DELIVERABLE

D19.1 Assessment report of VA External Board on VA1-VA5

Work package	WP19: Access to seismic waveforms at ORFEUS/KNMI (KNMI)
Lead	EMSC
Authors	Rémy Bossu (EMSC)
Reviewers	-
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Summary

This report presents the mid-project individual evaluation by the VA external board of the 5 virtual access (VA) activities carried out within the SERA project.

Under H2020 framework, VA ensures free-of-charge access to e-infrastructures delivering widely-used services (e.g., computing or communication infrastructure, data services…) in order to facilitate scientific research. SERA project includes 5 such VA:

- VA1: Access to parametric data and earthquake products operated by EMSC

- VA2: Access to seismic waveform data operated by ORFEUS/KNMI

- VA3: Access to the European Strong Motion database, the European Archive of Historical

  Earthquake Data, and the European Database of Seismogenic Faults operated by INGV

- VA4: Access to earthquake hazard and risk tools and products operated by EFHER/ETHZ

- VA5: Access to data and products of anthropogenic seismicity by IGPAS

The main objectives of the H2020 partial financial support to these activities are service improvement, development of their usage and integration in the EPOS (European Plate Observing System) initiative.

Each of these external evaluation reports presented in this deliverable is based on the individual reports prepared by the VA operator and compiled in D18.1 and submitted to an external evaluator. They provide an independent evaluation of the quality of the offered services and possible guidance for further improvement during the second part of the SERA project.

The evaluation panel (VA-EP) is composed by:

- VA coordinator (Rémy Bossu, EMSC)

- Paul Earle (NEIC/USGS) - VA1 reviewer

- J. Wassermann (Univ. Munich) - VA2 reviewer

- Hong Kie Thio (AECOM) - VA3 reviewer

- John Douglas (University of Strathclyde) - VA4 reviewer

- Marcelo Assumpçao (Univ. of São Paulo) - VA5 reviewer

VA1: Access to parametric data and earthquake products operated by EMSC

United States Department of the Interior
GEOLOGICAL SURVEY
Geologic Hazards Team
MS 966, Box 25046
Denver, Colorado 80225-0046
30 October, 2018

Evaluation of EMSC Activities within the SERA project

This outside evaluation of the European-Mediterranean Seismological Centre (EMSC) covers advances in distribution and collection of seismic data developed within the first 16 months of the SERA project. Previous visits to EMSC and frequent operational and scientific interactions between the EMSC and the USGS National Earthquake Information Center have left me impressed with EMSC's ability to expand their public real-time services and the scope of their scientific data services by streamlining their processing and automating tasks.

EMSC Data Collection

EMSC service expansion under SERA has been impressive for near real-time scientific information collection. Maintaining data imports and high-level collaborations with 85 institutes in 56 countries around the globe is labor intensive and EMSC's success with a limited staff is impressive. The continued demand for faster, higher-quality, and more diverse information has necessitated tighter collaboration with contributing external agencies. To better facilitate data collection, EMSC has adopted standards used by a range of contributing institutions. Under SERA, EMSC has evaluated the effectiveness of their information collection and embraced new technologies such as USGS's PDL distribution system and GFZ's HMB messaging system.

Beyond collection of traditional seismic information generated by observatories, EMSC leverages their mobile app and webpages to harvest important information for rapid earthquake detection and impact assessment including, eyewitness experiences via felt reports, comments or pictures. The documented increase in felt-report collection and impressive geographic coverage are a great benefit to the scientific community.

EMSC Information and Data Distribution

EMSC has expanded its use of social media and web technologies for distribution of information. Given the vast number of earthquakes that occur daily, monitoring agencies must be selective in the events that they chose to highlight for the media and the public. EMSC has implemented effective algorithms to rapidly identify if an earthquake is significant and distribute (and gather) information about the event. The algorithms draw on a diverse set of inputs including increases in EMSC web-site visits, official tsunami warnings, and systems that monitor for increases in social media traffic. I regularly access the EMSC webpages and Twitter account @LastQuake and find the performance of

both impressive. I also use the EMSC mobile application "lastquake" and appreciate its intuitive design and focus on providing targeted, understandable information to the user.

During the SERA project, EMSC has taken an integrated, targeted approach to the use of social media. Message content is tailored for the different distribution services. For example, Twitter is used for dissemination of rapid information and links are provided to invite witnesses to contribute information. Facebook is use for alerts, sharing basic earthquake knowledge and informing people of recent topical information. Very few agencies have taken the effort to understand the strengths and weaknesses of different forms of social media. EMSC has excelled at this.

