MONICH, V.K.

Eleventh session of the Commission on the Determination of the Absolute Age of Geological Formations. Izv.AN Kazakh.SSR. Set.geol. no.5:108 '62. (MIRA 15:12)

(Geological time)

RUMYANTSEVA, Tamara Aleksandrovna; MONICH, V.K., doktor geol.-miner. nauk, prof., otv. red.; NESTEROVA, I.I., red.; KHUDYAKOV, A.G., tekhn. red.

[Geology, petrography, and genetic characteristics of the Rulikha deposit in the Rudnyy Altai] Geologiia, petrografiia i geneticheskie osobennosti Rulikhinskogo mestorozhdeniia na rudnom Altae. Alma-Ata, Izd-vo Akad. nauk Kazakhskoi SSR, 1963. 146 p. (MIRA 16:5)

(Altai Mountains--Geology)

NURLYBAYEV, Abdrakhman Nurlybayevich; MONICH, V.K., doktor geologo-miner. nauk, prof., otv. red.; NESTEROVA, I.I., red.; KHUDYAKOV, A.G., tekhn. red.

[Granitoids of the Paleozoic intrusive complexes of the northwestern part of the Lake Balkhash region (Central Kazakhstan)] Granitoidy paleozoiskikh intruzivnykh kompleksov Severo-Zapadnogo Pribalkhash'ia (TSentral'nyi Kazakhstan). Alma-Ata, Izd-vo AN Kazakh. SSR, 1963. 219 p. (MIRA 16:11)

(Balkhash Lake region—Granite)

MONICH, V.K.; PEKARSKAYA, T.B.; SEMENOVA, T.P.; IVANOV, A.I.

Eleventh session of the Commission on the Determination of the Absolute Age of Geological Formations attached to the Department of Geological and Geographical Sciences of the Academy of Sciences of the U.S.S.R. Izv. AN SSSR. Ser.geol. 28 no.6:129-133 Je '63. (MIRA 16:8)

(Geological time)

PONOMAREV, V.D.; MONICH, V.K.; NURLYBAYEV, A.N.; NI, L.P.; SOLENKO, T.V.; PANCHENKO, A.G.

Nepheline rocks of the Virgin Territory as a comprehensive raw material for the production of aluminum oxide, soda products and cement. Vest. AN Kazakh. SSR 18 no.4:23-31 Ap '62. (MIRA 16:11)

MONICH, V.K.; SEMENOVA, T.P.

Geological time scale of 1963. Izv. AN Kazakh. SSR. Ser. geol. nauk no. 5:110-112 '63. (MIRA 17:1)

1. Institut geologicheskikh nauk AN KazSSR, Alma-Ata i Kazakhskiy institut mineral'nogo syr'ya, Alma-Ata.

MONICH, V.K.; STAROV, V.I.; MELIKHOV, V.D.

Comparative study of potassium feldspars from the intrusions of the Uspenskaya and Karatas-Gul'shadskaya zones. Trudy Inst. geol.nauk AN Kazakh.SSR 7:293-300 '63. (MIRA 17:9)

NURLYBAYEV, A.N.; MONICH, V.K. [deceased]; PANCHENKO, A.G.

New data on the geology of the Kubasadyr Massif of alkali rocks. Izv. AN Kazakh. SSR. Ser. geol. 22 no.1:57-61 Ja-F '65. (MIRA 18:6)

1. Institut geologicheskikh nauk im. K.I. Satpayeva, g. Alma-Ata.

BEDROV, G.I. [deceased]; MONICH, V.K. [deceased]; KULIKOVSKIY, K.T.; BRAZHENTSEVA, A.F.; PETROVA, M.P.; BAIGOZHINA, A.G.

Intrusion of Toparsk complex in Shetskiy District of central Kazakhstan. Trudy Inst. geol. nauk AN Kazakh. SSR 12:43-73 '65. (MIRA 19:9)

APPROVED FOR RELEASE: 03/13/2001 CIA-RDP86-00513R001135110018-0"

STAROV, V.I.; MONICH, V.K. [deceased]; GEKHT, I.I.; KULINICH, V.B.

Potassium feldspar of some of the different age intrusions. Trudy Inst. geol. nauk AN Kazakh. SSR 12:108-112 '65.
(MIRA 18:9)

MENCH, ..K. [deceased]; STAROV, V.I.; GOGEL', G.N.

Petrography of intrusions in the central part of the Trans-Ili Alatau. Trudy Inst. geol. nauk AN Kazakh. SSR 12:74-107 '65.

L 39280-66 EWT(d)/EWT(m)/EWP(c)/EWP(k)/T/EWP(v)/EWP(t)/ETI/EWP(1) IJP(c)

ACC NR: AP6021713 SOURCE CODE: UR/0130/66/000/003/0027/0028

AUTHOR: Monid, A. G.; Benyakovskiy, M. A.; Smolyarenko, D. A.; Sivtsov, G. V.; Tkachenko, ~~F. V.~~; D'yakonova, V. S.; Popov, P. I.; Pakudin, V. P.; Shirinskaya, S. A.; Sosipatrov, V. T.

ORG: none

52
49
B

TITLE: Production testing of 08Yu cold rolled low carbon steel

SOURCE: Metallurg, no. 3, 1966, 27-28

TOPIC TAGS: low carbon steel, deoxidation, cold rolling, quality control / 08Yu steel

ABSTRACT: Production testing was carried out on nonaging 08Yu steel sheets at the Cherepovetsky Metallurgical Plant and the results were compared to the norms set by GOST 9045-59. Melting was carried out in single-grooved Martens furnaces of average capacity; deoxidation by ferromanganese was done in steps--50% in the furnace and 50% in the ladle; Al was also introduced in the ladle in quantities of 100-150 g/T of steel while full deoxidation was accomplished by the addition of Al pellets in quantities of 900-1000 g/T. The chemical composition of 08Yu steel compared favorably with the standards set by GOST 9045-59 (experimentally--C=0.04-0.08%, Si=0.01%, Mn=0.32--0.38%, S=0.009-0.016%, P=0.01-0.015%, Cr=0.01-0.03%, Ni=0.03-0.07%, Cu=0.02-0.07% and Al=0.02-0.05%). Ingots weighing 14T were hot rolled in 15-18 passes into slabs of

UDC: 621.771.24

L 39980-66

ACC NR: AP6021713 3

135-140 mm thickness and 1070-1430 mm width on a 1150 bloom. These slabs were next cold rolled to a maximum of 68% reduction into sheets of 2.5-3.5 mm thickness and 1040-1430 mm width. Annealing was done at 550°C for 10 hrs at a heating rate of 15°/hr and cooling was at 6°/hr. The final operation was a finishing pass at 1.0-1.3% reduction. Tests made on the sheets after aging at 200°C for 30 min substantiated that the steel was nonaging. The sheets performed well in stamping tests which were run under the stamping conditions used at the Gor'ky Automotive Plant. Orig. art. has: 1 table.

SUB CODE: 11,14/ SUBM DATE: none

Card 2/2

[illegible]

Catalytic polymerization of [illegible] in presence of [illegible] Stanislav [illegible] and Jerzy [illegible] Chem. [illegible] 1, 71-[illegible] (English summary).—The authors studied [illegible] in the absence of O_2. [illegible] was introduced into a flask and heated to [illegible] After [illegible] 10 min. of [illegible] was introduced through a [illegible] After 12-[illegible] min. the liquid began to [illegible] thick. [illegible] the external heating was [illegible] The liquid [illegible] in order to keep the [illegible] its color darkened, which [illegible] became less and less [illegible] Depolymerization [illegible] explained by a [illegible] polymerization. [illegible] catalytic [illegible] can be explained by [illegible] cracking [illegible] long and short [illegible] and [illegible] Polymerization [illegible]

F. I. Hovid [illegible]

MONIKOWSKI, EDWARD

POLAND/Chemical Technology. Chemical Products and Their Application - Silicates. Glass. Ceramics. Binders. I-9

Abs Jour : Referat Zhur - Khimiya, No 4, 1957, 12681

Author : Monikowski Edward

Title : Experience with and Conclusions Derived from Accelerated Aging of Concrete at the Building Site

Orig Pub : Doswiadczenia i wnioski z przyspieszonego dojrzewania betonow na placu budowy. Budown. przemysl., 1956, 5, No 7-8, 29-33 (Polish)

Abstract : For the purpose of speeding up building operations it is recommended to produce the structural component parts directly at the building site on condition of careful selection of materials, addition of $CaCl_2$ (in winter) and heat treatments at temperatures up to 75°.

Card 1/1

MONIKOWSKI, E.; RAWINSKI, L.

Conclusions and generalizations concerning the construction of a carbarn in Warsaw. Pt. 1. p.13.

(BUDOWNICTWO PRZEMYSLOWE. Vol. 6, No. 6, June 1957. Warszawa, Poland)

SO: Monthly List of East European Accessions (EEAL) LC. Vol. 6, No. 10, October 1957. Uncl.

MONIKOWSKI, E.

