

PROFESSOR A. ZÁTOPEK
SEPTUAGENARIAN

At the height of his creative power, Professor Alois Zátópek lives to be seventy this year, in full vital strength and vigour.

Professor A. Zátópek contributed essentially to the knowledge of European seismicity, he was deeply involved in analysing the mechanism, properties and origin of microseisms propagating across the European continent. He has had the leading rôle in the efforts aimed at magnitude scale unification, carried out extensive and profound studies of the properties of the earthquake magnitude, which is a key quantity for earthquake energy determination, and he has contributed to the theory of seismographs, especially to the detailed study of the relation between seismograph and ground-motion. Having applied an original statistical method to East-Alpine earthquakes, thirty years ago Professor Zátópek was the first to determine the deep structure of the Bohemian Massif. Professor Zátópek has devoted a great deal of his efforts to the organisation of seismological studies in Europe taking over successfully the duties of Vice-President (elected in Alicante 1959 until 1962) and President (elected in Jena 1962, re-elected in Budapest 1964 until 1966) of the European Seismological Commission, and organizing, moreover, seismological studies of the Carpathians and Balkans as head of the respective Sub-Commission of the European Seismological Commission (1960–1970). Both the research and scientific coordination of Professor Zátópek had considerable influence on the further development of European seismology and stimulated new investigations.

His missions as United Nations and UNESCO expert were very important. On mission for these organisations he carried out intense studies of catastrophic earthquakes (Skopje Earthquake 1963, Varto-Ústükran Earthquake, Turkey 1966, Mudurnu-Valley Earthquake, Turkey 1967). These investigations were concerned mainly with the determination of the exact positions and depths of earthquake foci, the type of vibrations generated in the soil, the behaviour of different types of buildings with respect to their resistance under earthquake stresses, a detailed study of seismicity of the focus region, etc. The main purpose of these missions was finding effective measures to moderate the catastrophic earthquake. In connection with the UN and UNESCO bodies Professor A. Zátópek was involved in the following activities:

Member of United Nations Body for Detection and Identification of Nuclear Explosions, Geneva 1958; Member of a joint UN/UNESCO Mission to Skopje, 1963–64; Member of United Nations Consultant Board for the Reconstruction of Skopje – President of the “Science” group, 1964–66; Rapporteur Général of the UNESCO Intergovernmental Meeting of Seismology and Earthquake Engineering, Paris 1964; Member of an UNESCO Mission to Turkey at the occasion of the Varto-Ústükran Earthquake, 1967; Member of an UNESCO Mission to Turkey at the occasion of the Mudurnu-Valley Earthquake, 1967; UNESCO expert in seismology

and Chief Technical Adviser to the International Institute of Seismology and Earthquake Engineering, Tokyo, 1968–69; Permanent UNESCO Expert in Seismology; Permanent Consultant of the UN for Earthquake Catastrophe Prevention.

Professor Zátpek's scientific reputation, his enthusiastic work for the benefit of mankind, his human qualities and his merits have been highly acknowledged. His contribution to Czechoslovak and European Science has been recognized by state authorities and foreign organizations alike:

In 1953 he was elected Corresponding and in 1968 Full Member of the Czechoslovak Academy of Sciences. In recognition of his outstanding scientific abilities he was awarded the State Prize for Science in 1957, which was bestowed upon him for his investigations relating to the seismicity of Czechoslovakia. In 1960 he received the Euler Medal from the Academy of Sciences of the U.S.S.R., in 1964 he was elected Honorary Member of the Society of Hungarian Geophysicists, in 1964 he was awarded a Medal from the City of Skopje, in recognition of his merits for the reconstruction of Skopje, in 1965 he received the Commemorative Medal of the Charles University in Prague, in 1967 the Order of Labour was bestowed on him by the President of the CSSR in recognition of his work, in 1968 he was elected Member of the German Academy of Science LEOPOLDINA, Halle/Saale, in the same year he received the Gold Medal of the Charles University in recognition of his merits in developing it. In 1971 he received the Kepler Medal, in 1972 the Gold Medal of the Czechoslovak Academy of Sciences for Merits in respect of Science and Mankind, in 1973 he was awarded the Kopernik Medal by the Ministry of Culture and in 1976 the Medal of the Commission of the Academies of Socialist Countries for Planetary Geophysical Research for outstanding scientific and organizational work in this international body and similarly the Medal of Czechoslovak Meteorology Society of Czechoslovak Academy of Sciences for his merits in the branch of Meteorology, in 1977 the Gold Medal of the Czechoslovak Academy of Sciences for his merits in Physical Sciences.

Alois Zátpek was born at Zašová (in Moravia, Czechoslovakia) on June 30th, 1907, the son of stone-cutter. He was enrolled in the Faculty of Sciences of the Charles University in Prague in 1927. In 1932 he submitted his thesis on energy relations in two inductively coupled oscillatory circuits; in the same year he graduated with honours in mathematics and physics from the Charles University in Prague. In 1934 he became a member of the staff of the State Geophysical Institute in Prague. There he dealt mainly with seismological problems, especially with physics of the Earth's interior and applied geophysics (1934–1950).

