, that the wind is not geostrophic; 5) Forecast of the evolution of baric formations and local pressure variation under consideration of wind data; 6) Forecast of the baric zone according to various graphic methods; 7) Forecast of the baric zone at various atmospheric levels by the aid of empirical functions of the influence; 8) Investigation results concerning various synoptic methods of forecasting the shift and evolution of baric formations; 9) Elaboration of methods of objective analysis (by the aid of machines) of observation data; 10) Methods of analytical representation of meteorological zones; 11) Qualitative analysis of local pressure variations by the aid of various theoretical schemes.

All-Union Conference on the Theory of Pressure Variation and of Processes of Cyclo- and Anticyclogenesis SOV/50-59-3-23/24

Investigations in the field of numerical forecasting methods are stated as having expanded and a certain success in this regard is noted. Some of the success made in the field of the hydrodynamic forecasting methods is due to the application of modern high-speed computers. The Conference decided to set up within the shortest time a meteorological computing center at the GUGMS. It also recommended to intensify research work by the application of synoptic methods.

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MASHKOVICH, S.A.

3(7) PHASE I BOOK EXPLOITATION SOV/2592

Moscow. Tsentral'nyy institut prognozov

Voprosy dinamicheskoy meteorologii (Problems in Dynamic Meteorology) Moscow, Gidrometeoizdat, 1959. 69 p. (Series: Its Trudy, vyp. 86) Errata slip inserted. 900 copies printed.

Sponsoring Agency: Glavnoye upravleniye gidrometeorologicheskoy sluzhby pri Sovete Ministrov SSSR.

Ed. (Title page): S. A. Mashkovich; Ed. (Inside book): L. V. Blinnikov; Tech. Ed.: I. M. Zarkh.

PURPOSE: This issue of the Institute's Transactions is intended for specialists working in the field of dynamic and synoptic meteorology.

COVERAGE: This collection of articles treat problems of short-range weather forecasting using the methods of dynamic meteorology. The use of an electronic computing machine "Pogoda" in short-range(36 hours) forecasting of pressure fields at sea level and at 300 mb is described. The programming and coding system are discussed in some detail. The author concludes that the forecasting accuracy of the method he describes is on a par with

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Problems in Dynamic Meteorology (Cont.) SOV/2592

corresponding statistical techniques used in non-Soviet countries. References accompany each article.

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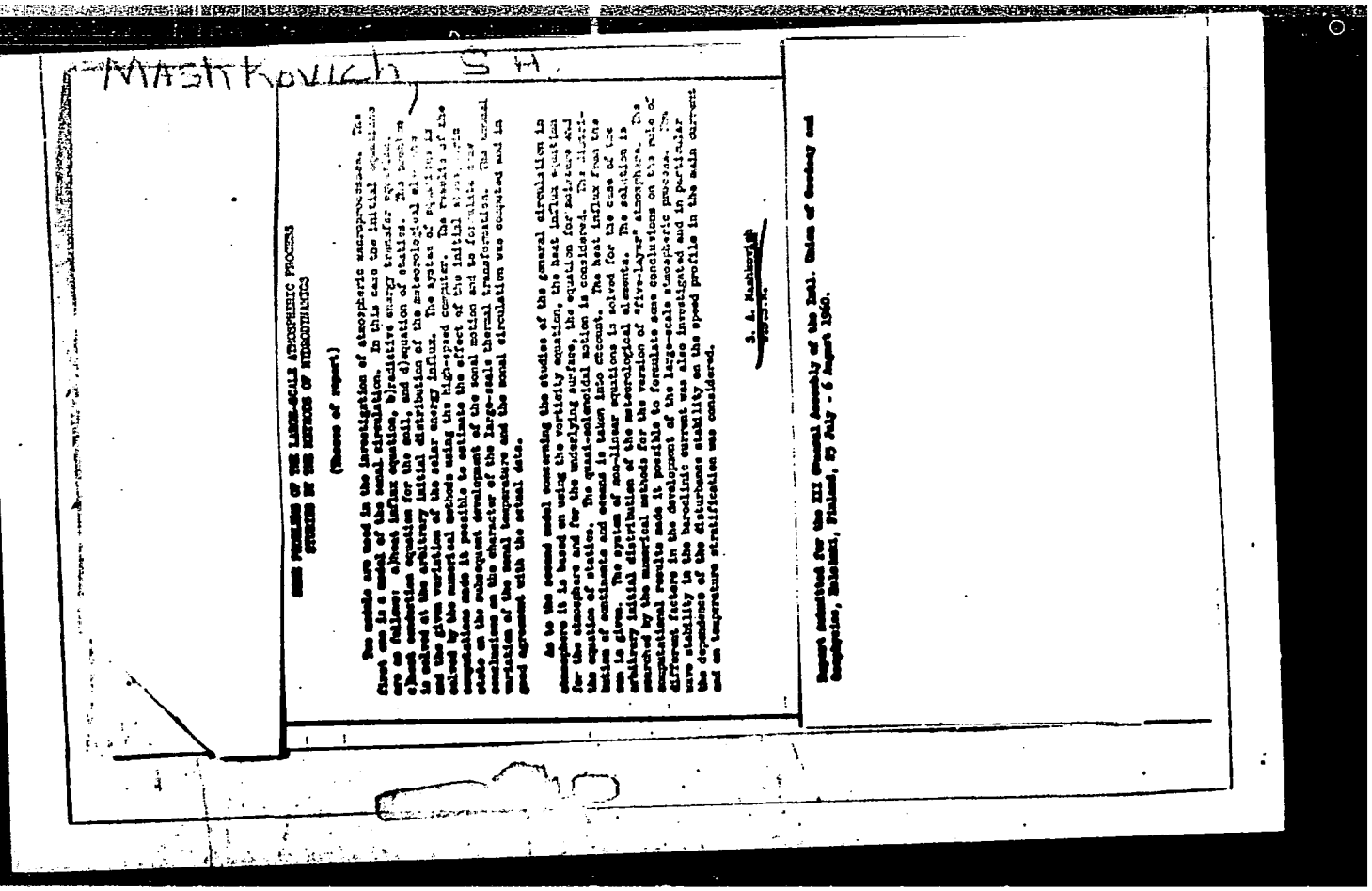

MASHKOVICH, S.A.