TECHNOLOGY

PERIODICAL: BUDOWNICTWO PRZEMYSLOWE. Vol. 7, no. 8, Aug. 1958

MONIKOWSKI, E. Experience acquired in constructing warehouses and industrial multisectional buildings from prefabricated parts. p. 1.

Monthly List of East European Accessions (EEAI) LC, Vol 8, no. 4.
April 1959, Unclass

MONIKOWSKI, E.

TECHNOLOGY

PERIODICAL: BUDOWNICTWO PRZEMYSLOWE. Vol. 7, no. 9, Sept. 1958

MONIKOWSKI, E. Experience acquaired in constructing warehouses and industrial multisectional buildings from prefabricated parts. Pt. 2, p. 45.

Monthly List of East European Accessions (EEAI) LC Vol. 8, no.4.
April 1959, Unclass

HORNIKOWSKI, Edward, mgr inz. (Warszawa)

Training course of the Warsaw Branch of the Association of Polish Building Engineers and Technicians at the Administration of Industrial Building of the city of Warsaw. Przegl budowl i bud mieszk 33 no.6:364-365 Je'61.

MONIKOWSKI, Edward (Warszawa)

Roof of a workshop hall in the form of a double-curved hanging shell. Przegl budowl i bud mieszk 23 no.8:481-486 Ag'61.

PROCESSES AND PROPERTIES INDEX

Ca

18

Conversion of superphosphate into ammonium phosphate. Kazimierz Mosikowski. *Przemysl Chem.* 14, 217-21(1930).—Prepn. of NH_4 phosphate from com. superphosphate by leaching the crushed rock under several different conditions was tried. When the superphosphate is leached with dil. H_2SO_4 in the presence of $(NH_4)_2SO_4$ a phosphate soln. of very low Ca content is obtained. When properly handled this process loses but very little P_2O_5. Solns. so obtained are suitable for use in fermentation industries. An attempt was made to sep. the phosphate from Ca by the use of oxalic acid. This is not economical, because the oxalic acid is lost, its recovery with the aid of H_2SO_4 having been found unworkable. A. C. Zachlin

METALLURGICAL LITERATURE CLASSIFICATION

CA

PROCESSES AND PROPERTIES INDEX

7 The so-called Polish surgical cotton prepared from flax. Kazimierz [illegible]. Wiadomości Farm. 60, [illegible] (1933).—Surgical "cotton" prepd. from flax shows the following compn.: H_2O 4.8%, ash 0.14%, SO_3 traces, Cl 0, Ca traces, reducing substances normal, reaction neutral, sorption of H_2O good. The use of Polish surgical cotton is advocated. J. Wiertelak

ASB-SLA METALLURGICAL LITERATURE CLASSIFICATION

7

BA

Determination of phosphate with benzidine. A. Mom-kowski (Univ. Lodz, Poland). Folia Abol. (... 1, 85-142 Prace Komisji Nauk Farm. Dissertationes Pharm. (1951) (French summary). Benzidine (I) and H_3PO_4 form an insol. compd. in water; salts of MeH_2PO_4 react quantitatively with benzidine.2HCl, Me_2HPO_4 reacts with I to release some benzidine.HCl (II) and thus give an excess of it in the ppt. For analytical work the pptn. must be conducted in a soln. neutral to phenolphthalein. The phosphate can then be detd. most accurately by direct titration of the ppt. with 0.1 N NaOH, also by volumetric titration or by detg. the change in acidity upon pptn. To remove unreacted II from the ppt., add AcOH or EtOH as both dissolve II easily. Benzidine phosphate (III) and sulfate can be detd. in the same sample as only III dissolves in 0.1 N HCl. Ferric iron has to be reduced to ferrous iron before the detn., and Al detd. in an AcOH soln. Detn. of phosphate in vegetable samples gives results within 2-3% of the molybdate method. I. Z. Roberts

1951

Formanek, K.

POL.

1078. Determination of peroxides in oils by the titanium method. C. Formanek and K. [illegible] (Rocz. Panstw. Zakl. Hig., 1953, 4, 117-127; Referativnyi Zh., Khim., 1954, Abstr. No. 30,239).— It is shown that Ti^{IV} reacts quant. to give a yellow colour only with those organic peroxides that can be hydrolysed to give H_2O_2 as one of the products. The volumetric method of Drozdov and Storikova (Myasnaya Industriya, SSSR, 1951, (1), 63) gives satisfactory results; results obtained by the Ti method are 2 to 3 per cent higher. F. Havas

[illegible], KAZIMIERZ

POL,

[illegible] color reaction for [illegible]. Jadwiga [illegible] and [illegible] [illegible] ([illegible] summary). [illegible] test for [illegible] was studied on [illegible] [illegible] glutamic acid, glycine, [illegible], [illegible] [illegible] tyrosine, tryptophan. The test is based on the change in the color of [illegible] blue in the presence of the [illegible] sample, HCl and $KMnO_4$. Only tyrosine and tryptophan gave a pos. reaction ([illegible] staining), while the [illegible] amino acids gave a neg. reaction ([illegible] staining). Conclusion: [illegible] reaction is only applicable [illegible] [illegible] tyrosine and tryptophan. [illegible]

MONIKOWSKI, K.

Tyroglyphidae, insects noxious to food, and their exertmination, p 438. (PRZEMYSL ROLNY I SPOZYWCZY, Warszawa, Vol. 8, no. 12, Dec. 1954.)

SO: Monthly List of East European Accessions, (EEAL), LC, Vol. 4, no. 1, Jan. 1955, Uncl.

MONIKOWSKI K.

POLAND/Chemical Technology. Chemical Products and Their Uses. Part III. Food Industry. H

Abs Jour : Ref Zhur-Khimiya, No 15, 1958, 51944

Author : Wieckowska, Elzbieta; Monikowski, Kazimierz
Inst : -
Title : Phosphatase Test for Meat and Meat Products.

Orig Pub : Roczn. Panstw. zakl. hig., 1956, 7, No 1, 79-88

Abstract : Application of the alkaline phosphatase (I) titration as an indicator of degree (sufficiency) of thermal treatment of meat and meat products has been explained. It was established that no I was present in meat products heated to ≥ 70° (positive reaction for I could be induced by bacteria).

Card : 1/2

109

HILLER, Andrzej; MONIKOWSKI, Kazimierz

Hydrolytic decomposition of phytin compounds during the production of bakery goods. I. Acta pol. pharm. 28 no.5:441-444 '61.

1. Z Zakladu Nauki o Srodkach Spozywczych Akademii Medycznej w Lodzi Kierownik Zakladu: prof. dr K.Monikowski.
(INOSITOL chem) (BREAD chem)

MONIKOWSKI, K.; BEDNAREK, W.; BODZAK, M.

Estimation of methyl bromide residues in foods treated with this preparation. Cesk. hyg. 10 no.3:198-205 My '65.

1. Bromatologicky ustav Lekarske akademie v Lodzi a Vyzkumne ustavy pro potirani obilnich skudcu v Lodzi. 2. M.Monikowski's address: Lodz, ul. Kilinskiego 93.

DZERDZEYEVSKIY, B. L.; MONIN, A. A.

"Typical Schematics of the General Circulation of the Atmosphere in the Northern Hemisphere and the Circulation Index," Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 6, 1954, pp 562-574.

Inst. of Geography and Geophysical Inst., AS USSR

Translation M-602, 5 Jul 55

MONIN, A. S. and L. N. GUTMAN

Monsoons

Vertical Structure of Monsoons. Met. i. gidrol. No. 6, 1947 (pp. 29-36)

Translation of contents available in U-3213, 3 Apr 53

MLRA

MONIN, A. S.

"Model of the Wind of Slope," Trudy TsIP, No. 8, 1948, pp. 3-32

APPROVED FOR RELEASE: 03/13/2001 CIA-RDP86-00513R001135110018-0"

MONIN, A. S.

"On the Theory of Atmospheric Turbulence." Thesis for degree of Cand. Physicomathematical Sci. Sub 11 May 49, Moscow Order of Lenin State U imeni M. V. Lomonosov.

Summary 82, 18 Dec 52, Dissertations Presented for Degrees in Science and Engineering in Moscow in 1949. From Vechernyaya Moskva, Jan-Dec 1949.

MONIN, A. S.

"Stationary Pattern of the Distribution of Wind According to Altitude in the Instance of Curvilinear Isobars," Meteorology i Gidrologiya, No. 1, 1949

Translation available in U-2392, 22 Sept 52

"A Stationary Model of Wind Distribution with Respect to Height for the Case of Curvilenear Isobars," Iz. AN SSSR, Ser. Geograf. i Geofiz., Vol. 13, No. 3, pp. 220-238, 1949

MONIN, A. S.

"A Stationary Model of Wind Distribution with Respect to Height for the Case of Curvilinear Isobars", Iz Ak Nauk SSSR, Ser Geograf i Geofiz, Vol. 13, No. 3, pp 229-238, 1949.

MONIN, A. S. and SHOKHAT, L. A.

