TCS-AH DATA FORMATS

DATA FOR FURTHER PROCESSING

The data for further processing should be loaded into Matlab/Octave and used for further calculations. Format of that data is GDF mat file (Generic Data Format prepared within IS-EPOS). Data prepared in this format can be easily converted to ASCII (CSV) format with homogenous structure.

CATALOG

The catalogue is a variable in the Matlab format file and it is kept in a file MAT. The structure is array with named fields that can contain data of various types and sizes. In the file there is only one variable, the file name and variable name are optional.

The variable describing the catalogue is a vector of structures, consisting of fields:

- **`field`** – name of field in the catalogue (text value);
- **`type`** – type of field in the catalogue and way of showing the field (numeric value);
- **`val`** – column array of values. For the text the column is an array type cell with text fields. For the remaining value the column is a numeric column.

The fundamental is a full catalogue i.e. the variable contains the definitions of all specified fields. When some field values are missing then for the numeric data NaN (not specified) is entered and for the text null [] is entered. In the fields "ID", "Time" and at least one of the fields "Mw" or "ML" values in all rows must be present.

Table The required parameters in catalogue MAT format

Name of field	Description of the field	Data format	Number of data type[1]	Unit	Comments
ID	Event ID	text	3		required field
Time	Matlab serial numerical time	double	5	days	required field
Lat	Latitude	double	24,25	[°] – North positive	
Long	Longitude	double	24,25,34,35	[°] – East positive	
Depth	Hypocenter depth measured from the ground level	double	11-13	[km]	
Elevation	Hypocenter elevation measured over the see level	double	10	[m]	
X	Original Coordinate		10		Original coordinates if other than geographical. Description of coordinates in the metadata
Y			10		
Z			10		
EPI_err	epicentral error	double	10	[m]	
Depth_err	depth error		10	[m]	
Nl	No of stations used in the localisation		2		
M0	Scalar moment		7	[Nm]	
Mw	moment magnitude	double 0.1[2]	4		Mw or ML must be for all event
ML	local magnitude	double 0.1	4		Mw or ML must be for all event
Ns_decomp	No of stations used in MT inversion	double	2		
DecompMethod	Method used to decompose moment tensor	text	3		

[1] The numerical value of the type of the data to be written to the field type. The Numbers description is shown below.
[2] The values rounded to 0.1.

Name of field	Description of the field	Data format	Number of data type[1]	Unit	Comments
MTrr	Full solution: Moment tensor rr component (r – up)	double	7	[Nm]	
MTss	Full solution: Moment tensor ss component (s – South)	double	7	[Nm]	
MTee	Full solution: Moment tensor ee component (e – East)	double	7	[Nm]	
MTrs	Full solution: Moment tensor rs component	double	7	[Nm]	
MTre	Full solution: Moment tensor re component	double	7	[Nm]	
MTse	Full solution: Moment tensor se component	double	7	[Nm]	
MT_err	Full solution: Moment tensor error	double	7	[Nm]	
ISO	isotropic MT component	double	120	[%] - positive or negative	
CLVD	CLVD component	double	120	[%] - positive or negative	
DC	Double-Couple component	double	20	[%] - only positive	
StrikeA	Strike of nodal plane A	double	30	[°]	The values range from 0 to 360
DipA	Dip of nodal plane A	double	20	[°]	The values range from 0 to 90
RakeA	Rake of nodal plane A	double	130	[°]	The values range from -180 to 180
SlopeA	Inclination for nodal plane A	double	20	[°]	The values range from 0 to 90
StrikeB	Strike of nodal plane B	double	30	[°]	The values range from 0 to 360
DipB	Dip of nodal plane B	double	20	[°]	The values range from 0 to 90
RakeB	Rake of nodal plane B	double	130	[°]	The values range from -180 to 180
SlopeB	Inclination for nodal plane B	double	20	[°]	The values range from 0 to 90
Strike_err	Strike error	double	10	[°]	
Dip_err	Dip error	double	10	[°]	
Rake_err	Rake error	double	10	[°]	
Slope_err	Inclination error	double	10	[°]	
Plunge_T	Plunge of T-axis	double	10	[°]	The values range from 0 to 360
PlungeT_err	T-axis plunge error	double	10	[°]	
Trend_T	Trend of T-axis	double	10	[°]	The values range from 0 to 90
TrendT_err	T-axis trend error	double	10	[°]	
Plunge_P	Plunge of P-axis	double	10	[°]	The values range from 0 to 360
PlungeP_err	P-axis plunge error	double	10	[°]	
Trend_P	Trend of P-axis	double	10	[°]	The values range from 0 to 90
TrendP_err	P-axis trend error	double	10	[°]	
DCrr	Double-Couple solution: Moment tensor rr component (r - up)	double	7	[Nm]	