SOME PROBLEMS OF THE LARGE-SCALE ATMOSPHERIC PROCESS
STUDIES BY THE METHODS OF HYDRODYNAMICS

(Theses of report)

The models now used in the investigation of atmospheric macroprocesses. The first one is a model of the zonal circulation. In this case the initial equations are as follows: a heat influx equation, a predictive energy transfer equation, a [illegible] equation for the soil, and a equation of statics. The zonal [illegible] is solved at the arbitrary initial distribution of the meteorological elements and the given variation of the solar energy influx. The system of equations is solved by the numerical methods using the high-speed computer. The results of the computations made it possible to estimate the effect of the initial [illegible] made on the subsequent development of the zonal motion and to formulate some conclusions on the character of the large-scale thermal transformation. The zonal variation of the zonal temperature and the zonal circulation was compared and in good agreement with the actual data.

As to the second model concerning the studies of the general circulation in atmosphere it is based on using the vorticity equation, the heat influx equation for the atmosphere and for the underlying surface, the equation for moisture and the equation of statics. The quasi-zonoidal motion is considered. The distribution of continents and oceans is taken into account. The heat influx from the sun is given. The system of non-linear equations is solved for the case of the arbitrary initial distribution of the meteorological elements. The solution is searched by the numerical methods for the version of "five-layer" atmosphere. The computational results made it possible to formulate some conclusions on the role of different factors in the development of the large-scale atmospheric processes. The more stability in the meridional current was also investigated and in particular the dependence of the disturbance stability on the speed profile in the main current and on temperature stratification was considered.

S. A. Mashkovich
(Moscow)

Report submitted for the III General Assembly of the Int. Union of Geodesy and Geophysics, Helsinki, Finland, 25 July - 6 August 1960.

3,5140

S/169/62/000/001/059/083
D228/D302

AUTHORS: Mashkovich, S. A. and Kheyfets, Ya. M.

TITLE: The theory of long-term forecasting with allowance for the atmosphere's vertical stratification and turbulent mixing

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 1, 1962, 57, abstract 1B365 (Tr. Tsentr. in-ta prognozov, no. 93, 1960, 3-15)

TEXT: Equations, linearized in respect of an east-west transfer (depending on the altitude), are considered for the eddying and inflow of heat in the atmosphere over a speherical earth (in the reading system moving together with a west-east transfer at a certain average level with allowance for horizontal large-scale turbulent heat-conductivity). The flow function and the vertical velocity w are unknowns in these equations. The zero parity of the velocity at an average level and of the vertical velocity at sea-level is taken as the marginal height condition. An initial value is

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assigned for the flow function in the whole atmosphere. The transition to an end-difference scheme for the height is accomplished with the calculation of data at three levels (one of which is the sea-level) so that the values of the flow function at three levels and of the vertical velocity at two levels become unknown quantities. In addition to this the known equation of Ye. N. Blinova is derived for the flow function at an average level, so that the system of four equation with righthand parts, which depend on the solution of Ye. N. Blinova's equation, has to be actually solved. These four equations are solved by means of spherical-function series, and a numerical analysis of the stability of elementary wave solutions in time is made with certain fixed values entering into the meteorologic-parameter equations, i.e. the supposed parts of the correspondingly proper frequencies are determined. All elementary waves appear to be stable (apart from the weak instability of the longest waves), from which the conclusion is drawn about the possibility of using the considered linearized three-level model for purposes of long-term forecasting. [Abstractor's note: Complete translation.]

MASHKOVICH, S.A.

Hydrodynamic theory of atmospheric macroprocesses. Trudy TSIP no.93: 35-37 '60. (MIRA 13:11)

(Weather forecasting)

MASHKOVICH, S.A.; AMBARTSUMYAN, M.

Evaluating the accuracy of solving vorticity equations by the iteration method. Trudy TSIP no.93:49-58 '60. (MIRA 13:11)
(Weather forecasting)

MASHKOVICH, S.A.; GROMOVA, L.G.

Some results of numerical pressure field forecasting by the use of the "Strela-3" electronic calculating machine. Trudy TSIP no.106:61-64 '60. (MIRA 13:12)

(Atmospheric pressure)
(Electronic calculating machines)

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S/720/61/001/000/002/003

AUTHOR: Mashkovich, S.A.

TITLE: Automation and meteorology.

SOURCE: Kibernetiku - na sluzhbu kommunizmu. v.1. A.I.Berg, ed. M[illegible] Gosenergoizdat, 1961, 242-252.

