



1  
2

## PSHA FOR SOME DAMS IN SOUTHERN ITALY

1

Alessandro REBEZ<sup>1</sup>, Marco SANTULIN<sup>2</sup>, Denis SANDRON<sup>3</sup>, Laura PERUZZA<sup>4</sup>, Alberto TAMARO<sup>5</sup>, Marina EUSEBIO<sup>6</sup>, Marco MUCCIARELLI<sup>7</sup> and Dario SLEJKO<sup>8</sup>

1  
2

A probabilistic seismic hazard analysis (PSHA) has been developed for selected sites located in northern Calabria with the specific aim of assessing very accurately the largest expected ground motion. The sites selected for the study host hydroelectric dams that must be seismically assessed as requested by Authority, based on Response Spectra and accelerometric time histories provided by the PSHA. The study has been developed for CESI S.p.A., that performs dams seismic assessment in the frame of a project developed by A2A S.p.A, owner of the plants. The study was designed to provide a broad spectrum of input ground motions suitable to the verification, through a mathematical model, of the structural behaviour of the dams.

The PSHA (Ordaz et al., 2012) uses the logical tree methodology constituted by 12 branches: two seismogenic models; two methods of computing the maximum magnitude, and three different ground motion prediction equations (GMPEs): one of global applicability (e.g., Cauzzi and Faccioli, 2008), one calibrated on European data (e.g., Ambraseys et al., 1996), and one specifically computed for the Italian territory (e.g., Sabetta and Pugliese, 1996). The results of the PSHA are given in terms of horizontal and vertical uniform hazard response spectra (UHRSs) for 3 return periods according to the Italian building code NTC08 (Ministro delle Infrastrutture, 2008): 101 years (Limit State of Damage, LSD), 475 years, 1950 years (Limit State of Collapse, LSC), and three soil types i.e. rock ( $V_{S30} > 800$  m/s), stiff soil ( $360 < V_{S30} \leq 800$  m/s), and soft soil ( $180 < V_{S30} \leq 360$  m/s)

A series of horizontal and vertical accelerometric time histories, referring to 5 actually recorded earthquakes, provided for the seismic assessment were selected from Italian and international databanks according with the disaggregation of the PSHA results in terms of distance and magnitude. In addition, the selected accelerograms were also matched (Seismosoft, 2013a) to two different target spectra: the spectrum of Italian building code NTC08 and the horizontal and vertical UHRS of the PSHA.

As an alternative option, some synthetic accelerometric time histories were also computed (Seismosoft, 2013b) in agreement with the magnitude and distance values suggested by the disaggregation and scaled to the average spectrum of the set of real accelerograms already cited and to the UHRS of the PSHA.

Accelerations that theoretically may have affected the dam site in the past (historical earthquakes) have been estimated using a GMPE suitable for the Italian territory (Sabetta and

<sup>1</sup> Dr, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Sgonico (TS) Italy, arebez@inogs.it

<sup>2</sup> Dr, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Sgonico (TS) Italy, msantulin@inogs.it

<sup>3</sup> Dr, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Sgonico (TS) Italy, dsandron@inogs.it

<sup>4</sup> Dr, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Sgonico (TS) Italy, lperuzza@inogs.it

<sup>5</sup> Dr, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Sgonico (TS) Italy, atamaro@inogs.it

<sup>6</sup> Eng, CESI S.p.A., Seriate (BG) Italy, marina.eusebio@cesi.it

<sup>7</sup> Prof, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Sgonico (TS) Italy, mmucciarelli@inogs.it

<sup>8</sup> Dr, Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Sgonico (TS) Italy, dslejko@inogs.it

Pugliese, 1996) and have been compared with those that the plant has actually experienced after its edification.

1  
2

## REFERENCES

1

- Ambraseys NN, Simpson KA and Bommer JJ (1996) "Prediction of horizontal response spectra in Europe", *Earthquake Eng. Struct. Dyn.*, 25:371-400.
- Cauzzi C and Faccioli E (2008) "Broadband (0.05 to 20 s) prediction of displacement response spectra based on worldwide digital records", *J. Seismol.*, 12: 453-475, doi 10.1007/s10950-008-9098-y
- Ministro delle Infrastrutture (2008) Decreto 14/01/2008 - Norme Tecniche per le Costruzioni, Ministero delle Infrastrutture, Roma
- Ordaz M, Aguilar A and Arboleda J (2012) CRISIS2012, Ver. 4.2. Program for computing seismic hazard, UNAM, México
- Sabetta F and Pugliese A (1996) "Estimation of response spectra and simulation of nonstationarity earthquake ground motion", *Bull. Seism. Soc. Am.*, 86:337-352
- Seismosoft (2013a) SeismoMatch v2.1 – A computer program for spectrum matching of earthquake records, available from <http://www.seismosoft.com>
- Seismosoft (2013b) SeismoArtif v2.1 – A computer program for generating artificial earthquake accelerograms matched to a specific target response spectrum, available from <http://www.seismosoft.com>