EMSC is also a leader in combining traditional and non-traditional sources of information to detect and characterize earthquakes. Detections of widely felt earthquakes made by monitoring traffic surges on the EMSC website and launches of their mobile app precede those made by traditional seismic instrumentation 90% of the time in the Euro-Med region. Rapid estimates of the felt area are also generated with these crowd-sourced data. These tools compliment monitoring and impact estimates that are based on traditional seismological data and techniques

The services EMSC provides through the seismic portal and website continue to be of great use to the scientific community. Specifically, at the USGS National Earthquake Information Center. We use their aggregated hypocenters and parametric data to identify events missing in our catalog and to verify our near real-time results. Travel-time picks collected by EMSC have proven to be very valuable for providing near-epicenter readings in regions where NEIC does not have direct access to the data. The availability, volume, and access methods of these data have improved during the SERA project.

EMSC has a clear vision for moving forward. They have plans for serving the wide-ranging needs of their diverse user base and they embrace new technologies. Their continued vision and ingenuity clearly places them as a leader in the seismological community.
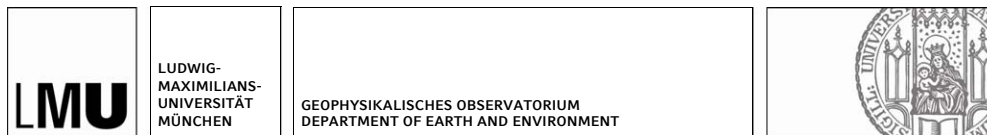
Sincerely,

Paul Earle, Ph.D.
Director of 24/7 operations
USGS National Earthquake Information Center
Telephone (303) 273-8417
pearle@usgs.gov

VA2: Access to seismic waveform data operated by ORFEUS/KNMI

LUDWIG-
MAXIMILIANS-
UNIVERSITÄT
MÜNCHEN

GEOPHYSIKALISCHES OBSERVATORIUM
DEPARTMENT OF EARTH AND ENVIRONMENT

LMU • Geophysikalisches Observatorium
• Ludwigshöhe 8 • 82256 Fürstenfeldbruck

To Whom It May Concern

Dr. Joachim Wassermann

Telefon +49 89 2180 73962
Telefax +49 89 2180 73970

j.wassermann@lmu.de
www.erdbeben-in-bayern.de
www.geophysik.uni-muenchen.de

Geophysikalisches
Observatorium
Ludwigshöhe 8
82256 Fürstenfeldbruck

Ihr Zeichen, Ihre Nachricht vom

Unser Zeichen

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VA2: Access to Seismic Waveforms at ORFEUS/KNMI

The present report covers in its main part the implementation and improvements of the FDSN web services at ORFEUS/EIDA as well as new mechanisms of data federation and interactive web portals for an easy access to the huge data volume of the participating European seismic networks. The strength of the ORFEUS/EIDA solution lies in its distributed data storage structure which significantly reduces the investment needed for national data centers. However, in this strength lies also its weakness as it accounts for complicated mechanisms to enable a simple end-user friendly and transparent data access possible. The techniques described in the present report mark an impressive large step forward towards a much simpler and modern use of the distributed European data archive.

The first part of the document reports about two very important new development of FDSN web services. The EIDAws-routing service is an overdue tool for accessing waveform and station metadata without knowing the end-points of the requests. While this was in principle already possible with the arclink protocol, the EIDAws-routing is the up-to-date version of a unified data portal and finds its expression in the IRIS federator tool. The next problem to be tackled by EIDA and the EIDAws-routing is to identify ways of selecting the most complete and best data set for the individual user. The introduction of an EIDA waveform catalog (EIDAws-wf-catalog) in which data statistics (gaps, overlaps, etc) are computed and stored, is a first step forward to make the EIDAws-mediator (FDSNws-dataselect, FDSNws-stationselect, EIDAws-routing, EIDAws-wf-catalog) reality.

For the seismological community these tools are essential in order to make a simple and transparent use of near-realtime data access or mass downloading of data feasible - especially in the light of the currently running and planed large N large S experiments.

The report also documents an important increase of the usage of web services rather the the heavily used arclink mechanism over the last year which shows the high acceptance of the community using these new mechanisms for data retrieval.

