Project S6 – Data base of the Italian strong-motion data relative to the period 1972-2004

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TASK 2 - Deliverable 2

Analog and digital the strong-motion data set (processed and unprocessed) relative to the period 1972 - 2004

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1. INTRODUCTION

The deliverable is represented by the waveform data set relative to the period 1972-2004. The strong motion files are distributed in the processed and unprocessed version. In addition, the velocity and displacement waveforms have been calculated together with the elastic acceleration response spectra at 5% damping for 23 periods.

The acceleration files, processed or unprocessed are distributed in ASCII format with a 43 row header and in SAC format, as defined in paragraph 3.
The velocity and displacement files are distributed in the ASCII version.
The acceleration spectra are evaluated at 23 periods: 0.03, 0.04, 0.07, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 2.0, 3.0, 4.0, 5.0, 7.0 and 10.0 s.

The following files can be downloaded:

- **proc_acc_ASCII.rar**: processed acceleration time series in ASCII format;
- **proc_acc_SAC.rar**: processed acceleration time series in SAC format;
- **unproc_acc_ASCII.rar**: unprocessed acceleration time series in ASCII format ;
- **unproc_acc_SAC.rar**: unprocessed acceleration time series in SAC format ;
- **vel_ASCII.rar**: velocity time series in ASCII format;
- **disp_ASCII.rar**: displacement time series in ASCII format;
- **spectra_ASCII.rar**: elastic acceleration response spectra at 5% damping in ASCII format (period-spectral ordinates)

2. RULES FOR FILES NAMING

The file name should make easier the data retrieval based on date, time, station name and component through simple OS commands. It should be therefore composed by:

YYYYYMMDD + _ + HHMMSS + NETWORK CODE + _ + STATION CODE + COMP ONENT+ PROCESSING FLAG . FORMAT

for a total length of 33 characters. The single segments are described in Table 1.

Example: the acceleration recorded by the *Department of Civil Protection network* (ITDPC) at *S. Giuliano di Puglia scuola* (SGIB), NS component, on 2002/11/12 at 09:27:00 GMT, unprocessed, ASCII format with header, will have the following name:

20021112_092700ITDPC_SGIB_NSX.DAT

Table 1: description of the segments forming the file name.

SEGMENT	DESCRIPTION	LENGTH	REQUIREMENTS
YYYYMMDD_HHMMSS	Origin time	15	The origin time of the selected localisation. When no events are listed in seismic catalogues, it is assumed the record start time
NETCODE	Network code	5	If the Network code has less than 5 characters, the rest is replaced by one or more underscores
STACODE	Station code	5	If the station code has less than 5 characters, the rest is replaced by one or more underscores
COMP	Component of the motion	2	NS = north-south WE = east-west UP = vertical FC = fixed trace
CORRECTION_FLAG	This flag specifies whether or not the record has been processed	1	C = processed X = unprocessed
FORMAT	Flag indicating the format type	4	SAC = acceleration (SAC format) DAT = acceleration (ASCII with header) VEL = velocity (ASCII with header) DIS = displacement (ASCII with header) SPE = 5% damped acceleration response spectrum (ASCII-XY with header)

3. RECORD HEADER

The ASCII-with-header records (acceleration, velocity, displacement or acceleration response spectrum) will be characterised by a header of 43 rows, containing the following information, in order to make the record self-consistent:

1. Name of the seismic event
2. GMT event date (YYYYMMDD)
3. GMT event origin time (hhmmss)
4. Event Latitude (decimal degrees)
5. Event Longitude (decimal degrees)
6. Event depth (km)
7. Local magnitude Ml
8. Surface wave magnitude Ms
9. Moment magnitude Mw
10. Focal mechanism
11. Station code
12. Station name
13. Station Latitude (decimal degrees)
14. Station Longitude (decimal degrees)
15. Station elevation (m.a.s.l.)
16. Geotechnical classification (EC8)
17. Morphologic classification
18. Epicentral distance (km)
19. Earthquake backazimuth
20. Time (GMT) of the first sample (hhmmss.dec)
21. Sampling interval (s)
22. Number of points
23. Duration (s)
24. Component (NS, WE, UP, FC)
25. Units (cm/s^2, cm/s, cm)
26. Instrument type
27. Instrument Frequency (Hz)
28. Instrument Damping
29. Sensitivity (cm/g, V/g)
30. Fullscale (g)
31. Number of bits of the Analog to Digital Converter
32. Pga, Pgv, Pgd (cm/s^2, cm/s, cm)
33. Time corresponding to the Pga, Pgv, Pgd (s)
34. Owner of the record
35. Epicentral intensity
36. Baseline correction (REMOVED/NOT REMOVED)
37. Filter type (Butterworth, Cosine, ……)
38. Filter order
39. LP1 (low-cut frequency)

40. LP2 (roll-on frequency)
41. HP1 (roll-off frequency)
42. HP2 (high-cut frequency)
43. Data type (unprocessed acceleration, processed acceleration, velocity, displacement, acceleration response spectrum)

The SAC files are stored in binary format, with little-endian byte order, to be used under Linux OS.

The binary SAC format contains a fixed length header section followed by one or two data sections. The header contains floating point, integer, logical, and character fields. Details on the SAC header are defined at http://www.llnl.gov/sac/.

Some of the 43 row ASCII header metadata were stored in the unused spaces of the SAC header.

In particular the instrument characteristics were stored in the floating point part of the header (numbers refer to the position inside the header):

#22 instrument frequency
#23   instrument damping
#24 instrument sensitivity
#25 instrument full scale
#41 low pass frequency 1
#42 low pass frequency 2
#43 high pass frequency 1
#44 high pass frequency 2
#67 macroseismic epicentral intensity
#68 surface wave magnitude
#69 local magnitude
#70 moment magnitude

In the integer part of the header the following information has been stored (numbers refer to the position inside the header):

#26 number of bit of ADC
#27 1 = BASELINE REMOVED, 0 = BASELINE NOT REMOVED
#28 1 = BUTTERWORTH, 0 = COSINE filter
#29 1 = PROCESSED ACCELERATION, 0 = UN PROCESSED ACCELERATION

The instrument type information, contained in the character header KINST, is stored as DIGITAL or ANALOG, due to the limitation to 8 characters.