"Methods of Analyzing Experimental Data", Izdatel'stvo Inostrannoy Literatury, 364, pp, 1950.

APPROVED FOR RELEASE: 03/13/2001 CIA-RDP86-00513R001135110018-0"

Monin, A. S. [illegible] turbulence in the atmosphere.
Izvestiya [illegible]
252-256 (1959) [illegible]

In the first [illegible]
for the rate of change of [illegible] the mean
velocity [illegible]
[illegible]
[illegible]
[illegible]
the resulting [illegible]
[illegible]
[illegible]

MONIN, A. S.

Meteorological Abst.
Vol. 4 No. 2
Feb. 1953
Bibliography on
Turbulent Exchange

4B-274

Monin, A. S. Turbulentnyi rezhim v prizemnom sloe vozdukha. [Turbulent regime in the layer of air near the ground.] U.S.S.R. Glavnoe Upravlenie Gidrometeorologicheskoi Sluzhby. Informatsionnyi Sbornik, 1:13-27, 1951. 2 figs., 12 refs., 33 eqs. DLC—A concentrated review of the general theory of turbulence, as it was developed or improved by Russian scientists, especially KOLMOGOROV. Simplified solutions are given for the layer near the ground. The equations of PRANDTL, KARMAN and other scientists are shown as single cases of the general theory. Stable and labile stratification is discussed. The assumptions of BUDYKO, who published a series of papers from 1946 to 1948 on this topic are criticized and the scheme of OBUKHOV (papers from 1942 to 1946) is commended. Subject Headings: 1. Turbulence theory 2. Atmospheric turbulence. I. Budyko, M. I. II. Obukhov, A. M.—C.A.

551.551

Dynhuk, A. F., and Moaln, A. S. On mutually orthogonal systems of functions. Doklady Akad. Nauk SSSR (N.S.) 75, 337–340 (1950). (Russian)

The system of differential equations

$$(k_i(x)u_i'(x))' - q_i(x)u_i(x) + \lambda\rho_i(x)u_i(x) = 0, \quad i=1,2,\cdots,N,$$

together with the boundary conditions $u_i'(x_i)+h_iu_i(x_i)=0$, $u_i'(0)-\sum_j \alpha_{ij}u_j(0)=0$ is considered. Here $\rho_i(x)\geqq 0$, $k_i(x)\geqq 0$, $0<k_i(0)<\infty$, $k_i(x_i)<\infty$. For $i\neq 1$, $\alpha_{i1}\neq 0$, $\alpha_{1i}\neq 0$ and $\alpha_{1i}\alpha_{i1}>0$. For $1<j<k$, $\alpha_{1j}\alpha_{jk}\alpha_{k1}=\alpha_{1k}\alpha_{kj}\alpha_{j1}$. The characteristic value problem is considered. Variational methods are used (with a reference to Courant and Hilbert, Methoden der mathematischen Physik, Bd. 1, Kap. 6 [2d ed., Springer, Berlin, 1931]) in establishing results.

N. Levinson.

Source: Mathematical Reviews 13 No-1

KOKHIN, A. S.

"The variation of pressure in the Barotropic atmosphere." News of the Academy of Science of the USSR, 1952 Geophysical Series.

SO: Summary-D-69993, 29 July 1954.

USSR/Geophysics - Pressure Variation, Atmospheric Jul/Aug 52

"Pressure Variations in a Barotropic Atmosphere," A.S. Monin, Geophys Inst, Acad Sci USSR

"Iz Ak Nauk SSSR, Ser Geofiz" No 4, pp 76-85

Studied the structure of the velocity field in a polytropic atm. Determines the vertical component of the velocity. As a result of analyzing the connection between velocity field and pressure field,

220T53

the author explains the mechanism governing pressure variations. Acknowledges helpful advice of A.M. Obukhov, who initiated this work. Submitted 11 Feb 52.

220T53

MONIN, A.S.

Meteorological Abst.
Vol. 4 No. 6
June 1953
Synoptic Analysis
and Forecasting

551.509.31

4.6-62

Monin, A. S., O perspektivakh razvitiia kratkosrochnoi sinoptiki. [Perspectives of the
development of short range forecasting.] Vsesoiuznoe Geograficheskoe Obshchestvo, Izvestiia,
84(2):180-185, March/April 1952. 12 refs. DLC—The complimentary nature of empirical
and theoretical methods of short range forecasting are stressed. The empirical approach
represented by "Advective dynamic analysis" (ADA), developed in the Soviet Union by KH. P.
POGOSIAN and M. I. TABOROVSKII involves a three dimensional analysis of the troposphere
based upon aerological data and is especially intended for large scale disturbances of the upper
pressure pattern. It is limited by the use of 700 and 500 mb charts and it utilizes data of
vertical soundings and cross sections; and its fundamental basis is the advective and dynamic
changes of pressure and temperature and their interrelationships. The inadequacies of this
method are pointed out. The theoretical approach is concerned with the mechanism of
pressure change. The theoretical concepts on the pressure change developed by N. E. KOCHIN,
M. E. IUDIN and especially by IA. KIBEL', OBUKHOV, etc. and the significance of the concept
of "second approximation" of KIBEL' in analyzing the energy transformation in cyclo- and
anticyclogenesis are discussed. Suggestions for ways of applying hydrodynamic theory and
more intensive aerological observations by the ADA approach for short range forecasting are
proposed. *Subject Headings:* 1. Short range forecasting 2. Kibel's method of forecasting
3. Advection dynamic analysis.—*I.L.D.*

MONIN, A.S.

1.1-27 551.511:551.524:551.525:551.585.35

Monin, A. S., **O mekhanizme nagrevaniia vozdukha v otkrytoi stepi.** [The mechanism of warming of the air in the open steppe.] [In: Akademiia Nauk SSSR, Institut Geografii [and] Institut Lesa, **Mikroklimaticheskie i klimaticheskie issledovaniia v Prikaspiiskoi Nizmennosti.** Moscow, 1953. p. 100-123. 15 figs., 5 tables, 11 eq., refs.] DLC—A study of the mechanism of warming up of the air was carried out in the summer of 1951 by a group of workers of the Geophysical Institute in the area of station Dzhanybek. In this paper the author describes the equipment, the organization of measurements and the methods of determining the turbulent flow of heat on the basis of direct and indirect (gradient) measurements. It has been shown that direct and diffused radiation has a mean intensity of 1.2-1.4 cal./cm² min at noon. The turbulent stream of heat comprises about half of the heat accumulated in the soil as a result of radiation processes. The daily balance of turbulent heat exchange is about 150 cal./cm² 24 hrs. Such is the approximate value of "heat surplus" which leads to the overheating of the air masses over open steppe. Gradient measurements can be successfully made at a 4 m height. *Subject Headings:* **1. Soil-air heat exchange 2. Turbulent heat exchange 3. Steppes.**—*A.M.P.*

Monin, A. S. and Obukhov, A. M. [illegible] (Integral characteristics of turbulence in the atmospheric layer near the ground.) Akademiia Nauk SSSR, Doklady, [illegible] The inhomogeneities of air temperature [illegible]

[illegible]

[illegible] the small changes [illegible] Temperature change effects [illegible]

Subject Headings: 1. Turbulence [illegible]

USSR/Geophysics - Atmosphere's Circulation FD-1195

Card 1/1 Pub. 45-6/8

Author : Dzerdzeyevskiy, B. L., and Monin, A. S.

Title : Standard schemes for the general circulation of the atmosphere in the Northern Hemisphere and the index of circulation

Periodical : Izv. AN SSSR, ser. geofiz., No 6, 1954, pp 562-574

Abstract : The authors describe indices of circulation calculated along the parallels of latitude of the Northern Hemisphere at heights corresponding to 500 and 700 mb pressure. They analyze their connection with the elementary circulatory mechanisms. They establish a close dependence of the values of the index of circulation upon a shift of the elementary circulatory mechanisms.

Institution : Geography Institute and Geophysics Institute, Acad. Sci. USSR

Submitted : February 2, 1954

MONIN, A. S.

7.6-8

Monin, A. S. and Obukhov, A. M., Osnovnye zakonomernosti turbulentnogo peremeshivaniya v prizemnom sloe atmosfery. [Basic laws of turbulent mixing in the atmosphere near the ground.] Akademiia Nauk SSSR. Geofizicheskii Institut, Trudy, No. 24, (51):163-187, 1954. 4 figs., tables, 20 refs., 18 eqs. DLC—The processes of mixing in a turbulent atmosphere are analyzed and more exact values of the numerical parameters are calculated on the basis of an extensive amount of empirical gradient observations collected by expeditions of the Central Geophysical Observatory and Geophysical Institute of Academy of Sciences of the USSR. The empirical data on the distribution of wind velocities at different temperature lapse rates are presented and a method of calculating the "Austausch" characteristics on the basis of measurements of wind velocity and temperature gradient is developed. Subject Heading: 1. Turbulent mixing.—I.L.D. 551.511:551.551

MONIN, A. S.