Name of field	Description of the field	Data format	Number of data type[1]	Unit	Comments
DCss	Double-Couple solution: Moment tensor ss component (s - South)	double	7	[Nm]	
DCee	Double-Couple solution: Moment tensor ee component (e - East)	double	7	[Nm]	
DCrs	Double-Couple solution: Moment tensor rs component	double	7	[Nm]	
DCre	Double-Couple solution: Moment tensor re component	double	7	[Nm]	
DCse	Double-Couple solution: Moment tensor se component	double	7	[Nm]	
DC_err	Double-Couple solution: Moment tensor error	double	7	[Nm]	
DCStrikeA	Double-Couple solution: Strike of nodal plane A	double	30	[°]	The values range from 0 to 360
DCDipA	Double-Couple solution: Dip of nodal plane A	double	20	[°]	The values range from 0 to 90
DCRakeA	Double-Couple solution: Rake of nodal plane A	double	130	[°]	The values range from -180 to 180
DCStrikeB	Double-Couple solution: Strike of nodal plane B	double	20	[°]	The values range from 0 to 90
DCDipB	Double-Couple solution: Dip of nodal plane B	double	30	[°]	The values range from 0 to 360
DCRakeB	Double-Couple solution: Rake of nodal plane B	double	20	[°]	The values range from 0 to 90
DCStrike_err	Double-Couple solution: Strike error	double	10	[°]	
DCDip_err	Double-Couple solution: Dip error	double	10	[°]	
DCRake_err	Double-Couple solution: Rake error	double	10	[°]	
DCPlunge_T	Double-Couple solution: Plunge of T-axis	double	10	[°]	The values range from 0 to 90
DCPlungeT_err	Double-Couple solution: T-axis plunge error	double	10	[°]	
DCTrend_T	Double-Couple solution: Trend of T-axis	double	10	[°]	The values range from 0 to 360
DCTrendT_err	Double-Couple solution: T-axis trend error	double	10	[°]	
DCPlunge_P	Double-Couple solution: Plunge of P-axis	double	10	[°]	The values range from 0 to 90
DCPlungeP_err	Double-Couple solution: P-axis plunge error	double	10	[°]	
DCTrend_P	Double-Couple solution: Trend of P-axis	double	10	[°]	The values range from 0 to 360
DCTrendP_err	Double-Couple solution: P-axis trend error	double	10	[°]	
TNrr	TN solution: Moment tensor rr component (r - up)	double	7	[Nm]	
TNss	TN solution: Moment tensor ss component (s - South)	double	7	[Nm]	
TNee	TN solution: Moment tensor ee component (e - East)	double	7	[Nm]	
TNrs	TN solution: Moment tensor rs component	double	7	[Nm]	
TNre	TN solution: Moment tensor re component	double	7	[Nm]	
TNse	TN solution: Moment tensor se component	double	7	[Nm]	

