User Manual

Waveforms and response spectra are provided as Adaptable Seismic Data Format (ASDF) or as ASCII files (DYNA 1.2 format). Into ASDF and DYNA 1.2 formats, response spectra are evaluated at 105 periods from 0.01 to 10 seconds.

Details on ASDF structure are available in Krischer et al., 2016 (https://dx.doi.org/10.1093/gji/ggw319). Response spectra are stored into ASDF volume in the *AuxiliaryData* structure. Browsing ASDF volumes is possible using many software (e.g. HDFView, ASDF SEXTANT) and many programming languages, e.g. Python using modules such as pyasdf or h5py, MATLAB.

You can find more details on ITACA website contents in the technical report *The new ITalian ACcelerometric Archive ITACA: database, web-services, and tools to access and analyze earthquakes waveforms*

DYNA 1.2 ASCII format contains a 64 rows header and a data vector. Response spectra files contain pairs of period - ordinates.

EVENT_NAME	Event name
EVENT_ID	Code to identify the seismic event in ITACA
EVENT_DATA_YYYYMMDD	Event date (GMT)
EVENT_TIME_hhmmss	Origin time of the seismic event (GMT)
EVENT_LATITUDE_DEGREE	Event latitude (decimal degrees)
EVENT_LONGITUDE_DEGREE	Event longitude (decimal degrees)
EVENT_DEPTH_KM	Hypocenter depth (km)
HYPOCENTER_REFERENCE	Reference of the hypocentral location
MAGNITUDE_W	Moment magnitude (Mw)
MAGNITUDE_W_REFERENCE	Reference of the moment magnitude
MAGNITUDE_L	Local magnitude (ML)
MAGNITUDE_L_REFERENCE	Reference for the local magnitude

FOCAL_MECHANISM	Focal mechanism (NF,SS,TF,U,oblique)
NETWORK	Code to identify the seismic network
STATION_CODE	Code to identify the recording station
STATION_NAME	name of the recording station
STATION_LATITUDE_DEGREE	Station latitude (decimal degrees)
STATION_LONGITUDE_DEGREE	Station longitude (decimal degrees)
STATION_ELEVATION_M	Elevation of the recording station (m a.s.l.)
LOCATION	Code to identify the sensor
SENSOR_DEPTH_M	Depth of the sensor
VS30_M/S	Average measure of the shear (S) waves propagation velocity in the soil, within the first 30 meters of depth from the ground level
SITE_CLASSIFICATION_EC8	Site classification based on EC8
MORPHOLOGIC_CLASSIFICATION	Morphological classification
EPICENTRAL_DISTANCE_KM	Epicentral distance (km)
EARTHQUAKE_BACKAZIMUTH_DEGREE	Backazimuth Angle(decimal degrees)
DATE_TIME_FIRST_SAMPLE_YYYYMMDD_HHMMSS	Time of the first sample YYYYMMDD_hhmmss.dec (GMT)
DATE_TIME_FIRST_SAMPLE_PRECISION	seconds / milliseconds
SAMPLING_INTERVAL_S	Sampling interval (s)
NDATA	Number of samples
DURATION_S	Duration of the time history (s)
STREAM	Code to identify the recording channel (3 caratteri es. HNE)
UNITS	Measure Unit (cm/s^2, cm/s, cm)
INSTRUMENT	Type of recording instrument

INSTRUMENT_ANALOG/ DIGITAL	Code to identify the type of record (D: Digital; A: Analog)
INSTRUMENTAL_FREQUENCY_HZ	Instrument frequency (Hz)
INSTRUMENTAL_DAMPING	Instrument damping
FULL_SCALE_G	Fullscale (g)
N_BIT_DIGITAL_CONVERTER	Number of bit of the Analogic Digital Converter
PGX_UNITS	Absolute maximum value of the ground motion parameter (PGA cm/s^2, PGV cm/s, PGD cm)
TIME_PGX_S	Time corresponding to PGA, PGV, or PGD
BASELINE_CORRECTION	BASELINE REMOVED/BASELINE NOT REMOVED
FILTER_TYPE	Type of filter applied to the acceleration (acausal band-pass - Butterworth)
FILTER_ORDER	Filter order
LOW_CUT_FREQUENCY_HZ	Low-cut frequency (Hz)
HIGH_CUT_FREQUENCY_HZ	High-cut frequency (Hz)
LATE/NORMAL_TRIGGERED	Code to identify seismic records triggered early enough to properly describe the first arrivals of the seismic waves (NT: Normally Triggered; LT: Late Triggered)
DATABASE_VERSION	Database version
HEADER_FORMAT	Header format of the ASCII file
DATA_TYPE	Ground motion parameter (PGA, PGV, PGD, SA, or SD)
PROCESSING	Processing flow applied to the accelerometric waveform
DATA_TIMESTAMP_YYYYMMDD_HHMMSS	Datetime of the ASCII file creation
DATA_LICENSE	Data licence
DATA_CITATION	Data citation
DATA_CREATOR	Creator of the processed datum
ORIGINAL_DATA_MEDIATOR_CITATION	Citation of the intermediary of the original data