TEXT: The complexity of meteorological (meteo) processes renders progress in meteo and hydrometeo forecasting impossible without the use of the means and methods of automation. The present paper describes the "technological process" currently required in the compilation of a forecast (fcst). Data obtained at various elevation levels are used: Most district fcst offices have access to meteo observations (obs) from all of the Eurasian continent; the main fcst centers have northern hemisphere and partial southern-hemisphere data in addition thereto. Observations are made by predominantly nonautomatic means, processed, coded, transmitted, decoded, plotted, and synoptically analyzed, a fcst is prepared and transmitted to the potential user. 1. Meteo measurements. Obs-data collection. The USSR has 4,000 obs stations and about 7,000 obs posts. 3,000 stations make 8-hrly obs. The data are transmitted by telegram in 7 to 9 code groups of 5 digits each. Several weather reports are extra. About 15 - 10[illegible] obs telegrams go annually from meteo stations to fcst offices in the USSR. The daily traffic in Moscow is about 30,000 telegrams. The Hydrometeorological Service, USSR, handles additional globa[illegible]

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Automation and meteorology. S/720/61.001.000 /6.

information (info). Prompt handling is imperative. Fcsts are better if based "fresh" data, and aviation and other transportation require current weather well. The USSR territory is divided into 5 regions. Obs data are gathered local Hydrometeorological Service Administration, where regional obs are made. Zonal centers collect the regional data and circularize the in toto to all fcst organizations, without any special consideration of the quirements of the various fcst offices. There is little automation, almost tic obs stations, little automation of transmission, voluminous manual g., interpolation). This lack of automation causes delays, delivery automatic measurements and transmission of obs data; (2) fcst-gathering collection centers, (3) automatic transmission of processed data with sideration of their requirements (character of info, regional sequence of volume of info, etc), and with automatic optimization of transmission (4) automatic response to current-weather inquiries; (5) automatic control stations to obtain special, more frequent, and severe-weather obs as automatic issuance of severe-weather advisories; (6) data analysis on computers at fcst centers. Lack of obs data over large portions of the the oceans, and lack of dependability of upper-altitude obs hinders fcst Rocket and satellite obs are hoped for to fill the gap. Automation and processing is being discussed, practiced abroad, but practical

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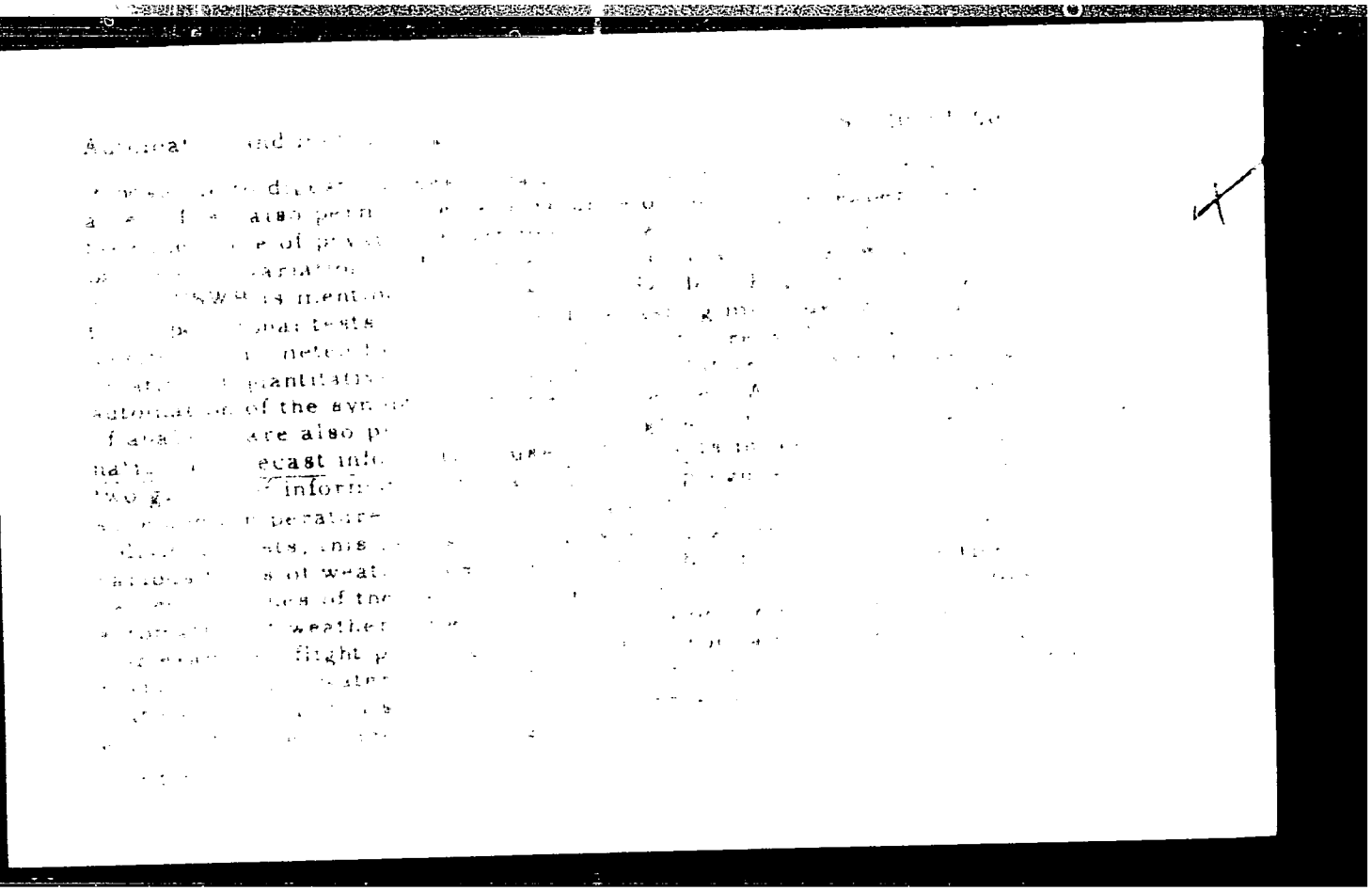
Automation and meteorology.