MONIN, A. S. "Problems in the Theory of Atmospheric Diffusion." Acad Sci USSR. Geophysics Inst. Moscow, 1955. (Dissertation for the Degree Doctor in Physicomathematical Sciences.)

SO Knizhnaya Letopis'
No 2, 1956

MONIN, A.S.

USSR/Geophysics - Diffusion FD-1734

Card 1/1 Pub 45-6/18

Author : Monin, A. S.

Title : Diffusion with finite velocity

Periodical : Izv. AN SSSR, Ser. geofiz. 234-248, May-Jun 1955

Abstract : The author considers turbulent diffusion to be the result of the action of currents and jets chaotically distributed in the medium. He distinguishes several types of jet currents differing in magnitude and direction of velocity of the current. He assumes that the coordinate of a diffusing particle and the number of the jet type in which it is found form a Markov random process. In the presence of jet currents of just two types differing in the direction of velocity of the current, the diffusion is described by means of the telegraph equation. The author thanks A. M. Obukhov. Seven references; e.g. A. S. Monin and A. M. Obukhov, "Dimensionless characteristics of turbulence in the ground layer of the atmosphere," DAN SSSR, 93, No 2, 1953.

Institution: Geophysical Institute, Academy of Sciences USSR

Submitted : June 15, 1954

APPROVED FOR RELEASE: 03/13/2001 CIA-RDP86-00513R001135110018-0"

5034

[illegible]

polation [illegible] are derived for universal functions with [illegible]

[illegible] "[illegible] mixing in the atmosphere" [illegible] 1-F,W

(Russian)

L'auteur reprend sous une forme plus complète et plus détaillée ses recherches [illegible] dans le travail analysé [illegible]

[illegible] par rapport à une source ponctuelle. M. Kiselevich

2

[illegible], A. E. A statistical interpretation of the scattering of microparticles. Teor. Veroyatnost. i Primenen. 1 (1956), 323–343. (Russian. English summary)

1-FW

The kinetic theory of microparticles moving in a dispersive and absorptive medium is constructed on the supposition that along a random path the radius vector of the particle, the unit vector of its velocity and its energy taken together form a vector Markov stochastic process. The processes of scattering in a homogeneous and isotropic medium are considered in detail when there are no energy changes. A solution to the kinetic equation is found for these processes for the case of an instantaneous point source of particles. (Author's summary.) *D. Falkoff.*

MONIN, A.S.

Macroturbulent exchange in the earth's atmosphere. Izv.AN SSSR.Ser. geofiz. no.4:452-463 Ap '56. (MLRA 9:8)

1. Akademiya nauk SSSR, Geofizicheskiy institut.
(Atmospheric turbulence)

MONIN, A. S.

"On Turbulent Diffusion in the Surface Layer of Air," by A. S. Monin, Institute of the Physics of the Atmosphere, Academy of Sciences USSR, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 12, Dec 56, pp 1461-1473

The author studies the solution of a hyperbolic equation of turbulent diffusion in the surface layer of air with neutral stratification. The diffusion of smoke of neutral temperature from a smokestack was studied as an example. An equation of diffusion generalized for cases with an arbitrary temperature of air stratification is presented.

Sum 1258

Monin, A.S.

60-33-1/3

AUTHOR: Monin, A.S.

TITLE: A Semi-Empirical Theory of Turbulent Diffusion (Poluempiricheskaya teoriya turbulentnoy diffuzii)

PERIODICAL: Trudy Geofizicheskogo instituta, Akademii nauk SSSR, 1956, Nr 33 (160), pp. 3-47 (USSR)

ABSTRACT: This is an analysis of solutions of a parabolic equation for diffusion describing the distribution of concentration of diffusing admixtures when several admixture sources are present. A number of schemes for determining the coefficient of turbulent diffusion in the troposphere and the near-surface layer of air are examined. The author draws an analogy between turbulence and molecular diffusion and discusses a suitable equation for diffusion in the atmosphere, diffusion in a field of homogeneous turbulence, diffusion in the case of a near-surface layer of a non-stratified nature, diffusion in a thermally non-homogeneous near-surface layer of air, and the variations in velocity of the wind with altitude. There are 11 figures, 1 table, and 13 references, of which 11 are Russian, 1 English and 1 German.

AVAILABLE: Library of Congress

Card 1/1

MONIN, A. S.

"Problems of turbulent diffusion," paper submitted at International Assoc. of Meteorology Meetings, Toronto, Canada, 3-14 Sep 57

[IUGG, XI Gen Assembly]

C-3,800,327

МОНИН, А. С.

KAZANSKIY, A.B.; MONIN, A.S.

Shape of smoke jets. Izv.AN SSSR.Ser.geofiz. no.8:1020-1033 Ag '57. (MIRA 10:8)

1.Akademiya nauk SSSR. Institut fiziki atmosfery.
(Smoke) (Jets--Fluid dynamics)

MONIN, A. S.

"Smoke Propagation in the Surface Layer of Atmosphere."

papers submitted for Intl. Symposium on Atmospheric Diffusion and Air-Pollution (IUTAM) (IUGG) 24-29 Aug 58, Oxford, UK.

MONIN, A.S.

3(7) p.2 PHASE I BOOK EXPLOITATION SOV/1837

Akademiya nauk SSSR. Institut fiziki atmosfery

Raboty po dinamicheskoy meteorologii (Works on Dynamic Meteorology) Moscow, Izd-vo AN SSSR, 1958. 186 p. (Series: Its: Trudy, vyp. 2) 1,500 copies printed.

Resp. Ed.: I.A. Kibel', Corresponding Member, USSR Academy of Sciences; Ed. of Publishing House: K.P. Gurov.

PURPOSE: The issue of the Institutes' Trudy [Transactions] is intended for scientists and research workers engaged in weather forecasting and climatology.

COVERAGE: This collection of articles represents the results of 12 studies in dynamic meteorology, carried out from 1951 through 1954. They treat weather forecasting techniques using the methods of dynamic meteorology as well as general theoretical questions in the study of climate. All authors,

Card 1/4

except N.I. Buleyev and A.D. Christyakov, are associated with the Geofizicheskiy institut (Geophysical Institute of the Academy of Sciences). A.D. Christyakov and N.I. Buleyev are associated with the Tsentral'nyy institut prognozov (Central Institute of Forecasts), GUGMS. References accompany each article.

TABLE OF CONTENTS:

Works on Dynamic Meteorology SOV/1837

Card 3/4

SOV/52-3-3-3/8

AUTHOR: ~~Monin, A. S.~~

TITLE: The Structure of Turbulence in the Atmosphere (Struktura atmosfernoy turbulentnosti)

PERIODICAL: Teoriya veroyatnostey i yeye primeneniya, 1958, Vol 3, Nr 3, pp 285-317 (USSR)

ABSTRACT: The theoretical and experimental data are given for the statistical characteristics of random fields of wind velocity and turbulent fluctuations of temperature in the lowest layer of the atmosphere. Components of wind velocity u, v, w, along the Descartes coordinates x, y, z and temperature T are considered as the random functions of the coordinates x, y, z and time t . The fluctuations are considered on one and two space points so that the values of u, v, w and T can be considered as stationary. Therefore, when the mean direction of wind is represented by the axis x , the expression (1) can be formulated. The relation of the turbulent friction τ to the turbulent heat flow q can be defined as Eq.(2). The expressions "speed of friction" $v_{*} = (\tau/\rho)^{1/2}$ and

Card 1/10

"temperature flow" $q/c_p\rho$ are introduced in order to define the distance L (Eq.3, where κ and α are constants). The mean values of the wind velocity and temperature are expressed as Eq.(4) where z_0 - "degree of roughness" of the ground surface. Two conditions of the stratification are expressed by: $q<0$, $L>0$, $T_*>0$ - stable, $q>0$, $L<0$, $T_*<0$ - unstable. The universal function $f(\zeta)$ is related to the Richardson No. as shown in Eq.(5) and its properties are shown in Fig.1. The turbulence coefficient (7) can be found from the formula (6) by substitution of the formulae (2-5). The probability distribution of the values of fluctuation:

$\frac{u'}{v_*}$, $\frac{v'}{v_*}$; $\frac{w'}{v_*}$ and $\frac{T'}{|T_*|}$ at a point in the space

depends only on the vertical coordinate at the point $\zeta = \frac{z}{L}$. As the distributions of $\frac{v'}{v_*}$ and $\frac{u'}{v_*}$ are symmetrical, their standard deviations $\frac{\sigma_u}{v_*}$, $\frac{\sigma_v}{v_*}$, can be defined. The

SOV/52-3-3-3/8

The Structure of Turbulence in the Atmosphere

relations of $\frac{g}{v_*}$ to Ri are shown in Fig.2. The examples of the probability distribution of w in the unstable (a), indifferent (b) and stable (б), stratifications are shown in Fig.3. As can be seen from the graphs and table on p 292, the asymmetry of distribution of w' increases with an increase of the unstable conditions. The kinetic energy of the turbulence can be calculated from Eq.(8). Some of the results are shown in Figs.4 and 5. The second moments of u', v', w' and T' can be taken as in Eq.(2). The correlation coefficients $r_{u,w}$ and $r_{w,T}$ can be expressed as the function ζ (or Ri) (Fig.2, d, e). The third moment can be written as Eq.(9) and is related to the z' component of the turbulent energy flow. The third moment is included in the equation of equilibrium of the turbulent energy (10), where ε - rate of dissipation of turbulent energy into heat.