In 1935 Dr. A. Zátpek became head of the Czechoslovak Seismological Service and he organized the modern Czechoslovak seismic network. He led the Czechoslovak Seismological Service until 1954 and brought it to a high international standard. In 1938 he was elected a member of the National Committee of Geodesy and Geophysics. During World War 2 he was forced to work in the Geophysical Institute of the German University in Prague as seismologist. After World War 2 (1945–50)

he was appointed Deputy-Director and Head of the Seismological Department of the State Institute of Geophysics in Prague.

In 1946 he habilitated in geophysics and was appointed Associate Professor of Geophysics at the Faculty of Sciences of the Charles University in Prague. In 1948 he was elected member of the National Research Council. During the period 1948 to 1964 Professor Zátpek acted as Secretary General of the National Committee of Geodesy and Geophysics. During the periods 1948–1951 and 1960–1963 he was member of the Executive Committee of the International Association of Seismology (elected at the Oslo and Helsinki IUGG General Assemblies, respectively). Since 1956 he has been active as the Titular Member of the European Seismological Commission for Czechoslovakia. In 1951 he was appointed Director of the Geophysical Institute of the Charles University, and in 1952 Professor of Geophysics.

Professor A. Zátpek was a member of the Technical Assistance Mission sent out by UNESCO to Yugoslavia, upon request of the government of this country, to study the mechanism and effects of the destructive Skopje Earthquake of July 26, 1963. During his three months stay in Yugoslavia, Professor A. Zátpek made an authoritative study of this earthquake and of the seismicity of Macedonia.

During the period of 1965–1970 Professor Zátpek acted as President of the National Committee of Geodesy and Geophysics and from 1966 to 1976 as Chairman of the Scientific Board of Astronomy, Geophysics, Geodesy and Meteorology.

Professor A. Zátpek was elected member of the IASPEI Organizing Committee at the IUGG Assembly in Zurich in 1967, Representative of the International Association of Seismology in the European Commission for Earthquake Engineering in 1969 and member of the Executive Board of this Commission.

Between November 1968 and November 1969, Professor A. Zátpek carried out a mission for UNESCO as Chief Technical Adviser to the United Nations Development Programme Special Fund Project at the International Institute of Earthquake Engineering and Seismology in Tokyo. In the course of his mission, he was called upon to advise on matters concerning the general policy of the Institute in introducing the so called second phase of curricula and relations with Japanese and foreign institutions. He also took part in the tutorial and research activities of the Institute.

Professor A. Zátpek published over 200 papers; most of them are listed below.

Professor Zátpek's solid, forthright way of attacking geophysical problems, utilizing a profound knowledge of physics, mathematics, statistics and geology, have set an exemplary standard for his colleagues and students. He is known internationally for his natural talent as a teacher-lecturer because of his curious and speculative intellect. His impact on education in geophysics is also attested by the fact that the majority of Czechoslovak geophysicists are his former students. They were lucky to attend his excellent courses in geophysics. (The photograph on the title page is from the special course "Physics of the Earth crust and mantle" held on Nov. 10, 1976.) They equally enjoyed his brilliant performance of classical music. As an active vio-

loncellist he has played as soloist and member of the string quartet of the Faculty. He always cordially invited the students to share the joy of listening to fine music.

The Editorial Board of the journal as well as the whole Czechoslovak Geophysical Community wishes our jubilant good health, happiness and many years of further active work in the field of geophysics.

Editorial Board

List of Publications

- [1] Dva nezávislé důkazy rotace zemské při pokusu s Foucaultovým kyvadlem. Rozhl. mat.-přír., 11 (1932), 44.
- [2] A Contribution to the Experimental Examination of Energy Relations in Two Inductively Coupled Oscillatory Circuits (in Czech), Čas. pro pěst. mat. a fys., 62 (1933), 233.
- [3] Bulletin séismique de Praha, 1934, I et II. Publ. Stát. úst. geofys. (SÚG), Praha 1934.
- [4] Ditto, Année 1935, I—IV. Publ. SÚG, Praha 1935.
- [5] Ditto, Année 1936, I—IV. Publ. SÚG, Praha 1936.
- [6] Bulletin annuel de Praha, Année 1928, 1929, 1930, 1931, 1932, 1933. Publ. SÚG, Praha 1936.
- [7] Zur experimentellen Untersuchung der energetischen Verhältnisse in zwei induktiv gekoppelten Schwingungskreisen. Elektr. Nachr.-Technik, 13 (1936), 404.
- [8] Bulletin séismique de Praha, Année 1937, I—IV. SÚG, Praha.
- [9] July, 24th, 1935 Earthquake in Northern Part of Moravia-Silesia (in Czech), III. roč. SÚG, Praha 1937.
- [10] Bulletin séismique de Praha, Année 1938. Publ. SÚG.
- [11] Bulletin séismique de Stará Ďala, No 1. Publ. Stát. obs., Stará Ďala 1938.
- [12] Seismika a stavba zemského tělesa. Říše hvězd (ŘH), 19 (1938), 93, 118.
- [13] Bulletin séismique de Praha, Année 1939, I—IV. Publ. SÚG, Praha 1939.
- [14] Earthquake Observations in Slovakia and Carpatho-Ukraine (1923—1938) (in Czech). Spec. pr. SÚG č. 2, 1940.
- [15] Makroseismická pozorování a astronom amatér. ŘH, 21 (1940), 93, 122, 145.
- [16] Velké zemětřesení v Rumunsku 10. listopadu 1940. ŘH, 21 (1940), 248.
- [17] O seismickém neklidu. ŘH, 22 (1941), 59, 81.
- [18] Co je geofysika. ŘH, 22 (1941), 209.
- [19] Seismic Records of Prague (in Czech). Sb. čes. spol. zem., 47 (1942), 130.
- [20] On Meaning and Application of a Map in Geophysics (in Czech). Sb. čes. spol. zem., 48 (1943), 6, 33.
- [21] Earthquake Activity 1942 According to Seismic Station Praha Records. Sb. čes. spol. zem., 48 (1943), 83.
- [22] Earthquake Catastrophes of Recent Years in Turkey as Part of Seismic Activity in East Mediterranean (in Czech). Sb. čes. spol. zem., 49 (1944), 55.
- [23] Magnetisches Ähnlichkeitsgesetz (mit T. Schlomka). Geoph. Inst. KU, Prag 1944.
- [24] Zur Vorhersage erdmagnetischer Stürme (mit T. Schlomka). Geoph. Inst. KU, Prag 1944.
- [25] Seismic Records of Prague (1943) (in Czech). Sb. čes. spol. zem., 49 (1944), 84.
- [26] O jednom použití principu zvukoměřičské úlohy. Rozhl. mat.-přír., 23 (1944), 129.
- [27] O Fermatově principu v seismice. Rozhl. mat.-přír., 23 (1944), 65.
- [28] Nová teorie struktury zemského nitra. ŘH, 25 (1944), 6, 38.
- [29] O seismografech. Rozhl. mat.-přír., 25 (1945), 9, 43, 70.
- [30] O pružnosti zemského tělesa. ŘH, 26 (1945), 92.
- [31] Geschichte der Erdbebenwarte Prag. Prager seism. Veröff., I (1945), 7.

