Seismology in Croatia, 1995–1998

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The seismological research in Croatia is carried out almost exclusively within the Department of Geophysics, Faculty of Science, University of Zagreb. Scientific investigations are mostly organised within the framework of the project "Seismicity of Croatia" which is financed by the Ministry of Science and Technology of the Republic of Croatia. Croatian Seismological Survey, also a part of the Department, is in charge of deploying and maintaining networks of seismograph- and strong-motion stations, compilation of up-to-date earthquake catalogues and exchange and analyses of seismological data. The pool of seismological instruments was considerably enlarged in 1998 when 7 broad-band digital seismographs were purchased. It is expected that those will provide additional boost to seismological research, especially in the area of physical seismology.

11 researchers (4 PhD's, 5 MSc's and 2 BSc) that took part in seismological investigations published a total of 36 scientific, qualification and conference papers over the period 1995–1998. In addition to participating in the national seismological project, Croatian seismologists were active also in international multilateral and bilateral programs dealing with, e.g., the seismicity of the Circumpannonian basin, the seismic zonation of megacities around the world (UNESCO-IGCP sponsored projects co-ordinated by the Department of Earth Sciences, University of Trieste), or interpretation and analysis of historical seismograms (co-operation between Universities of Zagreb and Hamburg).

Studies of Croatian seismicity constitute an important part of seismological studies by Croatian seismologists. The largest earthquake in Croatia in the last four years is the Ston-Slano event, which caused considerable damage in the greater Dubrovnik region. Detailed analyses of various topics related to this earthquake (macroseismic investigations, aftershock studies, focal mechanism determination, tectonic implications) are presented by Herak D. et al. (1998b) and, along with the analyses of the overall seismicity in the 1993–1996 period, in Markušić et al. (1998). An overview of Croatian seismicity based on the revised Croatian Earthquake Catalogue is presented in Herak M. et al. (1996a). The catalogue is regularly updated and currently contains data on 14715 earthquakes with epicentres in Croatia and neighbouring regions in the period BC–1998. Seismicity of the Central Adriatic was studied by Kuk and Skoko (1996). Herak M. et al., (1995a) collected large number of P-wave first-motion data for strong earthquakes in the greater Croatian region. They were able to re(assess) fault-plane solutions for the most important events in this region.

In a series of papers Prelogović et al. (1995, 1997, 1998a,b) studied tectonic and seismotectonic processes in various parts of Croatia (Medvednica Mt., Northern Dinarides, Velebit Mt, Pannonian basin).

The distribution of body-wave velocities in the Adriatic region was analysed by Herak D. and M. Herak (1995), who proposed a new technique to determine velocities by using a large dataset of local and regional travel-times. The same methodology was

subsequently modified and used to infer azimuthal velocity anisotropy in the region of External Dinarides (Herak and Lokmer, 1998). It has been shown that the direction of the fast P-wave in the upper crust corresponds to the direction of tectonic compression as obtained by averaging P-axes obtained by Herak M. et al. (1995a). Herak M. et al. (1995b) studied the stress field in the Gargano Ridge zone of the Central Adriatic.

Seismic zonation of Croatia was the subject of research of Markušić (1997), Markušić et al. (1997), Vaccari et al. (1997) and Markušić and Herak (1998). They have proposed new delineation of seismic sources based on seismological, geological and seismotectonic considerations, which served as basis for the estimation of seismic hazard elements. Deterministic modelling by computation of synthetic seismograms yielded expected maximal displacement, velocity and acceleration values for the Croatian territory, that are comparable to those obtained by classical methods (Markušić et al, 1998b).

Herak M. et al. (1995, 1997a) have presented theoretical basis for the Ms depth correction. They have computed a large number of synthetic seismograms (Love and Rayleigh waves) assuming validity of generally accepted global Earth models, and observed the theoretical amplitude decay with the source depth in agreement with observational data.

The Croatian Macroseismic Database is being compiled by digitising all existing macroseismic data for the Croatian territory. Initial results were presented by Sović (1998). Cecić et al. (1998) critically investigated historical sources related to the doubtful earthquake in Zagreb in 1502.

Intermediate term earthquake prediction algorithm CN was used by Herak D. and M. Herak (1997) and Herak D. et al. (1998a) to *a posteriori* investigate seismicity prior to 9 strong events in the Southern External Dinarides. They have found that 8 of them were preceded by a time period of increased probability (TIP) of earthquake occurrence.

Historical seismographs and their response were studied by Herak M. et al. (1996b,c; 1997), who proposed a method to determine magnification of undamped seismographs and used it to compute magnitude for the great 1906 San Francisco earthquake, based on the seismogram recorded by the Vicentini seismograph in Zagreb. They have also investigated details and possible nonlinearity of magnification curve of the Wiechert seismographs.

Croatian seismologists actively participated in the preparation of the very successful exhibition "Centuries of Natural Science in Croatia: Theory and Practice" (Zagreb, June–October 1996), where the opus of the famous geophysicist Andrija Mohorovičić was presented (see Skoko, 1997c,d). The second edition of the bilingual (Croatian–English) monograph (Skoko and Mokrović, 1998) dedicated to life and work of A. Mohorovičić was presented on the occasion of the 140th anniversary of his birth.

The scientific productivity of Croatian seismologists has more than doubled if compared to the previous 4-year period. This is mainly due to stable and adequate financing over the last couple of years, which helped to improve the computing facilities and acquire new seismological instruments. It also enabled scientists to actively participate in a number of important meetings and congresses, co-operate with the colleagues abroad and publish their work in respectable journals. One can also notice the broadening of scientific interests as well as the increase of the number of Croatian seismologists who published their results.

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