wanting. Partial developments are in progress, e.g., the USSR "Atm... This system is to perform automat[illegible] upper-level obs (RAOBS, RAWI[illegible]) preliminary data processing, and codin[illegible]. Branch computing centers are [illegible] obs data, process them on electronic computers, and pass them on to [illegible]. This partial project should constitute a first step toward automat[illegible] sing of obs materials. In current [illegible] practice subjective [illegible] of the analyst play a significant role [illegible] initial evaluation of [illegible] synoptic chart. Similarly assess[illegible] air masses, locat[illegible] fronts, [illegible] drawing of isobars, [illegible] of cyclones and anticyclones, etc., is [illegible] conclusions anchored [illegible] personal experience of the anal[illegible]. Two different analyses of the same s[illegible] meteo (statistical) analyses in enorm[illegible] recent progress in [illegible] analys[illegible] manual handling of the [illegible] mate[illegible] ([illegible] 1957). [illegible] Sweden (BESK), [illegible] the USSR, [illegible] Weather Forecasting [illegible] scie[illegible] is under way [illegible] selves to exact [illegible] enormous complexity of the atmospheric process. Electronic computers are [illegible]

[illegible] 3/5



reservoirs to feed a given power station than is currently done on the basis of climatological data alone. 5. Weather modification. Any hope for human control of weather reposes in the development of the quantitative theory of various meteorological phenomena, and broad experimentation in determining the effects of modifying action. The simple elimination of individual meteo phenomena appears unrealistic over the near term because of the enormous energies involved. For example, a single summertime cumulus cloud expends an amount of energy that is a multiple of that developed by the Volga hydroelectric station imeni V.I. Lenin. The method of "triggering intervention," that is, of disturbing a quasi-stable state in the atmosphere is a desirable and more promising avenue of endeavor. Examples of such efforts are found in cloud and fog modification, a difficult task which, however, according to V. Ya. Nikandrov (Iskusstvennyye vozdeystviya na oblaka i tumany - Artificial cloud and fog modification. Gidrometeoizdat, 1959) has been successfully attacked with small energy expenditures by local intervention into elementary processes, such as the stimulation of phase and microstructure changes. There are 18 references (13 Soviet, of which 1 English-language as cited in abstract, and 5 Western English-language).

ASSOCIATION: None given.

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S/050/61/000/002/001/004
B117/B209

3.5000

AUTHOR: Mashkovich, S. A.

TITLE: On the evolution of long waves in the baroclinic atmosphere

PERIODICAL: Meteorologiya i gidrologiya, no. 2, 1961, 3-12

TEXT: The author of the present paper investigated the waves above the spherical Earth at a multi-strata model of the baroclinic atmosphere. Particular attention was drawn to the examination of the peculiar features of wave development according to the character of the zonal motion and of the vertical structure of the initial perturbation. The author started from the equation of storm velocity and heat supply as suggested by Ye. Blinova (Ref. 3) as a starting point. The perturbation of a certain ground state was examined (according to Blinova, Ref. 1). The zonal motion, which depends on altitude and geographical latitude only, was assumed to be such a ground state. The solution of this problem was found in the form of the Eq. (4):

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On the evolution of long waves ...

$$\psi = \sum_{n=m}^{\infty} \sum_{m=1}^{\infty} \sum_{k=1}^{s+1} e^{-\sigma^{(2)}_{n,k} mt} \left[A^m_{j,n,k} \cos m\left(\lambda + \sigma^{(1)}_{k,n} t\right) - \right.$$

$$\left. - B^m_{j,n,k} \sin m\left(\lambda + \sigma^{(1)}_{k,n} t\right) \right] P^m_n(\theta) = \sum_n \sum_m \bar{A}^m_{j,n}(t) \cos\left[m\lambda + \varphi^m_{j,n}(t)\right] P^m_n. \quad (4)$$

Besides, the following formulas (5) were suggested for the energy of the development of baroclinic waves:

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$$\frac{\partial K'}{\partial t} = 2\omega a^2 \int_0^{1} \int_0^{2\pi} \int_0^{\pi} \cos\theta \psi' \frac{\partial \rho w'}{\partial \zeta} \sin\theta \, d\theta \, d\lambda \, d\zeta;$$

$$\frac{\partial \Pi'}{\partial t} = -2\omega a^2 \int_0^{1} \int_0^{2\pi} \int_0^{\pi} \cos\theta \psi' \frac{\partial \rho w'}{\partial \zeta} \sin\theta \, d\theta \, d\lambda \, d\zeta +$$

$$+ \frac{(2\omega)^2 g a^3}{(\gamma_a - \gamma)\tilde{T}_{cp} R^2} \int_0^{1} \int_0^{2\pi} \int_0^{\pi} \zeta^3 \frac{\partial \psi}{\partial \lambda} \frac{\partial \psi}{\partial \zeta} \frac{d\alpha}{d\zeta} \cos^2\theta \sin\theta \, d\theta \, d\lambda \, d\zeta. \qquad (5)$$

The symbols denote the following: ψ' - current function; w - the vertical velocity component; θ, λ, z - the spherical coordinates; t - time; $\zeta = \tilde{p}/P$; $\tilde{p} = \tilde{p}(z)$ - pressure; P = 1000 millibar; a - Earth's radius; g - gravitational acceleration; ρ - density; ω - angular velocity of Earth's rotation; R - gas constant; γ and γ_a - vertical and dry-adiabatic temperature gradient; $\alpha(\zeta)$ - index of circulation; K' and Π' - critical and potential

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energy of the perturbation; Symbols: (A, B) - Jacobian; $P_n^m(\theta)$ - sperical harmonic; j - level to which the concerned quantity is referred; $\sigma_k = \sigma_{k,n} + i\sigma_{k,n}$ - roots of the characteristic equation; A and φ - amplitude and phase of the wave which both depend in a definite manner on the vertical distribution of the initial phase and amplitude of the wave; s - number of strata. On the base of these solutions, a four-strata and a nine-strata model of the atmosphere were calculated. The results are in fair agreement for both models (Tables 1-3, Figs. 1 and 2). By analysing these results, a different development of the perturbations which initially were localized in various strata of the atmosphere was found. Above all, the perturbation penetrates much faster the higher strata than the lower ones. The baric perturbation initially localized in the lower strata of the troposphere rapidly propagates upwards on which occasion the perturbation near the ground becomes slightly reduced in intensity. After 4-5 days the perturbations are about equal at different altitudes of the lower half of the troposphere. The baric formation near the ground is slowly shifted