- [32] Seismische Registrierungen Prag 1940—1943. Prager seism. Veröff., I (1945), 19.
- [33] Seismic Effects of Air Bombardment of Prague, February, 14th, 1945 (in Czech). ŘH, 27 (1946), 25.
- [34] Tsunami 1. IV. 1946 (in Czech). Fyz. v techn., 1 (1946), 180.
- [35] O rozkmitávání a dokmitávání. Fyz. v techn., 1 (1946), 88, 102.
- [36] A New Kind of Statistical Seismic Map (in Czech). Kartogr. přehled, 1 (1946), 73.
- [37] Čtvrtstoletí Státního ústavu geofyzikálního. ŘH, 27 (1946), 1.
- [38] Stavba a stav zemského nitra. Fyz. v techn., 1 (1946), 213, 251, 269.
- [39] Zemětřesení v zálivu Omanském 27. listopadu 1945. Sb. čs. spol. zem., 51 (1946), 44.
- [40] Seismogramy a jejich vyčíslení. Rozhl. mat.-přír., 26 (1946), 43, 69.
- [41] A Simple Integrator for Evaluation of Integrals $\oint r(\varphi) \sin \varphi d\varphi$, (in Czech). Fyz. v techn., 2 (1947), 122.
- [42] Earthquake Activity in 1946 and Seismic Records of Prague (in Czech). Sb. čas. spol. zem., 52 (1947), 21.
- [43] Bulletin séismique de Praha, Année 1946 (co-author J. Vlček). Publ. SÚG, Praha 1947.
- [44] Systems of Inertia Excited by a Shock (in Czech). Fyz. v techn. 3 (1948), 79, 110, 140.
- [45] Tremblements de terre en Slovaquie et ancienne Russie Subcarpathique 1923—1938. 8^{ème} Ass. Gén. UGGI (1948), 1; Discussion: CR des Séances 8^{ème} Conf. Oslo 1950, 50.
- [46] Ditto enlarged, Publ. Bureau Central Int. de Séismologie (BCIS), Tr. Sc., Strasbourg 17 (1950), 115.
- [47] Bulletin séismique des stations séismologiques de Praha et de Cheb, Années 1944 et 1945 (co-author J. Vlček). Publ. SÚG, Praha 1948.
- [48] Bulletin séismique de Praha, Année 1947. Publ. SÚG, Praha 1948.
- [49] Vzpomínáme prof. Dr. V. Lásky. Met. zpr., 2 (1948), 1.
- [50] Aleutská zemětřesení 1. a 2. dubna 1946. Sbor. čs. spol. zem., 52 (1947), 61.
- [51] Moderní názory na stavbu zemského nitra. Vesmír, 23 (1947), 122.
- [52] Mikroseismy a pohyb tlakových depresí. Met. zpr., 1 (1947), 129.
- [53] Bulletin séismique des stations séismologiques tchécoslovaques, Année 1948. Publ. SÚG, Praha 1949.
- [54] Jak se studují zemětřesení (Základy seismiky). Cesta k vědě, 50, JČMF, Praha 1949.
- [55] The Propagation of East Alpine Earthquakes in the Bohemian Mass. Rés. Ass. Int. Séim. UGGI, 8^e Ass. Gén. Oslo 1948, CR d. Séances 8^e Conf. UGGI 1949, 51, Strasbourg.
- [56] Sur la propagation des séismes se produisant dans les Alpes orientales à travers le Massif de Bohême. Publ. BCIS, Tr. Sc., 17 (1950), 123, Strasbourg—Toulouse, (enlarged). On the Movement of the Seismograph Caused by Two Special Motions of Shock Type, 8th Gen. Ass. IUGG, Oslo; CR des Séances UGGI Oslo 1948; Strasbourg, (1949), 46.
- [57] Ditto enlarged, Hanzlíkův sborník. (1952), 181.
- [58] Ditto, Trav. Scient. BCIS, 17 (1950), 81.
- [59] Earthquake Activity in 1947—48. Sb. čs. spol. zem., 54 (1949), 205.
- [60] Bulletin séismique des stations tchécoslovaques. Année 1949 (co-author J. Vaněk). Publ. SÚG, Praha 1950.
- [61] Univ. prof. Dr. techn. Bedřich Šalamon sedmdesátníkem. Čas. pro pěst. mat. a fys., 76 (1951), 66.
- [62] Magnitude as an Objective Characteristic of Earthquake Activity (in Czech). Sb. čes. spol. zem., 55 (1950), 14.
- [63] Regional Distribution of Magnitude Differences Determined in Prague (in Czech), (co-author J. Vaněk). Kartogr. přehled, 4 (1950), 20, 41, 123.
- [64] On Plumb Line Recording by Zöllner Pendulum (in Czech). Čas. pro pěst. mat. a fys., 75 (1950), 400.
- [65] Dynamical Magnification of Seismograph Excited by a Shock of the Form $\lambda^n e^{-\lambda \tau^n}$ Čas. pro pěst. mat. a fys., 75 (1950), 103.