The next part of the report describes advances in the development of interactive web portals. While three of them, the ORFEUS web page as landing page, the EIDA web interface and the EIDA station books are mainly (but still important) continuations of already existing interactive tools, the RRSM tool for a fast evaluation of potentially relevant (i.e., damaging) earthquakes is a very timely development urgently needed by the seismological community and agencies.

The last development described in the report is a visualization of the already mentioned EIDAws-wf-catalog, which makes it possible to interactively search for the best dataset and also possibly to identify problematic stations.

In summery I'm impressed by the development and belief that the developed tools in this project will be a nucleus for much more within the next years

Best regards,

Joachim Wassermann

VA3: Access to the European Strong Motion database, the European Archive of Historical Earthquake Data, and the European Database of Seismogenic Faults operated by INGV

Review of D18.1 Report on access statistics and service provision

This report consists of two chapters: "Description of the services offered by the VA3" and "Access statistic". Although there are numerous links included in the report, the review itself supposedly only concerns the report.

However, I would first like to comment on the online data services that are presented here. I wasn't aware of most of these databases and was very impressed with the quality and contents of the data available, and all three sites provide extremely important contributions to seismic hazard studies in Europe.

Having worked with historical data in the past, I was particularly impressed with the historical earthquake database (AHEAD), which appears to unify the various national databases into a single consistent interface. The only thing really missing from the series of databases is an archive of historical seismograms, which used to exist at the INGV.

Chapter 1 gives a good overview of the online databases that are available. Following the links, it is easy to get an idea of what kind of data is available. Here are some comments per database, but I would want to stress that these are just minor comments on what I think are world-leading efforts in public access of seismological data for scientific and engineering purposes:

ESM – it is stated that is a database for events in the Euro-Mediterranean region, but the event list suggests it is a worldwide database, with data from, for instance, Costa Rica and Chile. I can see that this database will become some sort of definitive repository of European data, but it is not clear what the other data are doing here. Is the database supposed to have the same authority outside EuroMed? If not, it would be better to remove these data or store them in a separate area.

AHEAD – the 1900 cut-off is a but artificial but understandable. Yet, it would be very valuable if in future implementation it can be extended into the early 20the century, and maybe also link to repositories of historical seismograms.

EDSF – an extremely valuable asset and very impressive. If I had to make one comment, I would add a disclaimer explaining the use of this database in PSHA in terms of epistemic uncertainties, and the need for local site-specific investigations to augment the database.

Chapter 2 discusses the access statistics, and it could do no harm to begin this chapter with one paragraph of the main conclusions from this analysis, since it is a rather dry subject. The main take-away from this chapter is that although there is already significant interest and usage of these data, there is still a large untapped potential from countries outside of Italy and my main conclusion is that this fine effort would greatly benefit from greater outreach to other European and global communities of seismic hazard practitioners. I sincerely hope that this project will continue to be supported and thrive.

Hong Kie Thio (AECOM)

VA4: Evaluation of access to Earthquake Hazard and Risk Tools and Products (EFHER/ETHZ)

The European Facility for Earthquake Hazard and Risk (EFEHR, http://www.efehr.org/en/home/) aims to diffuse data, models, tools and expertise relevant for assessment of seismic hazard and risk in Europe. This short evaluation report is an update of my report from March 2014 when I previously reviewed EFEHR. My comments in my previous report on the overall aim of EFEHR and the high value of that aim still hold.

Currently EFEHR contains static webpages briefly explaining: EFEHR's goals, seismic hazard, seismic risk, exposure, vulnerability and contributing projects, as well as links to related services (e.g. EU Database of Seismogenic Faults). The principal data that can currently be accessed are the results of SHARE, GSHAP, EMME and the Swiss National Hazard Map. The recent addition of GSHAP, EMME and the Swiss Map is to be highly commended as the more data available the more EFEHR will become the go-to resource for hazard results in Europe and elsewhere. A future goal could be to add other national hazard maps to EFEHR so that they can be easily accessed and compared to regional studies. The results available on EFEHR include hazard curves, uniform hazard spectra and hazard maps, as well as many of the inputs used to derive these results and also supporting documentation. This is an excellent resource and, to my knowledge, the only free online resource worldwide providing such rich hazard results in a transparent manner. EFEHR will trigger much future research and it will be invaluable in better communicating seismic hazard to decision-makers and the general public. The statistics on the use of EFEHR (e.g. many thousands of requests per month from a wide variety of countries) shows that there is considerable interest in the information available on the website. It could be useful to survey users of EFEHR about why they are using the site and to ask for their comments and suggestions. This would allow EFEHR to be better tailored to their needs. Currently the knowledge needed to access and understand the information provided by EFEHR is quite high, which means that the general public and decision-makers may not find it as useful as it could be.