Name of field	Description of the field	Data format	Number of data type[1]	Unit	Comments
TN_err	TN solution: Moment tensor error	double	7	[Nm]	
TNStrikeA	TN solution: Strike of nodal plane A	double	30	[°]	The value range from 0 to 360
TNDipA	TN solution: Dip of nodal plane A	double	20	[°]	The value range from 0 to 90
TNRakeA	TN solution: Rake of nodal plane A	double	130	[°]	The value range from -180 to 180
TNStrikeB	TN solution: Strike of nodal plane B	double	20	[°]	The value range from 0 to 90
TNDipB	TN solution: Dip of nodal plane B	double	30	[°]	The value range from 0 to 360
TNRakeB	TN solution: Rake of nodal plane B	double	20	[°]	The value range from 0 to 90
TNStrike_err	TN solution: Strike error	double	10	[°]	
TNDip_err	TN solution: Dip error	double	10	[°]	
TNRake_err	TN solution: Rake error	double	10	[°]	
TNPlunge_T	TN solution: Plunge of T-axis	double	20	[°]	The value range from 0 to 90
TNPlungeT_err	TN solution: T-axis plunge error	double	10	[°]	
TNTrend_T	TN solution: Trend of T-axis	double	30	[°]	The value range from 0 to 360
TNTrendT_err	TN solution: T-axis trend error	double	10	[°]	
TNPlunge_P	TN solution: Plunge of P-axis	double	20	[°]	The value range from 0 to 90
TNPlungeP_err	TN solution: P-axis plunge error	double	10	[°]	
TNTrend_P	TN solution: Trend of P-axis	double	30	[°]	The value range from 0 to 360
TNTrendP_err	TN solution: P-axis trend error	double	10	[°]	
NsP	No of stations used in the P-wave spectral analysis	double	2		
E	total seismic energy	double	7	[J]	
E_err	total seismic energy error	double	7	[J]	
Ep	P-wave energy	double	7	[J]	
Ep_err	P-wave energy error	double	7	[J]	
fp	P-wave corner frequency	double	12	[Hz]	
fp_err	P-wave corner frequency error	double	12	[Hz]	
rad_eff_P	Radiation efficiency P	double	12		
Qp	Quality factor Pwaves	double	10		
NsS	No of stations used in the S-wave spectral analysis	double	2		
Es	S-wave energy	double	7	[J]	
Es_err	S-wave energy error [J]	double	7	[J]	
fs	S-wave corner frequency [Hz]	double	12	[Hz]	
fs_err	S-wave corner frequency error [Hz]	double	12	[Hz]	
Qs	Quality factor Swaves	double	10		
rad_eff_S	Radiation efficiency S	double	12		
R	source radius	double	10	[m]	
R_err	source radius error	double	10	[m]	
R_model	Source radius model used (Brune, Madariaga, Sato&Hirasawa)	text	3		

Name of field	Description of the field	Data format	Number of data type[1]	Unit	Comments
rad_eff	Radiation efficiency	double	12		
sigma_a	Apparent stress	double	13	[MPa]	
delta_sigma	Static stress drop	double	13	[MPa]	
sigma_d	Dynamic stress drop	double	13	[MPa]	
sigma_rms	RMS dynamic stress drop	double	13	[MPa]	
vr	Rupture velocity	double	10	[m/s]	
vr_model	Rupture velocity model (unilateral etc.)	text	3		
SW_eff	Savage-Wood efficiency	double	12		
u	Fault slip	double	12	[m]	

The Numbers of Data type:
1 – the real data without limits,
2 – the integer data,
3 – text value,
4 – the real number rounded to 0.1 (shown as 11),
5 – time in Matlab format serial time – the time display format; seconds with accuracy 1/10,
6 – the real data display in an engineering manner with one decimal place, e.g.: 3.5E6,
7 – the real data display in an engineering manner with two decimal place,
bc – (*b* and *c* are code digits) the real data display in fix-point manner with at minimum *b* places before decimal and *c* decimal place

e.g. For number 3.149.
10: „3”
11: „3.1”
12: „3.15”
20: „03”
23: „03.149”

1*bc*– the same manner as *bc*, but with place for a sign (space for sign „+”, sign - for sign „-”)

GROUND MOTION CATALOG

The catalogue is a variable in the Matlab format file and it is kept in a file MAT. The structure is array with named fields that can contain data of various types and sizes. In the file there is only one variable, the file name and variable name are optional. The format of ground motion catalog is made in the same manner as catalog of seismic events

The variable describing the catalogue is a vector of structures, consisting of fields:

- **`field`** – name of field in the catalogue (text value);
- **`type`** – type of field in the catalogue and way of showing the field (numeric value);
- **`val`** – column array of values. For the text the column is an array type cell with text fields. For the remaining value the column is a numeric column.