- [66] Earthquake Magnitudes at Praha and their Relation to the Revised Values of Pasadena. Rés. No 23 Ass. Int. Séism., 9^e Ass. gén. UGGI, Bruxelles 1951; CR des Séances Bruxelles 1952, 103 (co-author J. Vaněk) — enlarged paper 1950. Les magnitudes de Praha et leur relation avec les "revised values" de Pasadena, Tr. Sc. BCIS, 18 (1952), 136.
- [67] Dynamical Magnification of a Pendulum Excited by the Motion $e^{-\lambda t} t^3$ and some other Kinds of Shock. Rés. No 17 Ass. Int. de Séism., Bruxelles 1951, 98, Strasbourg 1952.
- [68] L'agrandissement dynamique d'un séismographe excité par un choc de la forme $e^{-\lambda t} t^3$. Tr. Sc. BCIS, 18 (1952), 125.
- [69] A Torsional Recording Device for 80 kg and 200 kg Wiechert Seismographs. UGGI, Rés. No 18, Ass. Ont. Séism., 9^e Ass. gén. UGGI, Bruxelles; CR des Séances (1952), 99, Strasbourg.
- [70] Dispositif enregistreur à torsion pour les séismographes Wiechert (80 kg et 200 kg), Tr. Sc. BCIS, Strasbourg 18 (1952), 131.
- [71] Buletén čechoslovackich seismologičeskich stancij, 1950 (co-authors V. Kárník, J. Vaněk). NČSAV, Praha 1952.
- [72] Bulletin československých seismických stanic, roč. 1951 (co-authors V. Kárník, J. Vaněk). NČSAV, Praha 1952.
- [73] Rapport sur le service séismologique en Tchécoslovaquie. CR des Séances 9^e Conf. UGGI, Bruxelles 1951, Strasbourg 1952, 255.
- [74] Metody užité geofysiky. Za soc. vědu a techn., 3 (1953), 619.
- [75] A Contribution to Ballistocardiography (Seismocardiography). Čs. fyziologie, 2 (1953), 196; (co-authors F. Zajíc, E. Smetánka), (in Czech: *čes. a rus. jazyky*).
- [76] Possible Applications of Electronic Chronographs in Geophysics. Czech. J. Physics, 4 (1954), 380.
- [77] On the Relation between the Gustiness and the Structure of the Wind-unrest of Seismographs. Geofys. sborník 1953, No 5, 65.
- [78] On the Microseisms of Praha. Résumés Ass. Int. Séism., 10^e Ass. gén. UGGI, Rome 1954.
- [79] Magnitudenbestimmung aus P , PP und S -Wellen für die Erdbebenwarte Prag (co-author J. Vaněk), Geofys. sborník 1955, No 26, 91.
- [80] Základní problémy tektonofysiky v díle prof. Dr. V. Lásky. Sov. věda, 5 (1955), 201.
- [81] Akademik G. A. Gamburcev v Československu. Čs. čas. fys., 5 (1955).
- [82] K sedmdesátým pátým narozeninám univ. prof. Dr. techn. Bedřicha Šalamona, nositele Řádu práce. Geofys. sborník 1955, 11.
- [83] Prof. Dr. Bedřich Šalamon — geofysik. Sb. čs. spol. zem., 61 (1956), 25.
- [84] Sur les microséismes de Praha. Publ. BCIS, Tr. Sc., 19 (1956) 183.
- [85] Die Seismizität auf dem Gebiet der Tschechoslowakei. 3^{ème} Ass. gén. Comm. Séism. Européenne, Bull. d'Inf. UGGI, 1956.
- [86] Zur Untersuchung harmonischer Bodenunruhe in Mitteleuropa, 3^{ème} Ass. gen. C. S. E. Vienne, Bull. d'Inf. UGGI (1956).
- [87] Die seismische Karte der Tschechoslowakei. Geofys. sborník 1957, No 70, 599.
- [88] Zu einigen Problemen der Erdkrustendynamik im Karpatengebiet. Geof. Közl., 6 (1957), 105.
- [89] On Earthquake Menace to Buildings in Czechoslovakia (in Czech) (co-author A. Dvořák). Geofys. sborník 1957, No 71, 619.
- [90] The Problem of Unification of Earthquake Magnitude Scales (co-authors V. Kárník, J. Vaněk). CR 11^e Ass. gén. UGGI, Toronto.
- [91] Contribution au problème des magnitudes unifiées. Publ. BCIS, Sér. A. Tr. Sc., 20 (1958) (co-authors J. Vaněk, V. Kárník).
- [92] Les problèmes de la carte séismotectonique de la Tchécoslovaquie. CR Réunion CSE, Alicante 1959.

