

	
<p>NATO North Atlantic Treaty Organization  <b>SCIENCE FOR PEACE AND SECURITY  PROGRAMME</b>  Public Diplomacy Division</p>	<p><b>Department of Geophysics</b>  Faculty of Sciences  University of Zagreb  <b>CROATIA</b></p>
<p align="center"><b>WORKSHOP OF NATO Sfp983054 Project</b>  <b>"Harmonization of Seismic Hazard Maps for the Western Balkan Countries"</b>  <b>DUBROVNIK, CROATIA</b>  26 – 27 March 2008</p>	

## MINUTES OF THE THIRD WORKSHOP

### Discussion and Conclusions

#### NATO SCIENCE FOR PEACE PROJECT NO. 983054

#### "Harmonization of Seismic Hazard Maps for the Western Balkan Countries"

**Dubrovnik, Croatia**

**26-27 March 2007**

The third Workshop of the Project '*Harmonization of Seismic Hazard Maps for the Western Balkan Countries*' was organized by Department of Geophysics of Faculty of Sciences - University of Zagreb, Croatia, with participation of representatives of the partner institutions from countries involved in the Project: Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, NPD Prof Sinan Akkar from Turkey, as well as the invited expert Mr. Mladen Zivcic, as the representative of one of the Project sponsoring institution ARSO, Slovenia. Also, representatives of INGVϕ Milano-Pavia section, Ms. Paola Albini and Mr. Andrea Rovida expressed their interest to present the goals, activities and results of NEREIS (2006-2010) Project.

On behalf of the workshop host, Mr. Vlado Kuk, Croatian Project Co-Director, gave the welcome speech and formally opened the Workshop.

#### **FIRST DAY SESSIONS:**

First session of the Workshop was dedicated to analysis of seismic instruments bid. The letter of request to provide technical documentation and quotation for instruments was issued by the NPD by the end of February 2008, as the result of Skopje Workshop conclusions and previous agreements among Co-Directors. The proposals from UK *Guralp Systems*, than *eentec*, also UK, and *Kinematics* and *Geotech* from USA reached.

Extensive comparison of technical features and prices for the proposed instruments was presented by Prof Sinan Akkar, NPD. Three general types of seismic sensors were offered: strong motion, weak motion and integrated version of both - weak and strong motion-instrument, along with necessary digitizers, communication software, and other supplementary kits.

The *Guralp* proposal was sent solely to the NPD and as the consequence Co-Directors were not fully familiar with the proposals. However, according to the presented Tender results Co-Directors expressed their preferable choice:

- Montenegro: 3 integrated solutions (weak and strong motion instruments) +1 digitizer *Geotech* preferably because of recently installed *Geotech* acquisition system and software (61 000 \$ worth).
- Croatia: 2 integrated and 3 weak motion instruments. *Guralp* system is the preferable choice because of existing type instruments, possibility of easier maintenance and replacements of spare ones.
- Albania: 8-10 *Guralp* strong motion instruments according to the existing ones.
- Macedonia: one integrated and possible number of strong motion stations according to the affordable budget item; to be elaborated.
- Bosnia: possible number of weak motion instruments according to the affordable budget item. First choice by Co-Director was *eentec*. Suggestion by the NPD and PPD was to revise this decision because of completely new technology applied and insufficient experience with it.
- Serbia: although absent, Co-Director from Serbia in written report expressed the Serbian choice as the densification the existing strong motion network with Etna, *Kinematics* instruments. PPD recommended not purchasing this type of instrument that is based on the old technology.

The final decision on possible number and type of instruments and kits will be elaborated in next several days in direct communication with NPD. The final term on decision-making and sending the final proposals to the NPD is fixed to be 11 April.

In addition NPD informed participants of its attention to organize the seminar on processing of accelerometric records during this summer in Turkey, Ankara, for the group of students from Turkey and suggested participation of few (up to 5) interested young scientists from this Project. All necessary information will be timely provided.

During the second session Prof. Marijan Herak from Croatia presented some of the results of the NATO SfP 980857 project related to the ambient noise measurements made in city of Stone. The conclusions about the soil amplification were elaborated using H/V technique applied to measured ambient vibrations. The presentation was an introduction to afternoon's visit to old town of Ston that was heavily damaged by earthquake in 1995.

## **Activities and Responsibilities – Conclusions**

- The final term on decision-making regarding the instrument bid to all Co-Directors is fixed to be 11 April.
- NPD will provide necessary information and timeframe for the summer seminar about the accelerometric records.

## **SECOND DAY SESSIONS:**

In the first session of the second workshop day Prof. Marijan Herak from Croatia presented the First progress report on unification of earthquake catalogue.

The essential procedures of declustering of national catalogues, merging in unified catalogue and removing of multiples is done automatically; after final merging of all available data this procedure will be re-checked.

Already provided national catalogues have been investigated in respect to the completeness of magnitude classes and recurrence relationship. The provided earthquake catalogue data are as follow:

COUNTRY	MAGNITUDE THRESHOLD	TIME SPAN
Albania	no lower magnitude threshold	58 . 2000 A.D.
Bosnia and Herzegovina	2.5	306 . 2006
Croatia	no lower magnitude threshold	373 -2008
Macedonia	2.9	479 . 2008
Montenegro	3.0	1444 . 2008
Serbia	did not supply any data yet	
Romania	no lower magnitude threshold	984 - 2008

In this stage of catalogue unification, additional catalogues have been used: ANSS (1963-2008), Shebalyn catalogue (343-1990) etc. Still needed catalogues are Serbian, Greek - with preferably lower magnitude threshold than one available with  $M_{\geq} 4.5$ , as well as the catalogues from Bulgaria, Hungary, Slovenia, and Italy.

