Preface of special issue on: *A new generation of ground-motion models for Europe and the Middle East*

John Douglas

BRGM – DRP/RSV, Orléans, France.

The past decade has seen great advances in the understanding of how strong ground motions scale with various independent (source, path and site) parameters and increased sophistication in the modelling of these effects in ground-motion prediction equations (GMPEs). In parallel there has been considerable progress made in modelling and quantifying the various components of aleatory variability (e.g. Al Atik et al., 2010) and uncertainty (e.g. Douglas, 2010) in GMPEs. The number of GMPEs derived continues to grow rapidly; according to the compendium of Douglas (2011) more than 15 new models are currently published every year. These developments led Bommer et al. (2010) to recommend criteria for the selection of GMPEs to retain only those models for consideration that could be thought of as representing the state of the art. They also suggest that these criteria could be used as a quality assurance step to guide publication of new GMPEs.

At the same time, the quantity and quality of strong-motion data and associated metadata (particularly local site characterization) available in Europe and the Middle East have improved significantly thanks to various national, e.g. Italian (Luzi et al., 2010) and Turkish (Akkar et al., 2010) strong-motion database projects, and international initiatives, e.g. the projects ISESD (Ambraseys et al., 2004a) and SHARE (Giardini et al., 2013) funded by the European Commission. However, apart from notable exceptions using national databases, e.g. for Italy (e.g. Bindi et al., 2011) and Turkey (Akkar and Çağnan, 2010), the available pan-European ground-motion models (e.g. Akkar and Bommer, 2010) have not fully kept pace with this improvement; pan-European models are invariably based on databases compiled in the early 2000s.

Therefore, it is an opportune moment to derive a new set of ground-motion models for application in this region, which would be comparable to those derived for applications in western North America during the Next Generation Attenuation project, which was completed with the publication of a special issue of Earthquake Spectra in 2008 (e.g. Power et al., 2008). Because of the considerable epistemic uncertainty associated with the prediction of median ground motions and their associated aleatory variabilities and the lack of a clear consensus as to the best way to derive such models (e.g. classic regression analysis or data-driven approaches) this special issue presents various ground-motion models that seek to capture this epistemic uncertainty but all derived using a common database. In addition, the special issue presents comparisons between the derived models.

The special issue begins with an article by Akkar et al. (2013c) on the common strong-motion database (RESORCE) used to derive all ground-motion models published here. Next, a comparison of the response spectra predicted by the different models for various earthquake scenarios is presented by Douglas et al. (2013). Following this five sets of developers present their models derived using RESORCE. Two of the groups (Akkar et al., 2013a, b; Bindi et al., 2013) use random-effects regression analysis, whereas Hermkes et al. (2013), Bora et al. (2013) and Derras et al. (2013) develop their models using novel techniques. Sandıkkaya et al. (2013) extend the model developed by Akkar et al. (2013a, b), for the prediction of the horizontal component of earthquake response spectra for 5% of critical damping, to other damping levels and for the prediction of the vertical component of motion.

We recommend these new ground-motion prediction equations for future applications in Europe and the Middle East.

I would like to thank the peer reviewers of the articles of this special issue for their careful and timely comments on these studies. These comments greatly helped improve the quality of the articles. This special issue was partially supported by the SHARE project and the EDF-led SIGMA project. We are very grateful to the personnel of the organisations operating seismological stations and freely disseminating their ground-motion data and related metadata, without which the studies reported in this special issue would have been impossible.

As the articles for this special issue were nearing completion, we heard the sad news of the death of Nicholas (Nick) Ambraseys at the age of 83 years old. Nick did more that probably anyone else over the past four decades to advance the study and use of strong-motion data from Europe and the Middle East for engineering purposes. He started the routine collection, processing and assessment of these data and associated parameters (metadata) in 1971. In those days collection and use of strong-motion data was difficult, time consuming and, in Europe, uncommon due to analogue instruments and the lack of electronic communications to facilitate data transfer but through Nick's contacts and tenacity the collection of data grew. During the 1970s and 1980s various colleagues and students at Imperial College helped with this data collection. In the mid-1980s a more structured project was launched by Nick with the Commissariat à l'Energie Atomique (CEA) (France), Ente Nazionale per l'Energia Elettrica (ENEL) and Ente per le Nuove Tecnologie, l'Energia e l'Ambiente (ENEA) (Italy) to produce a large high-quality strong-motion database/databank of European and Middle Eastern data. This goal was realized in the early 1990s and numerous publications on this dataset (e.g. Ambraseys and Bommer, 1991a) and subsequent analyses were published. This strong-motion archive was the first of its kind in Europe, where collection, dissemination and processing greatly lagged behind California and Japan. This archive allowed, for example, the derivation of robust ground-motion prediction equations for Europe (e.g. Ambraseys and Bommer, 1991b), which up until then had not been possible due to the poor organization of the observational datasets. In the 1990s and 2000s Nick continued to coordinate various projects for the collection, processing and dissemination of strong-motion data from Europe and the Middle East working very hard and continuously to have the various parts of the database released by the original data providers. These projects culminated with the publications in 2000 (Ambraseys et al., 2000) and 2004 (Ambraseys et al., 2004b) of freely-available CD ROMs of strong-motion data and their reassessed parameters and in 2002 the establishment of the Internet Site for European Strong-motion Data (Ambraseys et al., 2004a). This work was conducted within the frameworks of the Strong-Motion Working Groups of the European Seismological Commission and the European Association of Earthquake Engineering, which Nick led for much of the past forty years. We dedicate this special issue to his memory.

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