- [93] Die harmonische Bodenunruhe in Mitteleuropa (co-author O. Zikmunda). *Freib. Forschungsh. C* 81, (1959), 171.
- [94] The Development of Czechoslovak Geophysics from 1945 to 1960. *Studia geoph. et geod.*, 4 (1960), 102.
- [95] Les microséismes de Praha au cours de l'Année Géophysique Internationale. *Studia geoph. et geod.* 4 (1960), 233.
- [96] Les relations séismotectoniques dans les Carpathes occidentales. *Geofys. sborník No 135*, (1960) 285.
- [97] Sur la nature et l'origine des microséismes européens. *Studia geoph. et geod.*, 5 (1961), 51.
- [98] Neue Ergebnisse der Mikroseismenerforschung in Prag. *Freib. Forschungsh. C* 101, (1961), 35.
- [99] Junge Erdkrustenbewegungen und die Erdbebentätigkeit auf dem Gebiet der ČSSR. *Abh. DAW Berlin, Kl. Bergb.-Hüttenw. u. Montangeol.*, 62 (1962), 271.
- [100] Standardization of the Earthquake Magnitude Scale, (co-authors Kárník, Kondorskaja, Rizničenko, Savarenskij, Soloviov, Šebalin, Vaněk). *Studia geoph. et geod.*, 6 (1962), 41.
- [101] I. mezinárodní symposium o recentních pohybech zemské kůry, Lipsko NDR. *Věstník ČSAV*, 71 (1962), 519.
- [102] Sur quelques résultats de l'étude statistique des périodes des microséismes européens. *Veröff. Inst. Bodendyn. u. Erdbebenforsch. DAW, Jena, H. 77*, (1963), 121.
- [103] Über einige Ergebnisse der statistischen Periodenerforschung von europäischen Mikroseismen. *Studia geoph. et geod.*, 7 (1963), 164 (enlarged).
- [104] Investigation on Microseisms, 3rd Chapter in V. Kárník's "XII. Seismology", IGY in Czechoslovakia (1963), 225.
- [105] Les recherches des tremblements de terre de la région des Carpathes et des Balkans. *UGGI Monograph No 23* (1963), 57; *Veröff. Inst. B.-M. u. Erdb.-Forsch. DAW, H. 77*, 41.
- [106] Le centenaire de la naissance du Professeur Láska, l'un des fondateurs de la séismologie moderne. *Studia geoph. et geod.*, 7 (1963), 84.
- [107] The Skopje Earthquake of 26 July 1963 and the Seismicity of Macedonia. *UNESCO/UN — Paris—Belgrade* (1964).
- [108] Report on the Skopje Earthquake of July 26, 1963, and the Seismicity of Macedonia. *Documents 1st Conf. Int. Cons. Board UN, Belgrade—Skopje, Review of Results with Supplements*, 1964.
- [109] Long-Period Microseisms Generated in Eastern Part of Atlantic Frontal Zone. *Studia geoph. et geod.*, 8 (1964), 127.
- [110] Seismicity of Macedonia. *CR. 8^e Réunion CSE, Budapest* 1964.
- [111] Progress Report on the Upper Mantle Project in Czechoslovakia, 1961—1963. *Studia geoph. et geod.*, 8 (1964), 104.
- [112] Rapport d'activité de la Comm. Séism. Européenne 1960—1963. *CR Ass. gén. Berkeley* 1963, *Strasbourg* 1964.
- [113] Eröffnungsansprache der 7. Tagung der Europ. Seismol. Kommission, Jena. *Veröff. Inst. f. Bodenmech. u. Erdbebenforsch. DAW Berlin, H. 77* (1964), 13.
- [114] Schlussansprache des Präsidenten der ESK, 7. Tagung. *Veröff. Inst. B. u. E. DAW, Jena, H. 77* (1964), 283.
- [115] Rapport d'activité de la CSE 1962—1964. *Proc. VIIIth Gen. Ass., Budapest* 1964, 13.
- [116] Tätigkeitsbericht der Subkommission für seismische Untersuchungen des Karpaten- und Balkangebietes 1962—1964. *Proc. VIIIth Gen. Ass., Budapest* (1968), 327.
- [117] Presidential Address. *VIIIth ESC Assembly, Budapest* 1964, *Proceedings* (1968), 11.
- [118] Closing Speech of the ESC President, *VIIIth Ass., Budapest* 1964, *Proceedings*. (1968), 372.
- [119] Otčet regional'nogo dokladčika po sejsmologii Jevropejsko-Aziatskogo geofizičeskogo regiona za 1962—1964 gg., *Sb. VII-go sověščanija E-A Geof. Regiona soc. stran, M.* 1964.

