Plan Overview

A Data Management Plan created using DMPonline

Title: Engineering Strong Motion Database

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Project abstract:

The Engineering Strong Motion database (ESM) is the collection of the accelerometric recordings of earthquakes with magnitude larger than 4 in the Euro-Mediterranean region, since 1969. ESM is designed to provide end users with quality-checked, uniformly processed strong-motion data and relevant parameters. The database is intended for various stakeholders (expert seismologists, earthquake engineers, students, and professionals) and has a user-friendly and straightforward web interface. Specific tools are available to users to process strong-motion data and select ground-motion suites for code-based seismic structural analyses. Data and metadata can be accessed through web services

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Copyright information:

Engineering Strong Motion Database - Initial DMP

1. Data summary

Provide a summary of the data addressing the following issues:

- **State the purpose of the data collection/generation**
- **Explain the relation to the objectives of the project**
- **Specify the types and formats of data generated/collected**
- **Specify if existing data is being re-used (if any)**
- **Specify the origin of the data**
- **State the expected size of the data (if known)**
- **Outline the data utility: to whom will it be useful**

The collection of accelerometric records in an organized archive is useful to provide end users with quality-checked, uniformly processed strong-motion data and relevant parameters for several applications, such as predicting ground shaking and performing structural seismic analysis.

The earthquake recordings are distributed as ASCII, miniseed and HDF5 files. Unprocessed acceleration, processed acceleration, velocity and displacement time series and acceleration and displacement response spectra (5% damping) can be downloaded with relevant strong motion metadata.

The origin of earthquake recordings is the European Integrated Data Archive (EIDA). Data not available in the EIDA platform are obtained from original open-access databases:

1) Unified HEllenic Accelerogram Database (HEAD), containing Greek waveforms and metadata from 1973 to 1999;

2) ITACA, the database of Italian strong-motion data;

3) TR-NSMN, containing the Turkish dataset from 1976 to 2007;

4) Pan-European data from 1972 to 2008, not included in regional databases, are extracted from the European Strong Motion Database.

The Engineering Strong-Motion database is daily updated and the expected rate of growth is 300Gb per year

2. FAIR data

2.1 Making data findable, including provisions for metadata:

- **Outline the discoverability of data (metadata provision)**
- **Outline the identifiability of data and refer to standard identification mechanism. Do you make use of persistent and unique identifiers such as Digital Object Identifiers?**
- **Outline naming conventions used**
- **Outline the approach towards search keyword**
- **Outline the approach for clear versioning**
- **Specify standards for metadata creation (if any). If there are no standards in your discipline describe what metadata will be created and how**

The earthquake recordings in the Engineering Strong Motion database can be discovered by specifying 35 metadata related to stations, events, or waveforms.

The ESM database can be uniquely identified through a Digital Object Identifier (10.13127/ESM). DOIs are also available to identify the single contributing networks.

The SEED convention is used to name Network codes, Station codes, Location IDs and Channel codes.

The standard used for metadata is Data Cite

2.2 Making data openly accessible:

- **Specify which data will be made openly available? If some data is kept closed provide rationale for doing so**
- **Specify how the data will be made available**
- **Specify what methods or software tools are needed to access the data? Is documentation about the software needed to access the data included? Is it possible to include the relevant software (e.g. in open source code)?**
- **Specify where the data and associated metadata, documentation and code are deposited**
- **Specify how access will be provided in case there are any restrictions**

In the Engineering Strong Motion database a period of embargo can be applied to earthquake records. In particular, records are restricted until the processed version is available (usually it takes 1 day to a week) or in case of protection of data of temporary experiments (e.g. Alparray project, seismic microzonation of the area affected by the 2016 central Italy sequence).

Data are made available in different formats:

1) parametric table (flatfile) available at https://esm-db.eu/#/products/flat_file; it is associated with a DOI (**https://doi.org/10.13127/esm/flatfile.1.0)** and it is distributed with the licence CC-BY

2) waveforms are available as ASCII, miniseed and HDF5 files at https://esm-db.eu/. Different licenses can be associated with the records, depending on the data provider's policy. Waveforms are also available at the webservice https://esm-db.eu/esmws/eventdata/1/

3) event metadata are available at the webservice https://esm-db.eu/fdsnws/event/1/ and the web site HTTP://esm-db.eu

4) station metadata are available at the webservice https://esm-db.eu/fdsnws/station/1/ and the web site HTTP://esm-db.eu

5) USGS shakemap input is available in .XML format, through the webservice http://esm.mi.ingv.it/esmws/shakemap/1/ for single earthquakes.

The entire database is associated with the CC-BY licence

2.3 Making data interoperable:

- **Assess the interoperability of your data. Specify what data and metadata vocabularies, standards or methodologies you will follow to facilitate interoperability.**
- **Specify whether you will be using standard vocabulary for all data types present in your data set, to allow inter-disciplinary interoperability? If not, will you provide mapping to more commonly used ontologies?**

Data interoperability is guaranteed by adopting the seismological standards of the International Federation of Digital Seismograph Networks (FDSN).

The vocabulary for all data types present in the Engineering Strong-Motion database is built in the framework of EPOS.

2.4 Increase data re-use (through clarifying licenses):

- **Specify how the data will be licenced to permit the widest reuse possible**
- **Specify when the data will be made available for re-use. If applicable, specify why and for what period a data embargo is needed**
- **Specify whether the data produced and/or used in the project is useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why**
- **Describe data quality assurance processes**
- **Specify the length of time for which the data will remain re-usable**

Licenses are associated with the products distributed by ESM with a different degree of granularity.

The entire database has the CC-BY license

Single records have licenses that depend on the data provider policy (e.g. CC-BY-NC or CC-BY)

The USGS shakemap .xml has no license

The parametric table is associated with CC-BY

Data are assumed to be available and re-usable for the duration of the EPOS infrastructure

3. Allocation of resources

Explain the allocation of resources, addressing the following issues:

- **Estimate the costs for making your data FAIR. Describe how you intend to cover these costs**
- **Clearly identify responsibilities for data management in your project**
- **Describe costs and potential value of long term preservation**

The cost to make available the data of the Engineering Strong Motion database is about 200 keuro/year. These resources come from INGV in-kind contributions, Italian and European projects, the ORFEUS consortium, the Italian Civil Protection and the JRU-EPOS Italy.

The long-term preservation of the infrastructure depends on INGV in-kind contributions, the civil protection funds and the resources that will be allocated by ORFEUS and the Italian government through EPOS Italy.

The data management is in charge of the ESM working group and Strong-Motion Management Committee of ORFEUS.

4. Data security

Address data recovery as well as secure storage and transfer of sensitive data

Secure data storage of the Engineering Strong-Motion database is assured by daily backups performed on a server located at INGV Milan and on a mirror at a server located at the Rende (CS) INGV department.

5. Ethical aspects

To be covered in the context of the ethics review, ethics section of DoA and ethics deliverables. Include references and related technical aspects if not covered by the former

At the moment no consent for data sharing and long-term preservation is included in questionnaires dealing with personal data

6. Other

Refer to other national/funder/sectorial/departmental procedures for data management that you are using (if any)

none