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westwards and becomes quasisteady. The perturbations originally localized in the upper tropospheric and lower atmospheric strata are unstable. The amplitude rapidly increases with time. The displacement takes place with nearly constant velocity. The perturbation also penetrates into the lower strata. After 4-5 days, the amplitude of the wave formed at sea level amounts to about 30% of the initial amplitude at the level $\zeta = 0.3$, whereas at an altitude of $\zeta = 0.3$ the amplitude increases by the 1.5 fold during the same period. Another difference in the vertical structure of the baric field is the following: The baric formation, forming due to the development of the perturbation in the lower stratum, is characterized by the westward inclination of the vertical axis in the lower tropospheric strata and by an eastward inclination in the upper strata. Perturbations forming in the upper or middle tropospheric strata exhibit the opposite behavior. During the described evolution of baric formations, vertical air currents and temperature waves occur. (4) holds also for this case. Phases and amplitudes of the temperature waves and of the vertical velocity depend to a considerable extent on the initial structure of the pressure perturbation. The temperature field is subjected to especially strong changes if the original perturbation is isothermic. Local deviations of the vertical

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temperature gradient from its normal value at the respective levels occur as a consequence of the change of the temperature field. Calculation of the energy variations by means of formulas (5) has shown that the investigated motion of a single wave in the baroclinic atmosphere is related to a considerable transformation of potential perturbation energy into kinetic one. This energy transformation is due to vertical displacement of air masses in rising or falling currents. When the atmosphere is taken as a whole, an increase in kinetic energy takes place in all cases investigated. However, this process of transformation is different for every individual stratum. The extent of the change in kinetic and potential energy within an atmospheric column with a cross section of 1 m^2 is characterized by the following figures: The change of K' is relatively small at the beginning of the period. It amounts to $5 \cdot 10^{-3}$ t/sec^3 in the case of a perturbation near the ground and to 10^{-2} t/sec in the case of an altitude wave. In its further development, the change becomes more intense and correspondingly amounts to 0.75, 10^{-1} and 0.27 t/sec^3. The change in potential energy Π' in the cases investigated lays in the range between 0.2 and 0.5 t/sec^3 since a meridional temperature transfer occurs. These

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B117/B209

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data were obtained on the assumption that the perturbation amplitude at the beginning was 1 dm. M. I. Yudin is mentioned in the paper. There are 2 figures, 3 tables, and 23 references: 10 Soviet-bloc.

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MASHKOVICH, S.A.; KHEYFETS, Ya.M.

Letter to the editor. Meteor. i gidrol. no.4:59 Ap '61. (MIRA 14:3)

(Weather forecasting)

OVSYANNIKOV, V.V.; MASHKOVICH, S.A., nauchnyy red.

Numerical prediction of humidity, cloudiness, and atmospheric precipitation. Trudy TSIP no.81:92-112 '61. (MIRA 14:8)
(Weather forecasting)

33061
S/169/61/000/012/067/089
D228/D305

3,5000

AUTHOR: Mashkovich, S. A.

TITLE: The theory of pressure waves in the baroclinic atmosphere

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 12, 1961, 58, abstract 12B368 (Tr. tsentr. in-ta prognozov, 1961, no. 111, 13-28)

TEXT: The solution of the linear problem on the forecasting of meteorologic elements in the baroclinic atmosphere is given in the work with a detailed account of peculiarities in the vertical distribution of meteorologic elements. The vortex equations of the velocity, heat inflow, and statics under conditions of quasi-solenoidality are taken as the original equations. The solution of this problem by a numerical method is adduced for four- and ten-level models of the atmosphere. The stability of

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movement and the development of waves superimposed on the baroclinic zonal flow are investigated on the basis of the obtained results. It was ascertained that stability occurs for waves with an index of $n > 7$; long waves are stable. It was found that the rate of zonal movement increases more rapidly with altitude, the stronger the instability of movement. All waves are stable if the basic condition is quasi-barotropic. Increased stability of movement was observed on the reduction of the level of the tropopause. Temperature advection promotes the appearance of instability, whereas vertical movement compensates this effect to some extent. It follows from the obtained results that the rate of movement of waves is greater in winter than in summer. If the disturbances, whose amplitude and phase were identical at the initial moment at all levels, appeared to be unstable, then the size of the amplitude in the troposphere's upper and lower layers rapidly increases, and in the middle troposphere it decreases feebly. The baric disturbances localized at the initial

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moment in the lower layer appear to be quasi-stationary, while those localized in the upper troposphere are unstable; the most kinetic energy is generated in the latter case. The conversion of the potential energy of the disturbances into kinetic energy, occurring in the movement of a single wave, is the result of the vertical redistribution of thermally-heterogeneous masses through the action of ascending and descending currents. [Abstracter's note: Complete translation.]

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MASHKOVICH, S.A.; KHEYFETS, Ya.M.

Some characteristics of zonal atmospheric circulation over the Northern Hemisphere during the International Geophysical Year. Trudy TSIP no.111:50-51 '61. (MIRA 14:9)
(Atmosphere)

S/169/63/000/003/051/042
D263/D307

AUTHOR: Mashkovich, S.A.

