**THE CENTRAL AND EAST EUROPEAN EARTHQUAKE RESEARCH NETWORK (CE3RN)**

**Current status and future perspectives**

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**ABSTRACT**

In order to improve the monitoring of seismic activities in the border regions and to enhance the collaboration between countries and seismological institutions in Central Europe, the Slovenian Environment Agency (ARSO), the Italian National Institute for Oceanography and Experimental Geophysics (OGS), the University of Trieste (UNITS) and AMG signed an agreement to formalize the transfrontier network, to name it 3\*Central and East European Earthquake Research Network (CE3RN). This CE3RN will include a) the monitoring of seismic activities across borders, which will be done by the individual scientific institutions; b) a transnational research project; and c) a transnational training programme.

**ZAMG**

The Department of Geophysics at the ZAMG takes care of the seismic monitoring of Austria and analyses current and past seismic events. More than 10,000 events have been processed during 2015, including the nuclear test in North Korea on January 6, 2016 in its capacity as National Data Centre Austria. The department is currently involved in calculating new hazard maps on the Austrian territory and to supply civil protection services with accurate and fast data. Given this major task, the following aspects are of utmost importance: 1) Historical Earthquake Research; 2) Macroseismic questionnaire-exchange; 3) Austria is surrounded by several larger tectonically active areas (Cercis); 4) many local, medium and major events for automatic mechanism determination and distinction (Fig. 1); 5) Geographical and geophysical conditions of the border region for event locations; 4) Seismic noise, sensor orientation and amplification characteristics of our seismometer sites. Most broadband seismometers in Austria are installed in the Data Centre. Seismic recordings are exchanged with neighbouring countries monitoring their national seismicity on a real-time basis.

**OGS**

The Italian Seismology Centre (CNR-Ogs) is a research institute of the Italian National Research Council. Its main mission is the national and international seismic monitoring in Italy and Europe. CNR-OGS performs the following tasks: 1) basic research in seismology and related disciplines; 2) the monitoring of seismic and tectonic activity in Italy and in the Mediterranean area; 3) the assessment of earthquake hazard in Italy and in the Mediterranean area; 4) the development of tools for seismological applications; 5) the establishment of a broad network for European and international cooperation.

**ARSO**

The Slovenian Environment Agency (ARSO) has been established in 2010 as a result of the merger of the Slovenian Geophysical Institute and the Research Centre for Geology and Physics (RIOP). ARSO's main mission is the management of the monitoring of geohazard phenomena in Slovenia and the protection of the environment against their impacts. In the framework of the CE3RN, ARSO aims to improve the real-time monitoring of seismic activities in Slovenia and its surrounding areas and to assess their potential impact on the environment, infrastructure, and social and economic activities. ARSO will also contribute to the establishment of a transnational research project and a transnational training programme.

**UNIS**

The SeisRaM group at the Department of Mathematics and Geosciences actively manages 8 broadband stations, 14 stations of the Frului-Venezia Giulia Accelerometric Network (FRAN) and 14 stations of the national accelerometric network (RAN) in a framework of a cooperation with the Civil Defence (DF). The University of Trento seismic monitoring activity started in 1983 when a broadband station, one of the first in Italy, has been installed; later the RAN network was installed during 1993-1995. In the year 2000, SeisRaM and the FVG-Civil Service signed an agreement for the RAN management, and its use, not only for scientific studies, but also for civil defence purposes. The network has been enhanced through the real-time monitoring, the computation of ground-shaking scenarios, studies of seismic source properties, site effect microzonation analyses. Thanks to a strong cooperation with SeisRaM, since 2011 the RAN is fully integrated in the RAN. The network is in real-time processing and exchange and data centre management to improve the real-time monitoring for civil defence purpose. As one of the founder, the SeisRaM group exploits its competences in the transfrontier network (now referred to as the SeisRaM of the CE3RN), among several research and international projects starting from 2001.

**NIERP**

The National Institute for Earth Physics operates a seismic monitoring network in Bucharest, which is the only such system in the country. The seismic monitoring activity in the Romania territory, dominated by the Vrancea intermediate-depth (60-200 km) earthquakes. The ability to reduce the impact of earthquakes depends on the existence of a large amount of high quality observational data. The development in the last few years of an advanced seismic network and acquisition system are essential factors to achieve this goal. The real-time seismic monitoring of EANet, a network of 143 seismic stations, with 12 broadband components, and 2 arrays: DUR with 12 elements and PLO with 7 elements. The seismic stations are equipped with acceleration (Egideon) and velocity sensors (Druk); ST52, CMS33EP5; CM40S-T; or short period seismometers, and MEMS. The processing and the data exploitation on the CE3RN are: remote sensing of seismic station and exchange with neighboring countries; monitoring of seismic and seismotectonic activities, seismic hazard assessment, site effects and microseismicity; seismological and geophysical research on the activity of the Vrancea region; data acquisition and obtaining real-time seismicity ratings by sensitive and efficient monitoring techniques.