Since my previous report, the presentation of the front pages of EFEHR has been much improved. These improvements include a more direct access to the EFEHR-Hazard Platform. The presentation of the front pages was one of my criticisms in my previous review so it is good that this aspect has been improved. The EHEHR-Hazard Platform itself is still similar to the previous version. It is recommended that the user interface of this platform is improved as it looks a little old-fashioned and clunky (e.g. some of the dropdown menus include duplicate entries).

Currently there are no risk, exposure or vulnerability results available on EFEHR but it is stated that these are planned to be released within the coming months. If these services are as high a standard as the hazard results then these resources will also be very useful for future studies and for public information. It will be of great benefit to have available results and models all using consistent state-of-the-art science in one place. In addition, the use of OGC-compliant web services assures the interoperability of these data and eases their use by the community If not done so already, it would be useful to register the webservices within the GEOSS broker and other webpage listing webservices so that they can be easily discovered.

The SERA Deliverable D18.1 is a good report that summarises the current state of EFEHR well. There are many future objectives listed. It is highly recommended that these valuable objectives are met as they will significantly increase the usefulness of EFEHR even further.

In conclusion, I believe that EFEHR is a great step forward in the diffusion of knowledge on risk posed by earthquakes and it should be commended and continued.

11th October 2018, John Douglas, BSc. Hons, Ph.D., HDR, CSci.

VA5: Evaluation of access to data and products of anthropogenic seismicity (IGPAS)

The IS-EPOS platform for Anthropogenic Seismicity is becoming very useful for both researchers and public. Seismologists can upload their data and carry out several statistical and seismological analyses, as well as interact with other researchers. Important information will also be available to the public and decision makers, although not yet as easily accessible as for researchers.

The increasing number of users and more uploaded datasets ("episodes") demonstrate the usefulness of the platform, not only for European seismologists but also for a wider international community. In the case of reservoir-induced seismicity many important and useful statistical tools are available. Data uploading is still not straightforward. For example, user files with earthquake catalog must be converted to a special matlab format before uploading to the platform. I suggest implementing the conversion from user text files to the mat files within the platform itself. I tried several tools like visualization of time series, catalog filtering, calculation of b-values, stress inversion from focal mechanisms. They were generally easy to use, although some fine tuning needs to be done to make the process more user-friendly. I could not use the cross-correlation tool as it is still being implemented and tested. I hope it will be available soon.

I guess a major challenge of the platform will be to allow comparative analyses between many different cases (episodes) taking into account that the completeness of each dataset is very variable. I did not see an easy way to have a general picture of all cases already uploaded. For example, correlations between largest magnitudes, dam height, reservoir volume, depth of the underground mine, extracted volume, type of mechanism (stress regime), etc. I suppose this kind of analysis is a long term goal.

It is interesting to see the increased number of accesses and uploaded data sets soon after the platform is advertised and promoted in congresses and symposia, especially after the meeting of the European Geophysical Union. Considering that

a) the number of uploaded episodes is still not that many (21 cases by the time of the Report), compared to all cases reported in the literature,

b) comparison between many different episodes is necessary to allow more reliable hazard estimates (such as maximum magnitudes, for example),

I recommend to continue promoting the platform in conferences and workshops, and invite people to contribute their datasets.

I have a few minor recommendations:

1) The number of papers on reservoir induced seismicity (66) seems rather low. I wonder if it would be possible to have a mechanism for authors to upload paper references, independently of uploading datasets.

2) When people use the platform to analyze their own dataset, there should be a recommendation on how to cite the use of the IS-EPOS in a future publication. I did not see that.

The Report mentions new tools to be developed: shared workspace; interactive work to develop new tools; and allow applications to be downloaded and used in the user's own computer. I think these are good targets and will certainly enhance the scope and usefulness of the platform. Over all, the AH platform shows an excellent potential and will be very useful for the scientific community.

Marcelo Assumpção

Seismology Centre, University of São Paulo

30-October-2018

Contact

Project lead	ETH Zürich
Project coordinator	Prof. Dr. Domenico Giardini
Project manager	Dr. Kauzar Saleh
Project office	ETH Department of Earth Sciences
	Sonneggstrasse 5, NO H62, CH-8092 Zürich
	sera_office@erdw.ethz.ch
	+41 44 632 9690
Project website	www.sera-eu.org