- [120] European Seismological Commission 1960—1963. *Studia geoph. et geod.*, 8 (1964), 207.
- [121] In memoriam profesora Dr. Václava Lásky. *Čas. pro přest. mat.*, 89 (1964), 247.
- [122] Microseisms and the Importance of their World-Wide Study. *Acta Univ. Carol., Math. et Phys.*, No 1 (1966), 3.
- [123] A mikroszeismák egész Földre kiterjedő tanulmányozásának fontossága. *Magyar Geof. VI. EVF. 2., SZ.* (1965), 50.
- [124] The Skopje Earthquake of 26 July 1963 and the Seismicity of Macedonia. "The Skopje Earthquake 1963", UNESCO, Paris, 1968.
- [125] Progress Report on the UMP-Programme in Czechoslovakia. Meeting UMP-Comm., Toronto, Canada. *Proc. Int. UMP-Comm., USA* (1965).
- [126] Progress Report on the UMP-Programme 1963—1965. *Studia geoph. et geod.*, 10 (1966), 106; *Proc. Int. UMP-Comm., Los Angeles*.
- [127] Über die Koordination der künftigen seismischen Tiefensondierungen in Europa. Sonderband 1, int. Symp. über seism. Tiefensondierungen, Brno 1965, 7.
- [128] O mechanismu ohnisek seismických vln. *Techn. ekon. inf., Kamenouh. doly, obor. řed. Kladno VI* (1965), 47.
- [129] L'usage des microséismes pour l'étude de l'écorce terrestre. Rés. No 67. Ass. gén. CSE, Copenhagen 1966.
- [130] Utilization of Microseisms for Structural Study of the Earth Crust. *Københavns Univ. Inst. Geof., IUGG, IASPEI, ESC, Copenhagen 1966* (1967), 357.
- [131] The Varto-Üstükran Earthquake 1966, Collected inform., (co-author N. N. Ambraseys), UNESCO 1966.
- [132] The Varto-Üstükran Earthquake of 19 August 1966. Field Report, (co-author N. N. Ambraseys), UNESCO, Febr. 1967, Paris.
- [133] Ditto enlarged: *Bull. Seism. Soc. Am.*, 48 (1968), 147.
- [134] Tätigkeitsbericht über seismologische Untersuchungen in der Eurasiatischen Geophysikalischen Region. *Dokumente VIII. Konf., Leipzig*, 1966.
- [135] Presidential Address, IXth Gen. Ass. ESC., Copenhagen 1966; *Københavns Univ. Inst. Geof., IUGG, IASPEI, ESC Copenhagen 1966* (1967), 13.
- [136] Rapport d'activité de la CSE 1964—1966. *Københavns Univ. Inst. Geof., IUGG, IASPEI, ESC Copenhagen 1966* (1967).
- [137] Rapport d'activité de la S. C. Carpatho-Balkanique 1964—1966. *Københ. Univ. Inst. Geof., IUGG, IASPEI, ESC Copenhagen 1966* (1967).
- [138] Sovremennyye napravlenija Jevropejskoj sejsmologii. *Geof. issled. strojenija zemnoj kory jugo-vostočnoj Jevropy, Verchnaja mantija*, No 5, *Meždurv. geof. kom. pri Prez. AN SSSR* (1967), 20.
- [139] Upper Mantle Project Programme in Czechoslovakia 1962—1966. *Studia geoph. et geod.*, 11 (1967), 317.
- [140] Research into Characteristic Earthquakes. *Studia geoph. et geod.*, 11 (1967), 322.
- [141] Analysis of Microseisms Observed in Europe in Relation to the Structure of the European Continent. *Studia geoph. et geod.*, 11 (1967), 352.
- [142] Sur la détermination des intensités macroséismiques. *UGGI, IASPEI, Abstr. of Papers, II, No 61* (1967).
- [143] On the Determination of Macroseismic Intensities (co-author N. N. Ambraseys). XIV. Gen. Ass. IUGG, Zurich, *Publ. BCIS, Tr. Sc., Strasbourg* 1967.
- [144] Standardization of the Earthquake Magnitude Scales (co-authors V. Karník, J. Vaněk). *UGGI, IASPEI, Abstr. of Papers, II, No 51* (1967).
- [145] Ditto, enlarged, *Publ. BCIS, Strasbourg*.
- [146] The Skopje Earthquake of 26 July 1963 and the Seismicity of Macedonia, Macroseismic + Microseismic Results, Seismicity of Macedonia and the Skopje Region. *Proc. Int. Seminar on Earthquake Eng., Skopje 1964, UNESCO, (1968), 77.*