TITLE: Some problems of the study of large-scale processes with the aid of rapid computers

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 3, 1963, 48, abstract 3B276 (Tr. 3-y Nauchn. konferentsii po obshch. tsirkulyatsii atmosfery. 1960, M., Gidrometeoizdat, 1962, 101-113)

TEXT: Study of the regularities of planetary processes and assessment of individual climatological factors in the development of large-scale processes was carried out by consideration of models of purely zonal circulation (meteorological elements do not depend on geographic longitude, meridional and vertical wind velocities are absent) and of non-zonal circulation. For purely zonal circulation the initial system of equations in the form

$$\rho_0 \frac{\partial T}{\partial t} = \frac{\partial}{\partial z}\left(\lambda \frac{\partial T}{\partial z}\right) + \frac{\lambda}{r_0^2 \sin\theta}\frac{\partial}{\partial \theta}\left(\sin\theta \frac{\partial T}{\partial \theta}\right) +$$

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$$+ \alpha_2 \rho_w (A + B + \beta S - 2E);$$

$$2\omega \cos \theta v_\lambda = -\frac{1}{\rho r_0} \frac{\partial p}{\partial \theta};$$

$$\frac{\partial A}{\partial z} = -\alpha_2 \rho_w (K - E); \quad \frac{\partial B}{\partial z} = -\alpha_2 \rho_w (B - E);$$

$$\frac{\partial S}{\partial z} = \beta \alpha_2 \rho_w;$$

$$\sigma^2 \rho_* \frac{\partial^2 \pi^*}{\partial z^2} = \lambda \frac{\partial^2 \pi^*}{\partial z^2};$$

$$\frac{\partial p}{\partial z} = -g\rho;$$

$$p = R\rho T;$$

The boundary conditions are

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$$A = 0 \text{ when } z = \infty \qquad (1a)$$

$$\sigma = [1 - \Gamma(\theta,t)]\, w(\theta,t) = w(\theta,t) \text{ when } z = \infty \qquad (1b)$$

$$\frac{\partial T}{\partial z} = 0 \text{ when } z = \infty \qquad (1c)$$

$$-\lambda \frac{\partial T}{\partial z} + \lambda^* \frac{\partial T^*}{\partial z} = A + S - B \text{ when } z = 0 \qquad (1d)$$

$$B = q\varepsilon\sigma T^4 \text{ at } z = 0 \qquad (1e)$$

$$T^* = T \text{ at } z = 0 \qquad (1f)$$

$$T^* = T_0^*(\theta) \text{ at } z = -H \qquad (1g)$$

$$\frac{1}{\rho}\frac{\partial p}{\partial \theta_0} \to 0 \text{ at } z \to \infty \qquad (1h)$$

The symbols are: t - time; $\theta = (\pi/2) - \varphi$; λ - geographic longitude; φ - geographic latitude; z - altitude above sea level;

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r_0 - Earth's radius; T - temperature; p - pressure; ρ, ρ^* and ρ_w - densities of air, water vapor, and underlying medium respectively; v_θ, v_λ, v_z - corresponding velocities along θ, λ and z respectively; g - acceleration due to gravity; R - the gas content; A and B - streams of longwave radiation, directed downwards and upwards; ω - angular acceleration of the Earth; S - short wave (solar) radiation; E - total irradiation; σ - Stefan-Boltzmann's constant; f - Gilbert's multiplier; λ' and λ'' - coefficients of turbulent heat conductivity in vertical and horizontal directions; C* and λ^* - sp. heat and coefficient of thermal conductivity of the underlying layer; α_1 and α_2 - absorption coefficients by water vapor of short and longwave radiation respectively; $\beta = \frac{\alpha_1}{\alpha_2}$; Γ - total albedo; $\gamma(\theta,t)$ - solar energy falling on unit surface in unit times; P_n and P_n^m - the usual and the added Lezhander polynomials; ψ - function of flow; q - specific humidity; q* - quantity of condensed moisture. Study of the transformation of the initial field of meteorological elements with time was carried out for the most general set of starting conditions. Solution of the problem allows the det-

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ermination of the distribution of zonal temperature and wind values in any subsequent moment, from their given distribution at the starting moment and the known change of the incoming solar energy with time. After a series of transformation, the system of equations is solved by a method analogous to Roge's method (the time derivative is replaced by finite differences, and the coordinate derivatives are maintained in original form). The solution may be represented as a series of sums of 2 components, the first of which describes the appearance of temperature deviations from mean annual values, and the second, the effect of the initial state of the atmosphere. The results of calculations (on electronic computer M-2) allow an analysis on a definite example (the climatic distribution of the zonal temperature on March 22 was taken as the starting field) of the effect of the initial state of the atmosphere, to determine the regime corresponding to a given influx of heat, and also to study the theoretical model of the annual variation of zonal circulation and zonal temperature at various heights. The effect of the initial conditions is negligibly small after a month from the starting moment. Temperature disturbances from the underlying surface are rapid-

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ly propagated into upper levels and the actual temperature profile is set up in about 20 days. The computed zonal temperature and the zonal velocities of gradient wind, obtained from the computed temperature field are in good agreement with actual data. During the solution of problems of models of non-zonal atmospheric circulation as the starting equations one uses the equations for the vortex, for the influx of heat, for humidity, for the thermal conductivity of the underlying medium, and for atmospheric statics. Following Roge's method the problem is solved with an arbitrary initial pressure distribution. The following boundary conditions are assumed: (1) damping out of T, Ψ and q at the upper boundary of the atmosphere; (2) vertical velocity on the Earth's surface is zero; (3) saturation of water vapor over the equator at sea level; zero specific humidity or vertical gradient of specific humidity (no evaporation) over the continents at $\sigma = 1$; (4) fulfilment of conditions 1a to 1g; in 1d are added terms taking evaporation losses into account, taking the losses as proportional to $\partial q/\partial z$. After a series of transformations formulas of the following form are obtained:

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Some problems of the study ...