Card 3/10

SOV/52-3-3-3/8

The Structure of Turbulence in the Atmosphere

From Eqs.(2-4, and 9) the Eq.(11) can be formed, showing that the determination of vertical diffusion of turbulent energy, the values $D'(\zeta)$ and $1/\kappa\ f'(\zeta)$ should be equal. In order to facilitate the calculations the 2-point method is introduced. Thus, between the two points of flow the difference of wind velocities and temperature can be shown as Eq.(12) or Eq.(13). The mean squares of the Eqs.(12) and (13) are given in Eq.(14), where Δu_i, $\Delta_{\theta u_i}$ - components.

The parameters of turbulence in relation to the inert interval, ε and N, depend on the height z. These parameters are defined in Eqs.(16) and (17) (N - the molecular temperature conductivity). The probability distribution for the differences in space can be found by considering the values

$$\frac{\Delta u}{(\nu\varepsilon)^{1/4}}, \quad \frac{\Delta T}{(N^2\nu\varepsilon^{-1})^{1/4}}$$

, which represent the isotropic functions of the argument r/η. The spatial differences of wind velocity are represented by the components r_i and Δu_i, so that $r_1 = r$, $r_2 = r_3 = 0$ and

Card 4/10

SOV/52-3-3-3/8

The Structure of Turbulence in the Atmosphere

$\Delta u_1 = \Delta u_l$, $\Delta u_2 = \Delta u_n$, $\Delta u_3 = \Delta u_p$ are the coordinates. The mathematical expectation of Δu_l, Δu_n, Δu_p are equal to 0 and their 2nd, 3rd and 4th moment can be calculated from Eqs.(18), (19) and (20) where D_u and $D_{nn} = D_{pp}$, D_{lll} and $D_{lnn} = D_{lpp}$, D_{llll}, D_{llnn} and D_{llpp} and $D_{nnnn} = D_{pppp} = 3D_{nnpp}$ are not equal to zero (Eqs.21, 22 and 23). Due to isotropy, all the odd moments of the bi-dimensional distribution of Δu_n and Δu_p are equal to zero and from among even ones only the type (24) of moment is not zero. Therefore, Δu_n and Δu_p are not independent, i.e. their distribution is normal. The function (18) can be solved by the application of the formula (25) derived from the Eqs.(21) and (22). The

Card 5/10

SOV/52-3-3-3/6

value $D_{nn}(r)$ can be found from Eq.(26) which becomes Eq.(27) in the case of the indifferent stratification, i.e. small $|\zeta|$. Fig.7 shows graphs based on the formula (27) for the distances $r = 2-60$ cm and height $z = 3/2$, 3 and 15 m. Similarly, the spatial difference of temperature can be determined. The case of the values of Δ_u and ΔT being not independent can be seen from the formula (28). The difference of temperatures is calculated from Eq.(31) which becomes Eq.(32) for the indifferent stratification (small $|\zeta|$). The solution of the structural functions (the 2nd moments of the differences (13)) can be found from Eqs.(33) and (34). However, it is possible to replace them with the correlation functions of the type $b_{ww}(\theta) = \overline{w'(t)w'(t+\theta)}$ when the relation (35) is considered. An example of the function $R_{ww}(\theta)$ is shown in Fig.9. The magnitude of the turbulence L can be calculated from the formula $L = z\Lambda(\zeta)$, where $\Lambda(\zeta)$ - a universal function. It was found that it is possible to consider the various characteristics of turbulence from its spectral

SOV/52-3-3-3/8

The Structure of Turbulence in the Atmosphere

properties. Thus the spectral horizontal separation can be determined from the formula (36), where p - horizontal vector of waving, $A_i(P; z, t)$, $A_T(P; z, t)$ - spectral measurements as defined by the expressions (37). The formula (38) can be derived from Eqs.(36) and (37) where $S_{ij}(p, z)$ is waving density. The spectral functions $S_{TT}(p, z)$ are continuous on p, as shown in the relation (39) for the horizontal vector r. The formulae (40) and (42) are derived for $r = (r_1, 0, 0)$. The spectrum of the locally isotropic turbulence can be found from the formulae (43-45) and (48) where the structural functions $D_{ij}(r)$ and $D_{TT}(r)$ are expressed in terms of spectral density $E(p)$ and $G(p)$ in the formulae (46) and (47). The values of spectral densities can be found from Eq.(49). It can be added that the formula (50) which is derived from the Eqs.(48) and (49)

Card 7/10

SOV/52-3-3-3/8

The Structure of Turbulence in the Atmosphere

represents a detailed form of the expression (42). The spectral separation of time can be derived from the formulae (51) and (55). The Eq.(56) is the detailed form of the Eq. (55). Notations are: $\alpha_i(\Lambda, X)$ and $\alpha_T(\Lambda, X)$ - spectral measurements, σ_{ij} - time spectral tensor, $\sigma_{TT}(\geq 0)$ - spectral density of the temperature field, σ_{iT} - spectral density of U_i and T. The spectral analysis can be performed experimentally by means of a device (e.g. thermoanemometer) which could express the meteorological data as the fluctuations of the electric current. The frequency $\Delta\lambda$ could be obtained and thus the expressions (59) and (60) evaluated. The spectral functions could be calculated from Eqs.(62). Some results of the latter formulae for the low, medium and high winds are shown in the table on p 311, where w^{12} - energy of vertical fluctuation, q - heat flow, τ - friction. The method of spectral analysis can be employed for the determination of the dispersion, the 2nd moment (i.e. spectral function) and the various other characteristics such as anisotropy of spectral components

Card 8/10

$$\frac{\sigma_v(\Delta\lambda)}{\sigma_u(\Delta\lambda)} \text{ and } \frac{\sigma_w(\Delta\lambda)}{\sigma_u(\Delta\lambda)}$$

or the vertical turbulent flow of the energy q , i.e. the calculation of the 3rd moment of spectral component of the velocity (Eq.63). The problem of structure of the atmospheric turbulence cannot be solved without considering other factors such as pressure, turbulent acceleration and diffusion or the waving fluctuations. The structure of the pressure field can be expressed by the formula (64), while the turbulent acceleration can be found from the formula (65). The turbulent diffusion can be expressed as the coefficient $k \sim l^{4/3}$ (Ref.54) or from the formula (66) (Refs.56, 59), where the intensity G of concentration is taken into account. This concentration can be defined as the function (67) (Ref. 60). Changes in the atmosphere due to turbulence, cause fluctuations of the amplitude of the acoustic or electro-

APPROVED FOR RELEASE: 03/13/2001 CIA-RDP86-00513R001135110018-0"

SOV/52-3-3-3/8

The Structure of Turbulence in the Atmosphere

magnetic waves. The propagation of waves in these circumstances can be calculated from the expressions (68) or (69) and (70). The last formula allows the finding of the statistical characteristics $\phi(r)$ when the characteristics $\mu(r)$ are known. Then the function of the refraction coefficient can be found from Eqs.(71) and (72). The correlation between the refraction coefficient and the fluctuation of temperature or humidity can be calculated similarly (Ref.83). There are 9 figures, 1 table and 83 references, of which 45 are Soviet.

SUBMITTED: March 28, 1958.

Card 10/10

49-58-4-7/18

AUTHOR: Monin, A. S.

TITLE: The Change of Pressure in a Baroclinic Atmosphere (Izmeneniya davleniya v baroklinnoy atmosfere)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, 1958, Nr 4, pp 497-514 (USSR)

ABSTRACT: Electronic computers have made it possible to integrate the hydrodynamic and thermodynamic equations numerically to obtain values for the pressure, temperature and wind. Attempts have been made in many countries to simplify the dynamical equations of the atmosphere by the quasigeostrophic approximation. This uses the fact that the pressure gradient and the Coriolis force almost balance so that the relative acceleration of the air particles is small compared with the Coriolis acceleration. In this case, the wind is close to the geostrophic. The author reviews the main progress in the theory of pressure changes. I. A. Kibel' put forward the idea of a quasi-geostrophic approximation in 1940. In 1949, A. M. Obukhov gave a much fuller account connecting the pressure field and the wind field. Obukhov showed, in the simplest case of a barotropic atmosphere, that, at the break-

Card 1/11

49-58-4-7/18

The Change of Pressure in a Baroclinic Atmosphere.