- [147] Half a Century of Development of Geodesy, Geophysics and Meteorology in Czechoslovakia. *Studia geoph. et geod.*, 12 (1968), 333.
- [148] On the True Value of A/T for the First Maximum of Damped Harmonic Ground Movement for Directly Recording Pendulums (co-author L. Christoskov). *Bull. Int. Inst. Seism. and Earthquake Eng.*, 6 (1969), 63.
- [149] Generalized Amplitudes of IGY Microseisms in Europe and in Japan. *Bull. IISEE*, 7 (1970), 79.
- [150] Progress Report of the S.-C. for Seismic Studies in the Carpathian and Balkan Region. XIIth ESC-Meeting, Luxembourg, Brussels (1971), 33.
- [151] European Seismological Commission, Sub-Commission for the Carpathian and Balkan Region. Progress Rep. 1968—1970. *Studia geoph. et geod.*, 15 (1971), 194.
- [152] Geophysical Data Correlation with Structure Features in Middle Europe. *Věstník ÚÚG*, 48 (1973).
- [153] Geophysical Synthesis and Crustal Structure in Central Europe (co-author B. Beránek). Pres. XIV Gen. Ass. IASPEI, Lima 1973.
- [154] On Long-Term Microseismic Activity and Some Related Results. Pres. Gen. Ass. IASPEI, Lima 1973; Rapport du Groupe de Travail sur les Microséismes, Publ. Inst. Physique du Globe, Univ. Paris.
- [155] Geophysical Synthesis in Central Europe and Related Problems. Papers XVIIIth Geoph. Symp. M. G. E., Budapest 1973.
- [156] Padesát let Čs. národního komitétu geodetického a geofyzikálního, *Geod. a kartogr. obzor*, 19 (1973), 241.
- [157] Fifty Years of the Czechoslovak National Committee of Geodesy and Geophysics. *Studia geoph. et geod.*, 18 (1974), 85.
- [158] Correlation of Geophysical Data with Structural Phenomena of Central Europe (co-author B. Beránek). *J. Geol. Sci.*, No. 26 (1974), 113.
- [159] Közép-Europa geofizikai szintézise és az ezzel kapcsolatos problémák. *Magyar Geof.*, 15 (1974), 3—4, sz., 81.
- [160] Geofizickesij sintez na osnově rezul'tatov glubinnogo sejsmičeskogo zondirovanija na territorii ČSSR i v rajoně sredněj Jevropy. *Sbor. dokl. Mežd. sověščanija*, Kiev (1977), 19.
- [161] On the Correlation between Meteorological Microseisms and Solar Activity (co-author L. Křivský). *BAC*, 25 (1974), 257.
- [162] On the Long-Term Microseismic Activity and Some Related Results. *Studia geoph. et geod.*, 19 (1975), 14; Publ. Inst. Phys. du Globe, Univ. Paris 1974.
- [163] Geophysical Synthesis and Crustal Structure. Proc. Int. Symp. on the Occasion of 50 Years of Seism. Research and 75 Years of Seismic Registration at Jena, 1974, P. 2, 291, Potsdam 1975.
- [164] On the Similarity of Generalized Amplitudes of Microseisms. XIII Gen. Ass. ESC, P. III, Techn. and Econ. Studies, Inst. Geol. Geoph., D Ser., Geoph. Prospect., No 10 (1975), 53.
- [165] On the Crustal Structure in Czechoslovakia and the East-Alpine Region (co-author B. Beránek). XIIIth Gen. Ass. ESC, Braşov, P. III, Techn. and Econ. Studies, Inst. Geol. Geoph. D Ser., Geoph. Prospect., No 10 (1975), 187.
- [166] Long-Period Variations of Microseisms and Solar Activity (co-author L. Křivský). XIV Gen. Ass. ESC, Trieste 1974; Berlin 1975, 113.
- [167] Geophysical Synthesis and Crustal Structure in Central Europe (co-author B. Beránek). *Studia geoph. et geod.*, 19 (1975), 122.
- [168] On the Correlations of Solar, Interplanetary, Geomagnetic, Ionospheric, Atmospheric-Circulation and Microseismic Phenomena (co-authors: L. Křivský, J. Laštovička). XVI Gen. Ass. IUGG, Grenoble 1975, Abstr. of Papers Interdisc. Symp., I. S. 25, 211.
- [169] On the Sources of Meteorological Microseisms Observed in Central Europe. IUGG XVI Gen. Ass., IAPSO Sci. Program, MS, 158, Grenoble 1975.

- [170] Výsledky hlubinných výzkumů a regionální práce velkého rozsahu. Sb. 6. celost. konf. geof., Plzeň 1975, d. 1, 5.
- [171] Geofyzikální syntézy. Sb. 6. celost. konf. geof., Plzeň 1975, d. 1, 41.
- [172] Results from Deep Seismic Soundings Along the International Profile VII in Czechoslovakia and the Federal Republic of Germany (co-authors: B. Beránek, M. Mayerová, M. Zounková, Holub, G. Angenheister, G. Gebrande, H. Miller). XVI Gen. Ass. ESC, Nat. Comm. Geod. Geoph., Ac. Sci. GDR, Berlin 1975, 295.
- [173] Correlations Between Solar, Interplanetary, Geomagnetic, Ionospheric Circulation and Microseismic Phenomena (co-authors: L. Křivský, L. Laštovička). J. of Interdisc. Cycle Res., 7 (1976), 9.
- [174] On the Sources of Meteorological Microseisms Observed in Central Europe. Acta Univ. Ouluensis, Oulu 1976, 21.
- [175] Results of Deep Investigations of the Earth's Crust by Methods of Explosion Seismology in Czechoslovakia in the Period from 1971 to 1975 (co-authors: B. Beránek, A. Dudek, A. Biely, O. Fusán). In "Stroenie zemnoy kory i verkhney mantii v Centralnoy i Jugovostochnoy chasti Evropy", Acad. Sci. USSR, Kiev (1977), 28.
- [176] Geotraverse V. Gen. Ass. ESC, Kraków 1976. Preliminary version.