The fundamental is a full catalogue i.e. the variable contains the definitions of all specified fields. When some field values are missing then for the numeric data NaN (not specified) is entered and for the text null [] is entered. In the fields "ID", "Time" and at least one of the fields "Mw" or "ML" values in all rows must be present.

Name of field	Description of the field	Data format	Number of data type	Unit	Comments
RID	Registration ID	text	3		**required field. ID must be linked to name of signal accelerogram.**
EID	Event ID	text	3		required field. ID should be linked to catalog EID.
SID	Station ID	text	3		
S_name	Station name	text	3		
S_Lat	station latitude	double	24,25	[°] – North positive	
S_Long	station longitude	double	24,25,34,35	[°] – East positive	
S_Elevation	station elevation	double	10	[m]	
Time	Matlab serial numerical time	double	5	days	required field
PGA-x	Peak ground acceleration of x component	double	13	[m/s^2]	required field
PGA-y	Peak ground acceleration of y component	double	13	[m/s^2]	
PVA	Peak vertical acceleration component	double	13	[m/s^2]	
PHA	Peak horizontal acceleration	double	13	[m/s^2]	
PGA	Total peak ground acceleration	double	13	[m/s^2]	
PGA10-x	Peak values after low-pass filtering 10Hz.	double	13	[m/s^2]	
PGA10-y		double	13	[m/s^2]	
PVA10		double	13	[m/s^2]	
PHA10		double	13	[m/s^2]	
PGA10		double	13	[m/s^2]	
PGV-x	Peak ground velocity of x component	double	13	[cm/s]	
PGV-y	Peak ground velocity of y component	double	13	[cm/s]	
PVV	Peak vertical velocity component	double	13	[cm/s]	
PHV	Peak horizontal velocity	double	13	[cm/s]	
PGV	Total peak ground velocity	double	13	[cm/s]	
PGD-x	Peak ground displacement of x component	double	13	[mm]	
PGD-y	Peak ground displacement of y component	double	13	[mm]	
PVD	Peak vertical displacement component	double	13	[mm]	
PHD	Peak horizontal displacement	double	13	[mm]	
PGD	Total peak ground displacement	double	13	[mm]	
AI	Arias Intensity	double	6	[m/s]	
NED	Normalized Energy Density	double	6		

Name of field	Description of the field	Data format	Number of data type	Unit	Comments
ABD	Absolute bracketed duration	double	21	[s]	A problem with absolute durations relies in that one must prescribe for them absolute criteria. Maybe they should not be included in the catalog but to implement an appropriate service to evaluate them?
AUD	Absolute uniform duration	double	21	[s]	
AED	Absolute effective duration	double	21	[s]	
RBD	Relative bracketed duration	double	21	[s]	For relative durations criteria must be prescribed too but here there is a general agreement for 5%
RUD	Relative uniform duration	double	21	[s]	
RED	Relative effective duration	double	21	[s]	
RMS_A	Root-mean-square acceleration	double	21	[s]	
RMS-V	Root-mean-square velocity	double	21	[s]	
RMS-D	Root-mean-square displacement	double	21	[s]	

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4 – the real number rounded to 0.1 (shown as 11),
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e.g. For number 3.149.
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SIGNALS

WAVEFORM SEED/WAVEFORM MSEED

Continues seismogram in SEED or miniSEED format.