down of geostrophic conditions, high-velocity waves are generated. As a result, the pressure field adapts itself to the velocity field. The transfer of velocity vortices seems to be a basic factor in the change of velocity and pressure with time. The basic results for the geostrophic approximation in a baroclinic atmosphere were obtained in the USSR by Obukhov and also, independently, by N. I. Buleyev and G. I. Marchuk. They were also derived in other countries. The author now gives the baroclinic work in detail, starting with the dynamical equations of the atmosphere in the quasistatic approximation. There are many problems (slow synoptic processes, high frequency perturbation processes, etc.) in which vertical motion of the air particles can be represented by static equations. In the quasi-static approximation the vertical velocity of the disturbance is infinite. In this system a change of coordinates is possible - a non-stationary set given by the x- and y-planes and the isobaric p-plane. p is now the independent variable and the new function in the dynamical equations is the height of the isobaric surface, i.e., $z = z(x, y, p, t)$. The author gives the equations in this system. They include an important coefficient, α^2 , the baroclinic parameter, which

Card 2/11

The Change of Pressure in a Baroclinic Atmosphere.

is considered constant in subsequent work (in the troposphere α changes slowly and is approximately equal to 0.1). The Coriolis coefficient is taken to be constant. Five equations are derived: (1) projected motion on the x and y coordinate axes, (2) the equation of continuity (the simple form obtained is one of the advantages of the non-stationary coordinate system), (3) heat flow equation, (4) the hydrostatic equation, and (5) the Chapeyron equation. There is a simple transition in the limiting case from the baroclinic to the barotropic atmospheres. This occurs when $\alpha = 0$ and the density and the pressure are related adiabatically. The greatest use of the non-stationary coordinate system is the reduction from six equations in u, v, w, p, ρ and T to four in u, v, w^*(= dp/dt) and z. Also, w^* can be easily eliminated by integrating the continuity equation with the boundary conditions, $w^* \to 0$ as $p \to 0$ and $w \to 0$ as $z \to 0$. Substitution is made in the resultant expression not for $z = 0$, but for a nearby isobaric surface $p = p_g$ at height z'. The fact that it is impossible to use the boundary condition $z = 0$ (at the Earth's surface) is the major drawback of the stationary method. The boundary

49-58-4-7/18

The Change of Pressure in a Baroclinic Atmosphere.

expression thus obtained, together with the dynamic (with w^* eliminated) are the basic equations for a baroclinic atmosphere. The author next introduces dimensionless quantities which are dependent on a characteristic horizontal length and velocity. In high-frequency perturbation processes, the length used is that introduced by A. M. Obukhov and the velocity is that of sound. In synoptic processes, the length $\sim 10^3$km and the velocity ~ 10m/sec. The author introduces two ratios expressed in terms of these quantities - ε and β - ε represents the ratio of the characteristic relative vortex motion and the transfer motion and β represents the influence of the two-dimensional compressibility of the medium (i.e., the deformability in the horizontal plane). In synoptic processes, $\varepsilon \sim 10^{-1}$ and $\beta < 1$; for high-frequency perturbations, $\varepsilon = \beta = 1$. The equations for a baroclinic atmosphere in a dimensionless form are next used to obtain expressions for the vertical component of the relative turbulent velocities and for the horizontal divergence of the velocity. An expression is then derived for the change of $\partial z/\partial p$ with time. This is referred to as the change of pressure equation. High velocity perturbations generated in the atmosphere are due to differences between

Card 4/11 the velocity and pressure fields. The equations in this

49-58-4-7/18

The Change of Pressure in a Baroclinic Atmosphere.

case will have $\varepsilon = \beta = 1$. It is assumed that the waves are of small amplitude so that non-linear terms can be ignored and the total differential can be replaced by the partial differential. An integral expression for $\partial z/\partial t$ is then derived. At this point, stream and potential functions, ϕ and φ are introduced, equations in terms of ϕ , φ and z (all as functions of x , y and p) are obtained. The equations are not altered by adding an arbitrary function of p hence they are so chosen that $z(x, y, p, t)$ represents deviation of height of isobaric surface from standard corresponding to hydrostatic equilibrium. The equations have a family of stationary solutions for each of which $\overline{\varphi} \equiv 0$ and $\overline{\phi} \equiv \overline{z}$:- equivalent to a theorem by Jeffreys that in the field of a geostrophic wind the pressure does not change. It is sufficient, for stationary solutions to fulfil the condition $\varphi \equiv 0$. The author shows that this condition together with $\phi \equiv z$ need only be fulfilled at one fixed moment of time. There are also non-stationary solutions for which the potential turbulence is identically equal to zero - this is called,

Card 5/11

after Obukhov, the wave solution. The solutions of the equations for arbitrary initial values can be written as a sum of stationary solutions. The conditions under which high velocity perturbations will not be generated are expressed by the formula for the geostrophic wind. On the other hand, deviations of the wind from the geostrophic must generate these perturbations. If at the initial moment of time, the wind, in a limited region of space, deviates from the geostrophic, then the resultant perturbations will die away with time, so that the initial energy is dispersed throughout all the volume. This provides a mechanism for the pressure to adjust itself to the wind. Obukhov gave the solution for a barotropic atmosphere while I. A. Kibel' considered the case of a baroclinic atmosphere. The latter ignored, however, the waves which arose most rapidly. The author describes the limiting stationary state which the atmosphere approaches under the given initial conditions. This is characterized by a stream function $\bar{\Phi}$ which is defined in terms of $\underline{\Phi}$ - an integral function of $\bar{\Phi}$ and p . This integral is then transformed by the introduction of a source function in the same variables. Next, the high velocity waves are described in terms of a perturbed velocity potential. A function $\underline{\Phi}$ -

49-58-4-7/18

The change of Pressure in a Baroclinic Atmosphere.

similar to $\bar{\Phi}$ (and a function of p and the perturbed velocity potential) - is defined and then transformed into an integral of the same source function. The expression in this case describes two types of waves - the first arises in a barotropic atmosphere during the breakdown of the geostrophic balance, whilst the second corresponds to a slower wave which does not occur in a barotropic atmosphere. The author then takes the limiting case, $\alpha \rightarrow 0$, in the formula for the barotropic atmosphere. $\bar{\Phi}$ and Φ go in the limit to the stream and velocity potentials, and the source function becomes a cylindrical function. The equation for the waves becomes in the limit the usual wave equation together with a factor representing the effect of gyroscopic rigidity. (The simplifications made by I. A. Kibel' were such that, when $\alpha \rightarrow 0$, the corresponding functions tended to zero rather than their values in a barotropic atmosphere). During the adjustment of pressure to wind, the velocity changes relatively little whilst the press distribution changes quickly, approaching that connected with the geostrophic wind. With given values of the parameters it is calculated that the kinetic

Card 7/11

energy in the process of adjustment decreases by 3% due to wave formation and creation of non-uniform pressure. It has been shown that in the linear approximation the atmospheric motion, corresponding to fixed initial conditions, consists of two components (stationary and wave motion). In the real atmosphere, inertia (corresponding to non-linear terms) constantly causes a deviation of the wind from the geostrophic, leading to a generation of waves and, hence, energy dissipation, i.e., corresponding to the stationary solutions of the linearized equations are the quasi-stationary solutions of the non-linear equations which describe the slow change of the corresponding velocity and pressure fields. Only such slow processes are of interest for synoptic meteorology. In order to separate the quasi-stationary solution of the non-linear equations, use is made of the fact that the velocity field of this solution must be close to the geostrophic wind field and, in particular, the potential component of the velocity field must be small in comparison with the solenoidal component. This is defined more precisely using the dimensionless equations L and U which characterize synoptic processes. The velocity functions are of the order of unity. This gives small dimen-

49-58-4-7/18

The Change of Pressure in a Baroclinic Atmosphere.

sionless deviations of the wind from the geostrophic and provides a criterion for the separation of the quasi-stationary solution from other solutions. The quasi-stationary solution (u, v, z) can be found in terms of an asymptotic series in ε, the chief members of which are connected by the relationships of the geostrophic wind. Such series are called the quasi-geostrophic resolution. From this, the wind field can be calculated from the pressure field with an accuracy of $\sim\varepsilon^2$. The author obtains an equation for ϕ in terms of z and ε, which he calls the balance equation. The determination of the wind field from the pressure field, with the help of the balance equation, is considerably more accurate than from the formula for the geostrophic wind. If we assume $\varepsilon = 0$, the system of dynamical equations for the atmosphere simplify. This is called the quasi-geostrophic approximation. Equations are obtained for $\partial zo/\partial t$ in the case of a barotropic atmosphere ($\alpha = 0$) when the partial differentials of z with respect to x, y and t are independent. The equation is linear inhomogeneous of an elliptic type. In the case of a baroclinic atmosphere the equation for $\partial zc/\partial t$ shows that the

Card 9/11

49-58-4-7/18

The Change of Pressure in a Baroclinic Atmosphere.

rate of change of $\partial z_0/\partial t$ with pressure depends on the turbulent eddy transfer and also the temperature transfer. This is expressed in two equations containing the source function. This consists of two factors, one, the solution of an inhomogeneous equation with homogeneous boundary conditions and the second a solution of a homogeneous equation with inhomogeneous boundary conditions. To obtain further accuracy an analysis is made of the divergences in the calculations:
(1) An insufficiency and inaccuracy of data on the pressure, temperature and wind fields, which necessitates interpolation between data from neighbouring meteorological stations and correcting of dubious data. For this end, a method of 'objective analysis' has been worked out. In this the necessary data at each fixed point are determined by a statistical method from the data supplied from surrounding stations and known from previous periods of time.
(2) Errors connected with the mathematics, e.g., exchange of integrals by finite sums and of differential operators by differences.
(3) The physical limitations of the theoretical work. These include increases of accuracy due to introducing: a correction to the quasi-geostrophic approximation (e.g. more numbers

Card 10/11

49-58-4-7/18

The Change of Pressure in a Baroclinic Atmosphere.

in the series), a change of the baroclinic parameter, α^2 with space and time, and a consideration of non-adiabatic factors - turbulent friction, thermal conductivity and radiational energy sources (including the screening action of clouds, the consequences of phase changes in the water vapour and the influence of the Earth's relief). There is 1 figure and 12 Soviet, 4 English references.

