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Introduction to the translation of A. Mohorovičić's »Earthquake of 8 October 1909«

ANDRIJA MOHOROVIČIĆ, the outstanding Croatian meteorologist and seismologist of international fame, was born in Volosko near Opatija, in Croatia, on 23 January 1857. After he finished the high school passing examinations in Rijeka with excellent grades, he enrolled in the Department of Mathematics and Physics at the University of Prague. Having completed his studies A. Mohorovičić was appointed a teacher at the high school in Zagreb and then in Osijek and Bakar. In the period 1891–1921 he was the director of the nowadays Andrija Mohorovičić Geophysical Institute, Faculty of Science, University of Zagreb. He died on 18 December 1936.

The early Mohorovičić's scientific activities include mostly meteorological problems. He is considered to be the first Croatian scientist in the fields of meteorology and climatology and was the organizer of the systematically structured meteorological service. He was mostly interested in high atmospheric layers, systematic cloud observations, unusual atmospheric phenomena, climate of the city of Zagreb and hail prevention. In 1902. he initiates the publication of the *Annual Report of the Zagreb Meteorological Observatory*, the forerunner of the todays journal *Geofizika*.

Mohorovičić's last study in the field of meteorology was published in 1901. The circumstances which caused him to stop publishing meteorological papers are not known. The fact is that after the turn of the century his scientific interests turned exclusively to seismology, always keeping in mind the goal of physical seismology »...to investigate the interior of the Earth and to take over where the geologist stops, because the modern seismographs can serve as a binocular for observing even the greatest depths.«[1] The span of Mohorovičić's interests in seismology is very wide, and some of his basic ideas are quite relevant even today. Let's take for instance his papers on how an earthquake acts upon buildings[2] in which he analytically considers the forced oscillations of building models under seismic motion load. Of course, some of his work is less relevant today, in the times of electronics and computers, then it was in the first quarter of this century – for instance the ides how to construct the new type of mechanical seismograph[3] or his method for near earthquake epicentre location[4].

A. Mohorovičić gained worldwide reputation by discovering the existence of the velocity discontinuity in the uppermost part of the Earth. Namely in 1909 he detected

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[1] Mohorovičić, A. (1913): Razvoj seizmologije posljednjih pedeset godina. Ljetopis JAZU, sv. 27, Zagreb, reprint, 1–31.

[2] Mohorovičić, A. (1911): Djelovanje potresa na zgrade. Vijesti Hrvatskog društva inžinjera i tehničara, Zagreb, XXXII, No. 2, 17–18, No. 3, 33–35, No. 4, 51–53, No. 5, 69–72, No. 6, 85–86, No. 7, 103–105, No. 8, 112–116, No. 9, 126–129, No. 10, 139–142.

[3] Mohorovičić, A. (1917): Principi konstrukcije seizmografa i prijedlog za konstukciju nova seizmografa za horizontalne komponente gibanja zemlje. Rad JAZU, knjiga 217, Zagreb, 114–150.

[4] Mohorovičić, A. (1916): Die Bestimung des Epizentrums eines Nahbebens. Gerl. Beitr. zur Geophysik, Bd. XIV, H. 3, Leipzig, 199–205.

two distinct pairs of P and S phases on seismograms of the Kupa Valley (Croatia) earthquake of 8 October 1909 and inferred the presence of a marked structural discontinuity some distance below the surface of the Earth.[5,6] It was later named after him the Mohorovičić discontinuity or abbreviated MOHO or M-discontinuity. Subsequent studies in Europe, and later over the whole globe, showed that the Mohorovičić discontinuity exists worldwide, though not always as a sharp transition and at average depth of less than 54 km (as obtained by A. Mohorovičić).

This important Mohorovičić's discovery was firstly poorly known, because it was hard to recognize the importance of the work published under such unappealing title. In the year of 1911 H. Bendorf pointed to that paper[7] not only as to one of the most important seismological papers but also to show how interesting problems seismology has to solve. Theoretical review of the paper was given by E. Rothè[8] in 1924.

Let us also mention that in this paper Mohorovičić also introduced the new method for location of near earthquakes. His conclusion about the maximal phase: »If the focus of the earthquake was in the lower layer of the Earth[9], it would ... be an earthquake without the maximum phase...« was proved in 1929 by K. Wadati in Japan. A velocity distribution given by Mohorovičić's law $v = a\,r^b$ is especially important because of the simple form of the (T, Δ) relation. It is very close approximation of the actual velocity variation over wide range of depths in the Earth.

Because of great interest the Školska knjiga Publishing Co, Zagreb, published in 1977 a reprint of Mohorovičić's seminal paper[5] which was faithful to the original in every detail. The same publishing house issued in 1982 a bilingual monograph[10] about A. Mohorovičić, in Croatian and English.

Since the original paper[5] was published in Croatian with the translation in German, the Editorial Board of *Geofizika* decided to publish this English translation on the occasion of 135th anniversary of Andrija Mohorovičić's birth.

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[5] Mohorovičić, A. (1910): Potres od 8. X. 1909. Godišnje izvješće zagrebačkog meteorološkog opservatorija za godinu 1909, Zagreb, 1–56.

[6] Bullen, K. E. and B. A. Bolt (1985): An introduction to the theory of seismology, Fourth ed, Cambridge University Press, Cambridge, 499 pp.

[7] Bendorf, H. (1912): A. Mohorovičić – Das beben vom 8. X. 1909. Gerl. Beitr. zur Geophysik, Bd. XI, Leipzig, 348–352.

[8] Rothè, E. (1924): Sur la propagation des ondes séismiques au voisinage de l'épicenre. Préliminaires continues et trajets a réfraction, UGGI, Section ed Seismologie, Série A, Trav. Sci, Fasc. 1, Paris, 17–59.

[9] e. g. in the upper mantle (*D.S.*)

[10] Skoko, D. and J. Mokrović (1982): Andrija Mohorovičić. Školska knjiga, Zagreb, 147 pp.