ORIGINAL_DATA_MEDIATOR	Intermediary of the original data
ORIGINAL_DATA_CREATOR_CITATION	Citation of the original data provider
ORIGINAL_DATA_CREATOR	Original data provider
USER1	
USER2	
USER3	
USER4	
USER5	

ASCII-file/ASDF-tag components

Following the Seed manual v 2.4 , we adopt the following components:

- **net_code** is the FDSN network code (1 or 2 characters)
- **station_code** is the station code (3 to 5 characters)
- **location_code** is the code which indicates the station location (0 to 2 characters); in file names, the *location_code* '00' (double-zeros) is always replaced by an empty string
- **channel_code** indicates the instrument type and the ground-motion component and has 3 digits:
    - 1st digit for the band code (in our case H = High Broad Band i.e. sample rate within the range 80-250 Hz);
    - 2rd digit indicates the instrument code: N, L, G = accelerometer (the codes are the ones used as a convention by many networks),
    - 3th digit indicates the orientation code: e.g. Z N E (traditional Vertical, North-South, East-West), Z 2 3 (orthogonal components but nontraditional orientations), etc.

Other specific components are:

event_id is the event identifier

date is the event date as "YYYYMMDD"

time is the event origin time as "hhmmss"

file_type is either ACC (acceleration), VEL (velocity) or DIS (displacement) for time series, as well as SA (acceleration) or SD (displacement) for response spectra.

processing_type is either MP or AP (Manual or Automatic processing using the schema by Paolucci et al, 2011) or CV (unprocessed accelerations ConVerted in physical units). Details on the automatic processing can be found in Puglia et al., 2018.

processing_type_old is either X (unprocessed, that is the same as the above 'CV') or C (processed, same as above 'MP' or 'AP').

ASCII file naming

The ASCII files can be downloaded with two filenames:

Default filename:

'net_code'.'station_code'.'location_code'.'channel_code'.**D**.'event_id'.'file_type'.'processing_type'.**ASC**

Old filename: adopted in the previous versions ITACA 2.X:

'net_code'.'station_code'.'location_code'.'channel_code'.**D**.'date'.'time'.'processing_type_old'.'waveform_type'.**ASC**

ASDF tag naming

'location_code'_'channel_code'_'event_id'_'processing_type'_'file_type'

- all characters in lower-case
- not alphanumeric characters of 'event_id' are replaced by underscores

Examples:

The unprocessed acceleration time serie recorded by the Department of Civil Protection network (IT) at San Giuliano di Puglia station (station code SGIUB), location '00',component N, event ID 'IT-2002-0075' (occurred on 2002/11/12 at 09:27:48 GMT), assumes the following names:

ASCII default filename: **IT.SGIUB..HNN.D.IT-2002-0075.CV.ACC.ASC**

ASCII old filename: **IT.SGIUB..HNN.D.20021112.092700.X.ACC.ASC**

ASDF tag: **00_hnn_it_2002_0075_acc_cv**

References

Lion Krischer, James Smith, Wenjie Lei, Matthieu Lefebvre, Youyi Ruan, Elliott Sales de Andrade, Norbert Podhorszki, Ebru Bozdağ, Jeroen Tromp; An Adaptable Seismic Data Format, Geophysical Journal International, Volume 207, Issue 2, 1 November 2016, Pages 1003–1011, https://doi.org/10.1093/gji/ggw319

Paolucci R., Pacor F., Puglia R., Ameri G., Cauzzi C., Massa M. (2011). It appears as chapter 8 of the book Earthquake Data in Engineering Seismology - Predictive Models, Data Management and Networks by Sinan Akkar, Polat Gülkan, Torild van Eck (Editors). ISBN: 978-94-007-0151-9 (Printed version) 978-94-007-0152-6 (E-book version). This book is volume 14 of the series Geotechnical, Geological, and Earthquake Engineering, published by Springer Netherlands in 2011.

Puglia, R., Russo, E., Luzi, L., D'Amico, M., Felicetta, C., Pacor, F., & Lanzano, G. (2018). Strong-motion processing service: a tool to access and analyse earthquakes strong-motion waveforms. Bulletin of Earthquake Engineering, 16(7), 2641-2651.