ASSOCIATION: Akademiya nauk SSSR, Institut Fiziki Atmosfery (Academy of Sciences USSR, Institute of Physics of the Atmosphere).

SUBMITTED: April 26, 1957.

1. Atmosphere—Pressure 2. Atmosphere—Mathematical analysis 3. Mathematical computers—Performance 4. Atmosphere—Meteorological factors

Card 11/11

SOV-49-58-6-4/12

AUTHORS: Kazanskiy, A. B. and Monin, A. S.

TITLE: Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification (O turbulentnom rezhime v prizemnom sloye vozdukha pri neustoychivoy stratifikatsii)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, 1958, Nr 6, pp 741-751 (USSR)

ABSTRACT: It is important in many practical cases to determine the basic properties of turbulence from changes in gradients (e.g. of air temperature). A. M. Obukhov and A. S. Monin have put forward a suitable representation (Refs.1-5) based on similarity theory. In their theory a stationary turbulent regime is represented by the following parameters: v_* - the frictional velocity; q - the turbulent heat flow (or $q/c_p\rho$, where c_p and ρ are the specific heat and air density, which can be considered standard) and g/T_0, where g is the acceleration due to gravity and T_0 is the average air temperature in the surface layers. From these parameters, a scale length, velocity and temperature can be defined:

Card 1/16 14

SOV-49-58-2-4/12

$$L = -\frac{v_*^3}{\kappa \frac{g}{T_0} \frac{q}{c_p \rho}}, \quad V = \frac{v_*}{\kappa}, \quad T_* = -\frac{1}{\kappa v_*} \frac{q}{\alpha c_p \rho} \qquad (1)$$

where κ is the Karman constant; $\alpha = K_T/K$ is a universal dimensionless constant; K_T is the turbulent heat conductivity coefficient and K is the turbulent viscosity coefficient. For wind velocity v and air temperature T as functions of height z and thermal stratification of the atmosphere, Eqs.(2) and (3) result. Where z_0 is the roughness height, $f(\xi)$ is a universal function with an undefined constant term (since it only enters as a difference). Eqs.(2) and (3) give Eq.(4) for the Richardson number. For small values of the argument, $f(\xi)$ has the form Eq.(5). The existence of a universal function $f(\xi)$ was confirmed by experimental data (Ref.4).(A value $\beta \simeq 6$ was obtained). The form of $f(\xi)$ in cases of stable stratification was studied in (Ref.6). This article studies the form of $f(\xi)$ in unstable stratifications

$(q > 0$ and, hence, $L < 0$ and $\xi = z/L < 0)$

2/15

<u>1. Free Convection.</u> From Refs.1-5, it follows that consideration of the asymptotic form of the wind velocity profile at great heights in an unstable stratification (i.e. determination of the asymptotic form of $f(\xi)$ for large negative

values of ξ) is equivalent to consideration with fixed z and $q > 0$, $v_* \to 0$. Thus in an unstable stratification, the turbulent regime at great heights approximates to that of purely thermal turbulence without wind (i.e. free convection). For free convection, $v_* = 0$ and the turbulence is characterised by the parameters g/T_0, $q/c_p\rho$ (turbulence obtains energy only from the thermal stratification instability energy). It is impossible to form a scale length from these parameters. Thus this case is characterised by combinations of $q/c_p\rho$, g/T_0 and z. In particular,

Card 3/16

Eq.(6) is obtained for $T(z)$: where c is a universal dimensionless constant (>0); T_∞ is a constant with dimensions of temperature and the factor $\frac{1}{\alpha^{4/3}}$ is introduced for convenience in future calculation Eq.(6) can be rewritten in the form shown:

$$\frac{T(z)-T(z_0)}{T_*} = c\left(\frac{z}{L}\right)^{-1/3} - c\left(\frac{z_0}{L}\right)^{-1/3}$$

which, on comparison with Eq.(3), gives the asymptotic form Eq.(7) for $f(\xi)$ as $\xi \to -\infty$. Eq.(6) shows that, as the height increases, the temperature distribution approaches the isothermal. This is natural since, for an unstable

Card 4/16 /5

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

stratification, the turbulent elements reach a great size at large heights, producing mixing which levels out the temperature profile. Differentiating Eq.(6) with respect to z gives Eq.(8), which gives Eq.(9) for the turbulent heat flow, q, in free convection. It follows from Eq.(8), that, in such conditions, the turbulence coefficient (Eq.10) grows rapidly with height, due to the increase in the turbulent elements and the increase in the intensity of the pulsations (proportional to $z^{1/3}$). The turbulence scale length, ℓ, is distinguished from z only by a numerical factor, which is denoted by $\kappa\lambda_{\infty}$. Putting $\ell = \kappa\lambda_{\infty} z$ and assuming that in free convection $\ell = \kappa z$, we have $\lambda_{\infty} > 1$. The scheme outlined above corresponds to that suggested by A. A. Skvortsov (Ref.7), except that he uses a discrete spectrum of turbulent scale lengths, whereas the authors use a continuous spectrum. To determine the turbulent heat flow q and the exchange coefficient K in free convection, it is sufficient to measure the difference in temperature at two heights. Suppose these are $z = 2H$ and $z = H/2$ (where $H \sim 1-2$ m). Put $\Delta T = T(2H) - T(H/2)$. Then from

SOV-49-58-6-4/12

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

Eq.(5) an expression for ΔT is obtained which gives Eq.(11) for q. Thus q is differentiated from $H^{\frac{1}{2}}|\Delta T|^{\frac{3}{2}}$ only by a constant, universal (but not dimensionless) factor. Substituting in Eq.(10) z = H and the value of q from Eq.(11), Eq.(12) is obtained. Hence K(H) is distinguished from $H^{\frac{3}{2}}|\Delta T|^{\frac{1}{2}}$ only by a constant universal factor. Taking κ = 0.43; α = 0.8; c = 1 from the experimental data given below, and putting T_0 = 300°C (ΔT in °C, H in metres) Eqs.(13) are obtained.

2. The general case of an unstable stratification. In considering the form of $f(\zeta)$ in this case, it is convenient to consider the function F(Ri) - Eq.(14) - introduced by Priestley (Ref.9) and constructed on the basis of measurements made by Swinbank (Ref.10). These results were confirmed by

Card 6/16 15

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

Taylor (Ref.11) and Priestley (Ref.12). Using Eqs.(1) and (3), F(Ri) and $f(\xi)$ are found to be connected by Eq.(15). Formula (4) and (5) indicate that, for small $|\xi|$, $f'(\xi) \approx \approx 1/\xi$ and $Ri \approx \xi/\alpha$. If the asymptotic formula (7) for $f(\xi)$ at large $|\xi|$, Eq.(16) is obtained for F(Ri) at small and large $|Ri|$. The first of these asymptotic formulae corresponds to a logarithmic law for the wind velocity and temperature profiles (i.e. acts at a fixed $L<0$ for small heights z). If function F(Ri) is plotted on a graph with $\lg|Ri|$ as the abscissa and $\lg F(Ri)$ as the ordinate, the asymptotes of F(Ri) in terms of Eq.(16) will be two intersecting straight lines: for small $|Ri|$ with slope -1/2 and for large $|Ri|$ parallel to the axis with an ordinate F_∞. F(Ri) must decrease monotonically as $|Ri|$ increases since $F(Ri) \geq F_\infty$. The asymptotes of F(Ri) intersect at a point given by Eq.(17). Empirical data indicate that $|Ri^*|$ is of the order of several hundredths; but the empirical graph given by Obukhov-Monin indicates that $f(\xi)$ at e.g.