The stand point of view of Serbian partner that will provide the rough earthquake catalogue data within one week was delivered.

In the discussion that followed Slovenia offered the usage of their earthquake catalogue for the purpose of this Project. Also, the present INGV representative offered to provide digital version of the so-called Balkan catalogue . output of the 1970-es *Project Survey of the Seismicity of the Balkan Region*.

The need to precisely elaborate the geographical extension of area of investigation was underlined.

Regarding the present types of earthquake magnitude and way to unify it, the discussion led to the point of necessity for precise elaboration of type of used magnitude, way of conversion of magnitude obtained from other magnitude type or from intensity. Also, it would be very useful to investigate the inner differences of reported magnitudes of the same earthquakes and see if there is any stable trend.

Next topic of day two of the Workshop has been devoted to the identification of available ground motion prediction (GMP) models. Ass. Prof. Snezana Stamatovska from IZIIS Skopje in her presentation elaborated history of development and types of GMP formula as well as the state of the GMP formula in the region. The comparisons of recorded peak ground accelerations in respect to different prediction formula have been presented.

In the following part of the session guests from INGV presented about the NEREIS project: Ms. Paola Albini presented the essential structure and the goals of the NEREIS project, while Mr. Andrea Rovida in brief presented about the Activity of this Project related to *Distributed Archive of Historical Earthquake data*. On behalf of the NEREIS project they expressed their willingness to collaborate with the Project and also invited participating institutions to seek for the way to collaborate with this EC project too.

The second session was devoted to ongoing and next Project activities:

Mr. Branislav Glavatovic, PPD and Mr. Kresimir Kuk presented the recent achievement regarding the seismic real-data exchange between the Project participating countries and its importance. It has been decided to make a mutual Agreement on cooperation in this field having in mind all responsibilities of involved parties regarding the issues such are: obligations to inform about the type of instruments, state of the health of the stations, systematic timing errors, calibration errors and problems occurred, changes in the seismic station settings etc. Also, about the clear declaration of the property and conditions to use and report the data.

Mrs. Jadranka Mihaljevic briefly informed participants about the content and obligations regarding the Project First Six Month Progress Report. Participants agreed about the project acronym to be **BSHAP** (shorten from Balkan Seismic Hazard Assessment Project).

With respect to the next activities, an overview of milestones, deliverables and schedule was discussed:

- The necessity to agree about the way to elaborate seismotectonic settings was underlined. In that since it is important to define the requirements of PSHA software inputs so that appropriate seismotectonical elaboration will be implemented.
- GIS implementation and software purchase and training should be planned.

As Prof. Milutinovic reported about the opportunity to organize additional NATO SfP No. 983054 Project Meeting, providing the donation from other projects that IZIIS, Skopje, is already involved in. Having in mind planned next activities, decision was made to hold this meeting by the begging of June.

At the end, Prof. Glavatovic informed about the invitations to Montenegro Seismological Observatory as the Project leading country to participate on behalf of the Project to NATO Forum on Environmental Security held in Brussels, on March 12, 2008, as well as with the invitation to participate to EU SHARE Project. With the respect to the last one Co-Directors will inform during the next Meeting.

## **Activities and Responsibilities – Discussions and Conclusions**

### **AC1: Earthquake Catalogue preparation**

- Slovenia offered the usage of their earthquake catalogue for the purpose of this Project.
- INGV-Milano-Pavia section will provide digital version of the so-called Balkan catalogue.
- To issue letter on behalf of the project to Bulgarian Academy of Science to provide Bulgarian earthquake catalogue.
- Co-directors to provide necessary missing catalogue data.
- To precisely elaborate the geographical extension of area of investigation.
- To precisely elaborate type of used magnitude, way of conversion of magnitude obtained from other magnitude type ( $M_L$  from  $M_d$  instance) or from intensity (magnitude from earthquake intensity).
- To investigate the inner differences of reported magnitudes of the same earthquakes and see if there is any systematic trend in the way they differ.
- Final version of unified catalogue to be presented by the beginning to midst of June 2008.

## **AC2: Strong Motion Data and GMP formulas**

- To investigate earthquake parameters of important earthquakes (the ones that may be used for the evaluation of applicability of different GMP formulas) regardless of terms given for the earthquake catalogue completion - immediately.
- To exchange all available strong motion records originated from this region earthquakes.
- To exchange all available GMP formula elaborated for the region . from BSHAP participating institutions.
- To investigate alternative GMP formulas for the inner parts of the region . since most of the records solely mach to Dinarides.

### **Activities to follow:**

- All Co-Directors to provide missing parts of Technical Progress and Financial Status annexes (as well as other required information according to example already delivered) to *Six Month Report* not later than April 1.
- To prepare the Agreement on seismic real-time data exchange for the national seismological networks participating in the project. In the agreement to state the obligations and responsibilities of all parties.
- IZIS to inform soon about the preparation of the next Meeting in Macedonia.