The Standard for the Exchange of Earthquake Data (SEED) is a data format intended primarily for the archival and exchange of seismological time series data and related metadata. The format is maintained by the International Federation of Digital Seismograph Networks and documented in the SEED Manual (PDF format). Originally designed in the late 1980s, the format has been enhanced and refined a number of times and remains in widespread use. A so-called full SEED volume is the combination of time series values along with comprehensive metadata. In essense a full SEED volume is the combination of miniSEED with a matching dataless volume in a single file.

SIGNAL SEED/SIGNAL MSEED,

Trigger seismogram in SEED or miniSEED format.

SIGNAL SEED ACCELEROGRAM/SIGNAL MSEED ACCELEROGRAM

Trigger accelerogram in SEED or miniSEED format.

WAVEFORM SEED ACCELEROGRAM/WAVEFORM MSEED ACCELEROGRAM

Continues accelerogram in SEED or miniSEED format.

DATALESS

A dataless SEED volume is the metadata counterpart to miniSEED that contains the geographic coordinates and instrument response information often needed to process the time series data. A dataless can contain a complete and comprehensive history of metadata for one or many networks and stations. A dataless volume does not contain any time series values.

SEISMIC NETWORK

SEISMIC NETWORK,

XML file with SeisComP inventory format with information about seismic network of seismometers.

GROUND MOTION NETWORK

XML file with SeisComP inventory format with information about seismic network of accelerometers.

GDF v2.1 – GENERIC DATA FORMAT

This structure contains 9 variables, where *d* is the most essential one, because it contains the data which can be further processed. The other variables are used for the correct data description – units, coordinate system, fields etc.

GDF file name following the scheme: *GDF_EPIZODNAME_file_description*.

The structure of Generic Data Format

Variable name	Type	Description
CRS	char	Coordinate Reference System EPSG code (or local) mapping surveying (http://epsg.io), standard WGS84 (EPSG: 4326)
d	struct	The variable containing the data. The data may be as a single variable, a vector or an array. Data name following the scheme: *Name_of_parameter* or *NAME* (for shortcuts, chemical formulas etc.)
Description	char	The text description of the data contained in the file
FieldDescription	cell	Description of the fields. An array contains two columns: the first contains the name of the field/column of data, the second contains a description of them. All data must be specified
FieldType	cell	An array contains two columns: the first contains the name of the field/column of data, the second contains the data type number. All data must be specified. The Numbers of Data type: 1 – the real data without limits, 2 – the integer data, 3 – text value, 4 – the real number rounded to 0.1 (shown as 11), 5 – time in Matlab format serial time – the time display format; seconds with accuracy 1/10, 6 – the real data display in an engineering manner with one decimal place, e.g.: 3.5E6, 7 – the real data display in an engineering manner with two decimal place, bc – (b and c are code digits) the real data display in fix-point manner with at minimum b places before decimal and c decimal place e.g. For number 3.149. 10: „3” 11: „3.1” 12: „3.15” 20: „03” 23: „03.149” 1bc– the same manner as bc, but with place for a sign (space for sign „+”, sign ‘-’ for sign „-”)
FieldUnit	cell	Description of units for individual data, e.g. m/s. An array contains two columns: the first contains the name of the field/column of data, the second contains the unit. All data must be specified.
FormatName	char	Name of data format GDF (Generic Data Format).
FormatVersion	double	When changing/expansion of the format change its version. It can have one number after the decimal point.
TimeZone	char	Acronym of Time Zone (http://en.wikipedia.org/wiki/List_of_time_zone_abbreviations), normally UTC

AIR QUALITY

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers specifying 'matlab' time
- ***NO*** – vector of real numbers specifying concentration of nitrogen oxide
- ***NO_2*** –vector of real numbers specifying concentration of nitrogen dioxide
- ***NO_x*** –vector of real numbers specifying concentration of nitrogen oxides
- ***CO*** – vector of real numbers specifying concentration of carbon monoxide
- ***PM10*** – vector of real numbers specifying concentration of particulate matter PM10
- ***O_3*** – vector of real numbers specifying concentration of ozone
- ***CO_2*** – vector of real numbers specifying concentration of carbon dioxide
- ***CH_4*** – vector of real numbers specifying concentration of methane
- ***NMHC*** – vector of real numbers specifying concentration of non-methane hydrocarbons
- ***THC*** – vector of real numbers specifying concentration of total hydrocarbons

