

“Harmonization of Seismic Hazard Maps for the Western Balkan Countries”

MEETING OF THE BSHAP CO-DIRECTORS

October 29, 2010

Hotel "Mondial", Tirana, Albania

BSHAP Activities and Open Questions in Albania

O V E R V I E W

- ✓ Compiling of the earthquake catalogue for Albania (58 BC - 2008).
- ✓ Compiling of a unified earthquake catalog in terms of M_w .
- ✓ Preparing of seismotectonic data for Albanian territory (map of active faults, delineation and characterization of source zones).
- ✓ Statistical analysis of the earthquake catalog (completeness, declustering, recurrence relations and the maximum magnitude for the identified seismotectonic zones, etc.).
- ✓ Preparation of GIS background maps for Albania (topography, hydrography, settlements, transport infrastructure, etc.).
- ✓ Further development and improving of OHAZ software.
- ✓ Preliminary seismic hazard assessment for Albanian territory.

Magnitude Homogenous Earthquake Catalogue

- Two catalogues of Albanian earthquakes have been compiled:
 - Catalogue of earthquakes with $M_s \geq 4.5$, for the time period 58BC-2006, comprising events occurred in $[39.0-43.0N, 18.5-21.5E]$. Events are reported in terms of M_L magnitude.
 - Catalogue of the earthquakes with $M_L \geq 3.0$, for the time period 1964-2008, occurred in the area $[38.0-43.85N; 18.0-22.0E]$; reported magnitude is M_L .
- Most of PGM models proposed recently use the moment magnitude M_W . Therefore, an homogenous earthquake catalog in terms of M_W is compiled.
 - Regression models are derived, and subsequently used to convert M_L reported by the relevant seismological agencies (Tirana, Podgorica, Zagreb, Belgrade, Skopje, Thessaloniki) to M_W .

Seismotectonic data

- Seismic source zones are determined with two fundamental tools: a seismicity profile and the present-day tectonic regime of the region under consideration.
 - Digitizing of the map of active faults.
 - Map of the earthquakes epicenters ($M_W \geq 3.0$).
- Based on the above-mentioned considerations, 8 seismic source zones are delineated and characterized (fault types, orientations, weights).
- The seismotectonic datafile for Albanian territory is prepared accordingly to the OHAZ requirements.
- No data available for specific faults.

- Magnitude data completeness with time
- Declustering the earthquake catalog
- Estimation of recurrence parameters by zones and for the Albanian territory.
- Assessment of maximum magnitude by zones and for the Albanian territory.

GIS background maps

- GIS background maps for Albania are completed, digitizing the existing national maps in the scale 1:200K (topography, hydrography, settlements, transport infrastructure, etc.).
- They are already integrated in the MapInfo environment.
- Coordinate system: Albanian (Krassovsky ellipsoïde, Gauss-Kruger projection).
- DTM – completed (ASTER GDEM 2009, WGS84/EGM96)
Accuracy (95% CI): 20 m for vertical, and 30 m for horizontal.

Improving of OHAZ software

- Accounting for unequal observational periods (magnitude completeness levels identified for the earthquake catalogue).
- Estimation of the recurrence relationships (incremental and cumulative) in OHAZ.
- The PGMM database is reorganized and extended with the following models:
 - Berge-Thierry *et al.* (2003)
 - Bindi *et al.* (2009).
 - Akkar & Bommer, 2010
 - Boore & Atkinson 2008 (NGA, EERI 2008).

- Preliminary seismic hazard assessment for Albanian territory.
- Gridded seismicity (Frankel 1995, Lapajne et al. 2003).
- Four PGME are used (Berge-Thierry *et al.* 2003, Bindi *et al.* (2009), Akkar & Bommer 2007, Boore & Atkinson 2008).

- Preliminary seismic hazard maps for PGA, SA 0.2s and SA 1s (10% PE in 50 years) are prepared using GMT software.

OHAZ software

- Implementation of the last recommendations for PGME-s from the SHARE project, in order to use them in BSHAP.
- Combining of hazard curves in a logic-tree approach needs to be developed (to account for the epistemic uncertainties).

Harmonization of earthquake and seismotectonic databases

- Final version (corrected and unified) of BSHAP earthquake catalog in terms of M_w (in the last version delivered should be specified the type of magnitude for each event).
- The homogenous and harmonized seismotectonic database (the identified source zones with their characteristics) for BSHAP project.

Open Questions

Refinement of the seismic hazard output

- Statistical analysis of the final unified and improved catalogue (completeness periods, declustering, recurrence relations, M_{max} , etc.).
- Final hazard calculation for different combinations of input parameters; mean and median hazard curves (logic-tree output).

Output integration in a GIS environment

- Datum transformation (to WGS84) - has to be done.
- Vertical reference should be unified (WGS84/EGM96) for BSHAP.
- Map production: GMT (postscript and pdf format, scale ?)
- Integration of input and output in the a GIS environment (MapInfo).

Instrumentation

- **CMG-5TD (10 standalone systems): in process of installation.**
 - power supplies and batteries are already provided,
 - installation sites are selected,
 - we are exploring the possibility to have remote control and data downloading using Internet (in real-time ?).
- **CMG-5T (8 pieces):**
 - These sensors will be installed in our VSAT broadband seismic stations, and will transmit in real-time, using our existing seismographic satellite technology (Nanometrics).
 - 3 Trident digitizers and the necessary accessories are purchased by the BSHAP project funds, and this week arrived in the Institute.
Installation: during next month
 - 2 Trident digitizers with accessories are tendered with our funds.

Use of the budget in the last period

➤ Actual expenditures (from start until 30.09.2010):

83007 Eur (spent)

+ 6214 Eur on hold (50% - final payment for Trident digitizers)

(Equipment: 58939 Eur)

➤ Forecast expenditures until project's end: 6779 Eur.

- Installation of instruments (power supplies, batteries, routers ?, etc):
2000 Eur

- Books: 1000 Eur

- Experts: 1000 Eur

- Travel (meetings): 1716 Eur

- Consumables, spare parts: 1063 Eur.

Thank You !