$\varphi_j = P_{j1} + b_j(v_{n,\xi=0}^{m}) + c_j(u_{n,\xi=0}^{m})$; where φ - any unknown coefficient; $\xi = p/p_s$ ($p_s = 1000$ mb), $u = \partial r/\partial \xi$, and $v = \partial q/\partial \xi$. Magnitudes of P_{j1}, b_{j1}, c_{j1} are found from their values under preceding conditions, with the aid of recurring equations. Solution of the equations of radiation transfer is performed by an analogous method. Solution of the problems was used to study the energetics of large-scale processes, energy transformations in the atmosphere, etc. A brief preliminary analysis is given of the results of calculation for a variation of a '5-layer' atmosphere.

[Abstracter's note: Complete translation.]

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MASHKOVICH, S.A.; KHEYFETS, Ya.M.

Practice in numerical forecasting of ground pressure for some days in advance. Trudy IZIP no.126:8-19 '63. (MIRA 16:11)

MASHKOVICH, S.A.

Taking into account the diabatic effects in numerical short-range pressure forecasting. Trudy TSIP no.126:38-46 '63.
(MIRA 16:11)

ACCESSION NR: AP4023378 S/0049/64/000/002/0285/0292

AUTHOR: Mashkovich, S. A.

TITLE: An objective analysis of aerological observations and the requirements for setting up a network of stations

SOURCE: AN SSSR. Izv. Seriya geofizicheskaya, no. 2, 1964, 285-292

TOPIC TAGS: aerological sounding, meteorological chart, interpolation

ABSTRACT: The author discusses a method of objective (machine) analysis of aerological data in the northern hemisphere. The method is based on the use of optimal interpolation of meteorological fields. An analysis was made for a regular network of points, coinciding with the intersections of meridians and parallels. The computational scheme was carried out on a high-speed computer. This computation involves: 1) determination of coordinates of the investigated points, 2) locating eight stations near these points, 3) computing the value of μ_{ij} (a normal value of autocorrelation moment of H', depending only on the distance between points of observation or computation), 4) preparing a system of equations of

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$$\sum_{i=1}^{n} p_i \mu_{ij} + \eta_0 \mu_j = \mu_{0j} \quad (j = 1, 2, 3, \ldots, n).$$

(where p_i is the factor to be determined, η is the geopotential, and i refers to the number of observations at the station), 5) solving for p_i, and 6) computing) of interpolation error. The results of the computation give an isopleth map showing interpolation errors. This map is shown in Fig. 1, and is based on the geographic points indicated in Fig. 2 of the Enclosures. The problem of station distribution is discussed, and a method of computation is proposed for selecting station location to insure the best objective analysis. In doing this, stations were inserted between the original points, and a new run of the computer was made, with subsequent determination of interpolation error. Then more stations were added and new runs made. Eighteen stations were added on the first run, 31 more on the second, 42 more on the third. On the third run, with a total of 91 new stations, almost all errors exceeding 0.5 disappeared. With 195 new stations, all errors in excess of 0.2 disappeared, and it was concluded that this gave sufficient accuracy for reliable long-range forecasting. Orig. art. has: 3 figures, 1

ACCESSION NR: AP4023378

table, and 3 formulas.

ASSOCIATION: GUGMS Vychislitel'nyy meteorologicheskiy tsentr (GUGMS Meteorological Computing Center)

SUBMITTED: 25May63 DATE ACQ: 27Mar64 ENCL: 04

SUB CODE: ES NO REF SOV: 003 OTHER: 000

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ACCESSION NR: AP4023378 ENCLOSURE: 01

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ACCESSION NR: AP4023378 ENCLOSURE: 02

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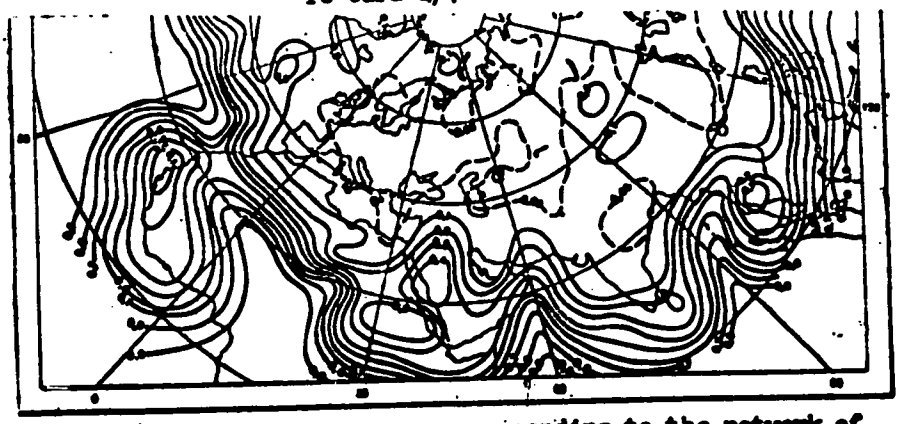

Fig. 1. Interpolation errors corresponding to the network of stations shown in Fig. 2.

