The Croatian Earthquake on December 29, 2020

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A strong earthquake hit Croatia in December 2020 near Petrinja, some 50 km south of Zagreb. The magnitude 6.4 earthquake caused severe damage in the epicentre and was noticed widely in Austria. Seismic recordings at the COBS were analysed in terms of frequency content and amplitude.

Earthquakes and seismic activity in the wider Zagreb area are not uncommon. Between 1502 and 1883 as many as 661 earthquakes were noted by Mokrović (1950). The strongest earthquake in recent Zagreb history occurred on November 9, 1880 and has been estimated, according to macroseismic observations, as of magnitude 6.3. This earthquake caused damage to more than 1500 buildings in the city. Another important earthquake in this region occurred on October 8, 1909 in the Kupa valley (Mohorovičić, 1909). This event has many similarities to the December 29 earthquake (Fig. 1), is well known, and occupies a special place in the history of seismology as it occurred soon after the installation of a seismographic station in Zagreb. It was this earthquake which led Andrija Mohorovičić to propose, that the Earth's crust differs in its properties from the Earth's mantle.

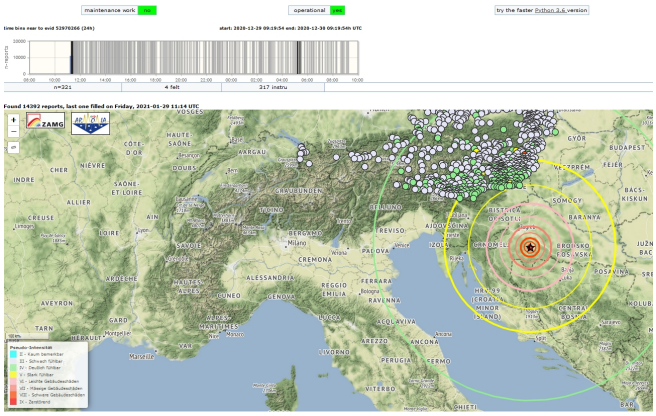

Figure 1: The felt area of potential response is indicated by the green circle. Grey dots refer to places from where observations were reported.

Almost 14.000 questionnaires (13.441 positive reports and 327 negative responses) were collected after the earthquake in Austria. These observations are very valuable as they can be used for verifying ground-motion prediction equations.

At the time of writing (16.2.2021) strong aftershocks are still being observed.

The earthquake was well recorded at the Conrad Observatory. Two seismic stations are compared – one of which (CSNA) is installed in front of the Seismological Observatory in a shaft at a depth of 6 m, while the other station (CONA) is positioned in a 140 m long tunnel on a pier (overburden approximately 50 m). Each station is equipped with a three-component Streckeisen STS-2.0 broadband sensor. The earthquake in Croatia was used to analyse the relative transfer function of both sensors (Fig. 2).

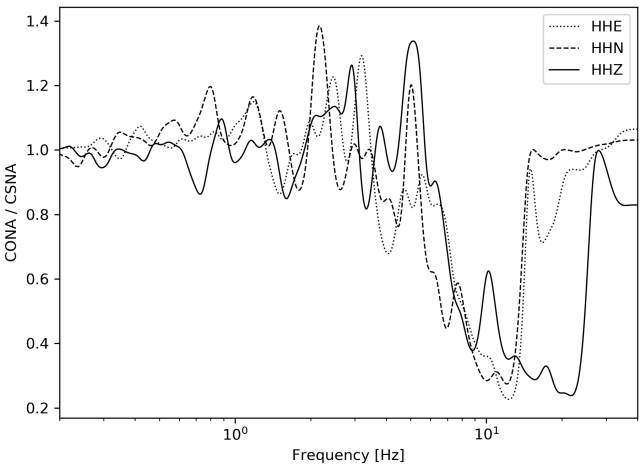

Figure 2: Spectral ratios of stations CONA and CSNA as recorded by STS-2.0 sensors.

The comparison of both sites showed a remarkable similarity, although the sites differ in terms of overburden. However, station CSNA records "high frequent" noise between 5 – 12 Hz, or, in other words, the seismic station CONA is less obscured by these signals. The origin of the noise is now under investigation.

References:

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