SOV-49-58-6-4/12

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

$|Ri| < \frac{1}{10}$ is practically given by a logarithmic law. Hence for $|Ri| < |\overset{*}{Ri}|$, $F(Ri)$ practically coincides with its asymptote $F(Ri) = \kappa^2 \alpha |Ri|^{-\frac{1}{2}}$. If $|Ri| > |\overset{*}{Ri}|$, it follows further, that $F(Ri) = F_\infty$, i.e. practically coincides with the second asymptote. Hence, the transitional zone between the two regions must be negligible. If: $\xi\ (<0)$ is the root of $\frac{1}{f'(\xi)} = \alpha \overset{*}{Ri}$, it can be said that, for unstable stratification with $z < \overset{*}{\xi} L$, the profiles of wind velocity and temperature are described by a logarithmic law and with $z > \overset{*}{\xi} L$, the mixing mechanism is almost the same as in free convection. Neglecting any transitional region between the two limiting conditions and changing from

Card 8/16 25

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

F(Ri) to $f(\xi)$ (considered continuous), the interpolation formulae (Eq.18) are put forward. Fig.1 gives an empirical graph of F(Ri) according to Taylor (Ref.11). The mean square deviation (indicated by the lines) is quite large. (Priestley stated the pulsational method of measuring the turbulent heat flow was insufficiently sensitive at high frequencies). Nevertheless, the points define the two regions quite accurately. The parameters on the graph are $|Ri|$ and F_∞ from which, knowing κ , the constants α and c can be calculated from Eqs.(16) and (17). Priestley (Ref.9) obtained the value 0.68 for F_∞ (which he considered too low), whilst Taylor obtained 0.79 ± 0.04. In (Ref.12), Priestley estimated a value 0.8 - 1.0. The value of $|Ri^*|$ lies in the interval 0.025-0.04. The authors find a value for α of 0.82 (the accuracy being small, however) and they use values c = 1, α = 0.8, κ = 0.43, which gives results in Eq.(18) agreeing with the empirical graph for $f(\xi)$ of Obukhov and Monin. Calculation of the straight lines in the method outlined above was carried out by several authors before

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

Priestley. Thus Pasquill (Ref.13) published graphs of the function (19), where E is the evaporation rate, χ the absolute humidity and α_1 the ratio of the exchange and motion coefficients. Pasquill's measurements were repeated by Rider (Ref.14), who also drew graphs of the function (20). Values for the turbulent frictional stress, $\tau = \rho v^2$, were determined by Rider, using a direct, dynamometric method, first suggested by Sheppard. Finally, Deacon (Ref. 15) drew graphs of the function (21), where v_* is determined by a pulsational method. (The functions $F_1(Ri) - F_4(Ri)$ are connected with Priestley's function as shown). Although all this experimental material could be collated it is in such poor agreement that further experimental data is required. Functions $F_3(Ri)$ and $F_4(Ri)$ are particularly suitable for determing κ - $F_3(0) = \kappa^2$; $F_4(0) = \kappa$. The value $\kappa = 0.4$ seems to be in good agreement

SOV-49-58-6-4/12

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

..th the experimental data.

2. Interpretation of gradient measurements. To determine L, v_* and q , a method similar to that in Ref.6, for stable stratification, is used. Suppose v(H) and $\Delta T = T(2H) - T(H/2)$ have been measured and z_0 is known. (The latter is normally obtained by extrapolation to zero of the velocity of the wind velocity profile). The Richardson number (Eq.22) is first calculated from the gradient measurements. Putting $L_1 = L/H$ and using Eqs.(1)-(3), Eq.(22) can be written in the form Eq.(23). Substituting Eq.(18) in this equation, L_1 can be determined from σ and ζ_0 . Fig.2 gives a nomogram for determining L_1 from σ and ζ_0 - as derived from Eqs.(23) and (18). For large negative values of L_1

$$\sigma \sim \frac{1}{L_1} \frac{\ln 4}{(\ln \zeta_0)^2}$$; for small negative values

Card 11/16

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

$$\sigma \to -\frac{2^{1/3} - 2^{-1/3}}{c(1 - \zeta_0^{-1/3})^2} L_1^{-4/3}$$. In determining the

frictional velocity v_*, Eq.(24) (derived from Eq.2) can be used, and a nomogram for v_*/v can be derived from σ and ζ_0, using Eq.(18) (Fig.3). For large negative values of L $\frac{v_*}{v} \sim \frac{\kappa}{\ln 1/\zeta_0}$ and for small negative values

$$\frac{v_*}{v} \sim \frac{\kappa}{c(1 - \zeta_0^{-1/3})} L^{-1/3}$$. Using Eqs.(1)-(3), Eq.(25)

is obtained for the turbulent heat flow. Fig.4 gives the

SOV-49-58-6-4/12

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

nomogram for $q/\alpha v \Delta T$. For heights of measurement higher than the dynamical turbulence layer. Eq.(13) can be used for determining q and K if the condition Eq.(26) holds. Values of Eq.(26) are given in a table. Swinbank's results confirm Eq.(13) and the numerical coefficient (0.14) therein used. Fig.5 gives a nomogram for calculating Eq.(13) (the abscissa is $|\Delta T|$ in degrees and the ordinates, q in cal/cm²/min and K m²/sec). The continuous line represents measurements of q at H = 1 and 2 m, and the dotted line represents K(H) at these heights.

4. Scale of turbulence. As shown above $\ell = \kappa \lambda_{\infty} z$.

According to similarity theory, in the case considered, $\ell = \kappa \lambda (z/L) z$ (where $\lambda(0) = 1$ and $\lambda(-\infty) = \lambda_{\infty}$) . To determine $\lambda(\xi)$ and in particular λ_{∞} , Eq.(27) (used in Refs.1, 2 and 6) is employed. Deleting K , using Eqs.(1), (3) and substituting $\ell = \kappa \lambda(\xi) z$, gives Eq.(28). For small negative values of ξ , it is found from Eq.(5) with $\beta = 0.6$

Card 13/16

that:

$$\ell = \kappa z \left[1 - \frac{7}{20} \frac{z}{L} + O\left(\frac{z^2}{L^2}\right)\right] .$$

For large negative values of ξ, it is found from Eqs.(7) and (28) that:

$$\lambda(\xi) = \left(\frac{3}{c}\right)^{3/4} \left(1 + \frac{c}{3} \xi^{-4/3}\right)^{-1/4} .$$

Thus $\lambda_{\infty} = \left(\frac{3}{c}\right)^{1/4}$. If c is close to unity λ_{∞} is close to $1/\kappa$ and, hence, in free convection, ℓ is asymptotically equal to z. Substituting in Eq.(28) :

SOV-49-58-6-4/12

Turbulence in the Surface Layers of the Atmosphere and in the Presence of Unstable Stratification.

$$f'(\xi) = \begin{cases} \dfrac{1 + \beta\xi}{\xi} & (\xi_1 \leq \xi < 0) \\ -\dfrac{c}{3}\xi^{-4/3} & (\xi \leq \xi_1) \end{cases}$$

where ξ_1 is determined from the fact that $f'(\xi)$ must be continuous), Fig.6 is obtained for the function $\ell/z = \kappa\lambda(\xi)$. This represents the growth of turbulent elements with height for unstable stratification.
There are 6 figures, 1 table and 15 references, 8 of which are Soviet and 7 English.

AS, USSR - Inst. of Atmospheric Physics

Card 15/15

SOV/49-58-10-11/15

AUTHOR: [redacted]

TITLE: The Pre-calculation of Zonal Circulation Characteristics of the Atmosphere (O predvychislenii kharakteristik zonal'noy tsirkulyatsii atmosfery)

PERIODICAL: Izvestiya Akademii Nauk SSSR, seriya geofizicheskaya, 1958, Nr 10, pp 1250-1253 (USSR)

ABSTRACT: The evolution of atmospheric processes depends on the energy sources and currents rather than on the initial conditions. If the scale is large enough, however, these energy sources can be ignored. Although the inaccuracy in the initial data leads to errors increasing with time, these inaccuracies usually concern small-scale processes. Hence, long-range forecasts must be based mainly on the large-scale processes, although the small-scale processes must still be considered as fluctuations on the main process. It is possible, in principle, to obtain equations from the dynamic equations for the macrocomponents (analogous to Reynold's equations in turbulence theory) together with subsidiary equations for the microcomponents (analogous to the Friedman-Keller equations in turbulence theory). This approach is applied to the prediction of zonal circulation characteristics. This requires simultaneous examination of the zonal

Card 1/4

-58-10-11/15

The Pre-calculation of Zonal Circulation Characteristics of the Atmosphere

streaming characteristics (Ref.1) and the statistical characteristics of azonal disturbances (Ref.2). The author writes the dynamical equations in the idealized forms Eqs. (1), (2) and (3) (the symbols have their normal significance - u, V being the velocity components along latitude and longitude). The zonal circulation provides the macro-components of the atmospheric processes. Then the azonal (varying with longitude) processes form the microcomponents.. The macrocomponent characteristics can be obtained by averaging over a circle of latitude (denoted by a bar). The micro-components (denoted by a dash) are considered as accidental fluctuations. Using these definitions in the dynamic equations gives $(\bar{1})$ and $(\bar{2})$ as the macrocomponent equations and (1'), (2') and (3') as the microcomponent equations. The circulation index $\alpha (= \bar{u}/R \sin \theta$ is now introduced. For ease of calculation, Eqs.(1')-(3') are used only for determining the statistical characteristics of the microcomponents

Card 2/4