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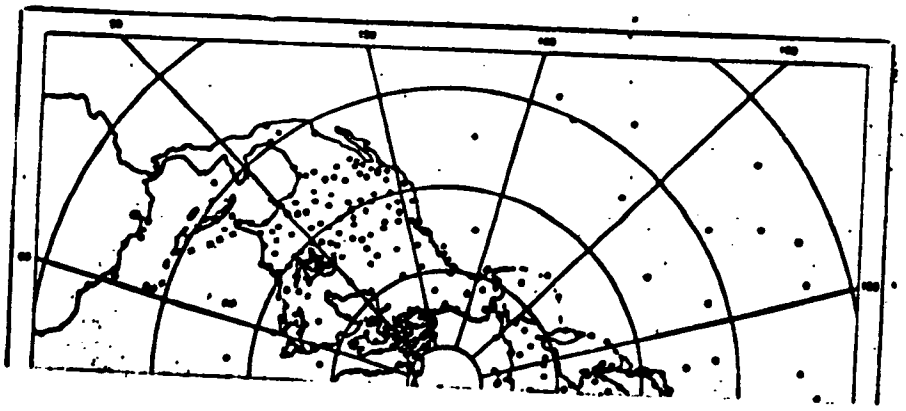
ENCLOSURE: 03



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ACCESSION NR: AP4023378 ENCLOSURE: 04

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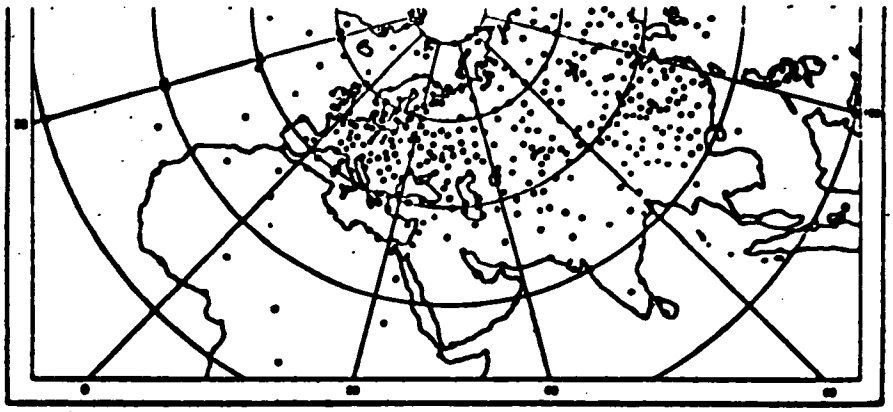

Fig. 2. Network for aerological data representing the normal distribution of available observation at the present time.

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ACCESSION NR: AT5002850 S/3118/64/000/004/0003/0010

AUTHOR: Mashkovich, S.A.

TITLE: Objective analysis of pressure pattern charts of the northern hemisphere

SOURCE: Mirovoy meteorologicheskiy tsentr. Trudy, no. 4, 1964. Voprosy ob"yektivnogo analiza meteorologicheskikh elementov (Problems in the objective analysis of meteorological elements), 3-10

TOPIC TAGS: weather forecasting, atmospheric pressure pattern, atmospheric pressure, numerical weather forecasting, long range weather forecasting

ABSTRACT: Effective and practical methods of objective analysis of the geopotential field based on the optimum interpolation method were developed and introduced into day-to-day use in the SSSR in 1961-1962. In this method, the analysis is made of a relatively small region covering part of the Atlantic Ocean, Europe and Western Siberia. The method has now been made applicable to a much larger area and adapted in such a way as to permit automatic preparation of the initial data for hydrodynamic long-range forecasting. The area covered now is the entire northern hemisphere. This article gives the preliminary results of this work carried out at the Mirovoy meteorologicheskiy tsentr

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(World meteorological center). The objective analysis method involves two basic stages: a. the input of initial information into the machine and its storage in the machine memory in a specified sequence and b. computation of the values of a meteorological element at the junctions of a regular grid on the basis of observational data from irregularly distributed stations. The latter stage can be divided into a search for stations whose observational data should be used for computing the values of the meteorological element at a particular junction of grid lines and computation of the value of the meteorological element at this junction by interpolation or extrapolation on the basis of observational data for the selected stations. There is a detailed discussion of the stages in the solution of the problem. The program for solution of the problem on an electronic computer was prepared in such a way that analysis of pressure pattern charts for the northern hemisphere can be done simultaneously for three isobaric surfaces. The latitude interval in the grid is 10°; longitude interval is 5°. Analysis was for the region between the equator and 85°N. Analysis of three pressure pattern charts for the northern hemisphere requires 4 minutes on the computer. The method described ensures an extremely high accuracy of analysis for Europe, North America and a large part of Asia. The article presents as an example the umerical analysis of an AT500 chart. Analyses of

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ACCESSION NR: AT5002850

AT350 and AT300 charts also have been highly successful. Orig. art. has: 3 formulas and 3 figures.

ASSOCIATION: Mirovoy meteorologicheskoy tsentr (World meteorological center)

SUBMITTED: 00 ENCL: 00 SUB CODE: DP, ES

NO REF SOV: 004 OTHER: 000

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L 24159-65 EWT(1)/FCC GW

ACCESSION NR: AT5002861 S/3116/64/000/004/0011/0016

AUTHOR: Mashkovich, S.A.; Gubanova, S.I.

TITLE: Practical use of a method for objective analysis of pressure pattern charts for the Northern Hemisphere on an electronic computer

SOURCE: Mirovoy meteorologicheskiy tsentr. Trudy, no. 4, 1964. Voprosy ob"yektivnogo analiza meteorologicheskikh elementov (Problems in the objective analysis of meteorological elements), 11-26

TOPIC TAGS: atmospheric pressure, atmospheric pressure pattern, weather forecasting, atmospheric geopotential field, computer programming

ABSTRACT: A method for analyzing the geopotential field over the northern hemisphere was presented in this same collection of articles (Trudy Mirovogo meteorologicheskogo tsentra, No. 4, 1964). In this companion article, the author develops in greater detail the algorithm proposed in the first article for solution of the problem on an electronic computer. The computation method was developed to obtain the results of an analysis at the points of intersection of a regular grid of points coinciding with the intersections of meridians and parallels. The latitude interval was 10° and the longitude interval was 5°. The grid covered the entire northern hemisphere. Three isobaric surfaces were

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