

90 years of the seismological station in Zagreb (ZAG) (1906–1996)

The strong development of science in Europe by the turn of the 19th century was felt also in Croatia, mainly in its capital Zagreb. That was the time when Croatia had a strong political autonomy within the Austro-Hungarian Empire and was able to revitalize and establish many national institutions – the University, the Academy of Science and Arts, the National Theater, the Society for Natural Sciences and particularly the Meteorological Observatory (1861). The first seismographs in Croatia were installed in Pula and Rijeka in 1900 and 1901, respectively. Unfortunately, both of the stations came to an end with the breakdown of Austro-Hungarian Empire and the seismograms archive disappeared. Although the seismological station in Zagreb was the third one in Croatia, in the seismological sense it is the most important one in the region. It has been operated since 1906 and the whole seismogram archive still exists.

The seismological station in Zagreb was established within the Meteorological Observatory (founded in 1861) by A. Mohorovičić, who took over the duty of the director of the Observatory in January 1892 (Skoko and Mokrović, 1982). At that time he started to determine the time corrections of the observatory clocks by measuring the moment of passage of the stars through the local meridian. To improve the accuracy of the timing needed in both seismology and meteorology he acquired a good quality »Riefler« pendulum clock in 1905.

The macroseismic research was already well established by the Committee for the Observation of Seismic Phenomena, founded by the National Academy of Science and Arts three years after the strong earthquake occurred in Zagreb in 1880. Mohorovičić, however, aimed at quantifying the earthquakes by direct measurement, and he proposed to start the development of instrumental seismology in Croatia. His plans were accepted at the conference of directors of seismic stations held in Innsbruck in 1905. Moreover, T. M. Konkoly, the director of the Central Meteorological Observatory in Budapest promised to donate one of his Vicentini seismographs to Mohorovičić. The instrument arrived to Zagreb within a month, but the government failed to ensure finances for its installation. It seems that few strong earthquakes in December 1905 and January 1906 were needed to re-awaken the public interest in seismology so that the University was able to solve the financial problems, and after three months of preparatory work carried out in the basement

of the Observatory in Grič 3, Zagreb, the Vicentini seismograph (Herak et al., 1996) was installed (Fig. 1).

The recording started on *April 06, 1906* and the Meteorological Observatory consequently grew into the Geophysical Institute. It was just on time to record the great San Francisco earthquake which was the fourth earthquake ever recorded in Zagreb.

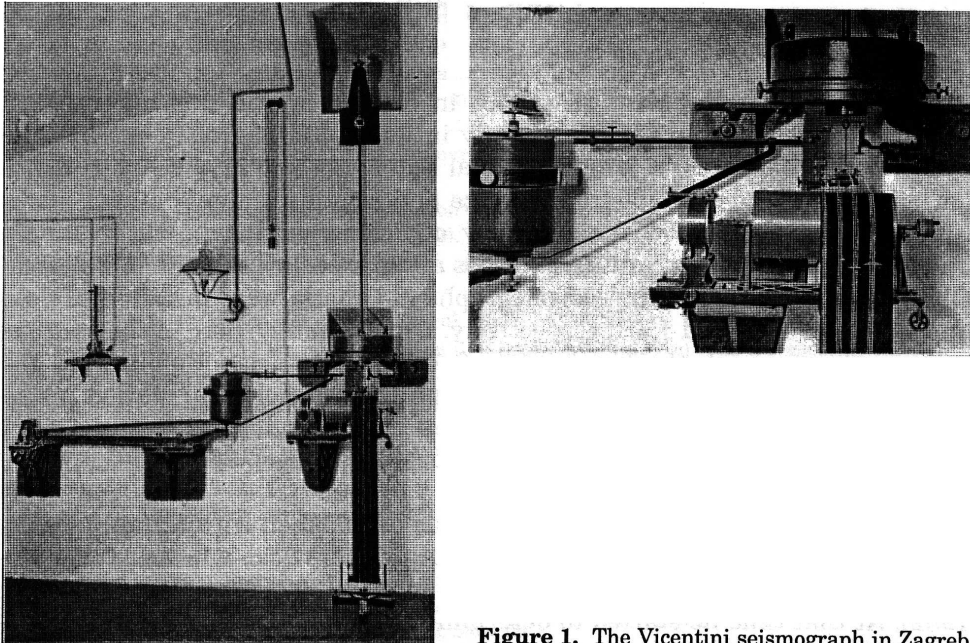


Figure 1. The Vicentini seismograph in Zagreb.

Two years later, in 1908, Mohorovičić installed the Wiechert seismograph with an 80 kg pendulum. A year later the famous Wiechert horizontal astatic seismograph with the pendulum mass of 1000 kg was installed too (Fig. 2). Again, it was on time to record the well-known Kupa valley earthquake of 1909, the analyses of which led to discovery of the discontinuity surface between the Earth's crust and mantle (Mohorovičić, 1910). This achievement brought the scientific recognition to its author, and reputation to the Zagreb seismological observatory.

The most unfortunate period for the Zagreb seismological station was from 1919 to 1925. The laboratory diary reads: »January 22, 1919 – There is no coal in the gasworks, so the smoking of the seismograms is poor«. In August there was no alcohol for seismogram preparation. Finally, in 1920 the instruments stopped to record, because there was no more paper and no money to buy it with. A few months later the instruments restarted recording. In 1922 A. Mohorovičić retired as the director of the Institute.

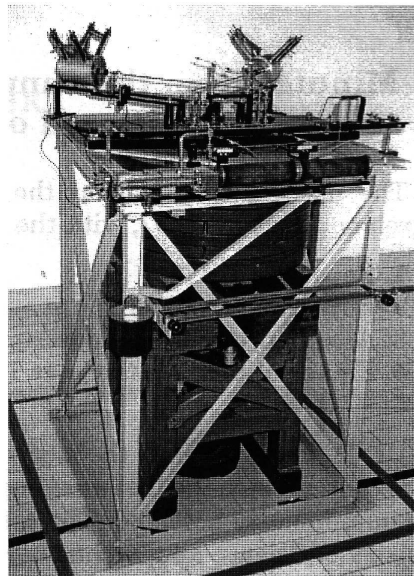


Figure 2. The Wiechert horizontal seismograph with 1000 kg pendulum mass in Zagreb (photographed after restoration).

It got better in 1932 when the vertical Wiechert seismograph with a pendulum of 1300 kg was installed. All Wiechert seismographs at the Zagreb station were in operation until 1983, when they were restored and moved to the new building of the Geophysical Institute of the Faculty of Sciences and Mathematics on Horvatovac in Zagreb.

At the new site recording of earthquakes continues with the Sprengnether seismometers (series S-5100 H and S-5100 V) and analogue recorders. Nowadays the digital recorder is connected in parallel to the analogue ones. The observatory clocks are synchronized to the Omega Navigation System and to the German DCF-77 radio signal.

The results of ninety years of recording make a rich seismological archive of the Zagreb seismological station, enabling interested seismologists to analyze important historical earthquakes. Along with the seismograms, most of the laboratory notes are also preserved, containing time corrections and data on the instruments calibration that was performed on the average three times a year.

References

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