Addendum

- [177] The Propagation of East Alpine Earthquakes in the Bohemian Mass. Publ. Inst. Géophys. Nat. Tchecosl. Travaux spéc. No 3, SÚG, Praha 1948, (in Czech).
- [178] E. I. Savarenskij, D. P. Kirnos, Elementy sejsmologii i sejsmometrii (in Czech). Čs. čas. fys., 1 (1951), 95.
- [179] B. Gutenberg, C. F. Richter, Seismicity of the Earth (in Czech). Čs. čas. fys., 1 (1951), 205.
- [180] V. N. Dachnov, Električeskaja razvedka neftjannyh i gazovyh mestorožďenij, (in Czech). Čs. čas. fys., 2 (1952), 161.
- [181] Kraev, Osnovy geoelektriki (in Czech). Čs. čas. fys., 3 (1953), 82.
- [182] Bulletin séismique de Stará Ďala, No 2. Publ. Stát. obs., Stará Ďala 1938.
- [183] Sur le mouvement du séismographe sous l'influence de deux formes du choc. Travaux Sci., Ass. de Séism., 17 (1950), 81.
- [184] K voprosu balistokardiografii (sejsmokardiografii) (co-authors F. Zajíc, E. Smetánka). Čechosl. fiziolog., 2 (1953), 209.
- [185] V. Kárník, J. Nykles, Bulletin československých seismických stanic Praha, Cheb, Hurbanovo, Skalnaté pleso. Čs. čas. fys., 5 (1955), 359.
- [186] Seismická charakteristika Československa. Sb. čs. spol. zeměp., 61 (1956), 81.
- [187] Les microséismes de Praha au cours de l'AGI. UGGI Monographie No 6, (1960), 23.
- [188] Rapport sur l'état des recherches des tremblements de terre de la région des Carpathes en 1962. CSE, Prague 1962; Summary Sonderdruck Veröff. Inst. für Bodendynamik und Erdbebenforschung, Jena, H. 77, 41.
- [189] Podíl ČSAV na řešení komplexního problému „Planetární geofyzikální výzkumy“. Věstník ČSAV, 76 (1967), 621.
- [190] Proceedings of the Eighth Assembly of the European Seismological Commission. Akad. Kiadó, Budapest 1968, 77.
- [191] Seismicity and Related Problems. IISEE Lecture Notes, No 6 (1969), 1.
- [192] Ob opredelenii makrosejsmičeskoj intensivnosti (co-author N. N. Ambraseys). Fiz. zemli, No 7 (1969), 86.
- [193] The Mudurnu Valley, West Anatolia, Turkey, Earthquake of 22 July 1967 (co-author N. N. Ambraseys). Bull. Seism. Soc., 59 (1969), 521.

- [194] European Seismological Commission, Sub-Commission for the Carpathian and Balkan Regions (Progress Rep. 1966—1968), *Studia geoph. et geod.*, 13 (1969), 100.
- [195] Nové vydání geofyzikálního kompendia o Zemi od H. Jeffreyse. *VÚG*, 46 (1971), 237.
- [196] Geofyzika a společnost. Sbor. vybr. statí z věd. konf. MFF UK, 1972, 112.
- [197] K účasti čs. vědy na mezinárodních geofyzikálních projektech. *Práce z dějin přír. věd, Ústav čs. a svět. dějin ČSAV*, 4 (1973), 223.
- [198] Korelace geofyzikálních dat se strukturními fenomény Střední Evropy (co-author B. Beránek). *Věstník ÚÚG*, 48 (1973).
- [199] Úvod do geofyziky. MFF UK, Praha 1976.
- [200] Geotraverse V; in "Structure of the Earth's Crust of South-East Europe and Adjacent Areas". *Pol. Acad. Sci., Rus. version Acad. Sci. USSR* (in press).
- [201] Crustal Structure in the West Carpathians; in "Structure of the Earth's Crust of South-East Europe and Adjacent Areas". *Pol. Acad. Sci., Rus. version Acad. Sci. USSR* (in press).

EXPANSION OF A FUNCTION GIVEN OVER AN EQUIPOTENTIAL SURFACE INTO SPHERICAL HARMONICS

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Резюме: Выводятся формулы для вычисления гармонических коэффициентов в разложении функции, заданной на уровенной поверхности геопотенциала, в ряд по сферическим функциям. Показано, что обычное сферическое решение содержит погрешности, соизмеримые с порядком Стоксовых постоянных, если разлагаемая функция вызвана тем же геопотенциалом.

The equipotential surface of the geopotential,

$$(1) \quad W = W_0,$$

has been determined from satellite and terrestrial astronomical and gravimetric data by expansion in terms of harmonics reliably at least to degree $n = 8$, including all orders $k = 0, 1, \dots, n$. In [4] the area element dS of this surface is expressed by a series:

$$(2) \quad dS = (GM/W_0)^2 \left[1 + s_0^{(0)} + \sum_{n=2}^N \sum_{k=0}^n (s_n^{(k)} \cos k\lambda + t_n^{(k)} \sin k\lambda) P_n^{(k)}(\sin \Phi) \right] \cdot \cos \Phi d\lambda d\Phi;$$

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