Field details

FieldDescription

- ***Date*** – Time of measurement
- ***NO*** – Nitrogen oxide
- ***NO_2*** – Nitrogen dioxide
- ***NO_x*** – Nitrogen oxides
- ***CO*** – Carbon monoxide
- ***PM10*** – Particulate matter PM10 (particles that are 10 micrometers in diameter or smaller)
- ***O_3*** – Ozone
- ***CO_2*** – Carbon dioxide
- ***CH_4*** – Methane
- ***NMHC*** – Non-methane hydrocarbons
- ***THC*** – Total hydrocarbons

FieldType

- ***Date*** – 5
- ***NO*** – 34
- ***NO_2*** – 34
- ***NO_x*** – 34
- ***CO*** – 44
- ***PM10*** – 34
- ***O_3*** – 34
- ***CO_2*** – 44
- ***CH_4*** – 24
- ***NMHC*** – 16
- ***THC*** – 26

FieldUnit

- ***Date*** – datenum
- ***NO*** – ppb
- ***NO_2*** – ppb
- ***NO_x*** – ppb
- ***CO*** – ppb
- ***PM10*** – ug/m^3
- ***O_3*** – ppb
- ***CO_2*** – ppm
- ***CH_4*** – ppm
- ***NMHC*** – ppmC
- ***THC*** – ppmC

Files associated with format:

- *GDF_WYSIN_air_quality*

BOTTOMHOLE PRESSURE

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Bottomhole_pressure*** – vector of real numbers containing the bottomhole pressure

Field details

FieldDescription

- ***Date*** – Time of fluid injection
- ***Bottomhole_pressure*** – Bottomhole pressure

FieldType

- ***Date*** – 5
- ***Bottomhole_pressure*** – 34

FieldUnit

- ***Date*** – datenum
- ***Bottomhole_pressure*** – MPa

Files associated with format:

- *GDF_PREESEHALL_Bottomhole_Pressure*

CUMULATIVE INJECTION

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Cumulative_injection*** – vector of real numbers containing the cumulative injection measured at a defined borehole

Field details

FieldDescription

- ***Date*** – Time of cumulative fluid injection
- ***Cumulative_injection*** – Cumulative injection

FieldType

- ***Date*** – 5
- ***Cumulative_injection*** – 14 [134]

FieldUnit

- ***Date*** – datenum
- ***Cumulative_injection*** – m^3

Files associated with format:

- *GDF_TG_cum_inj_rate_prati_9*
- *GDF_TG_cum_inj_rate_prati_9_29*
- *GDF_TG_cum_inj_rate_prati_29*
- *GDF_TG_daily_cum_inj_rate_prati_9*
- *GDF_TG_daily_cum_inj_rate_prati_9_29*
- *GDF_TG_daily_cum_inj_rate_prati_29*

FLOWBACK BOTTOMHOLE PRESSURE

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Flowback_bottomhole_pressure*** – vector of real numbers containing the flowback bottomhole pressure

Field details

FieldDescription

- ***Date*** – Time of flowback bottomhole pressure
- ***Flowback_bottomhole_pressure*** – Flowback bottomhole pressure

FieldType

- ***Date*** – 5
- ***Flowback_bottomhole_pressure*** – 34

FieldUnit

- ***Date*** – datenum
- ***Flowback_bottomhole_pressure*** – MPa

Files associated with format:

- *GDF_PREESEHALL_Flowback_Bottomhole_Pressure*

FLOWBACK RATE

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Flowback_rate*** – vector of real numbers containing the flowback rate

Field details

FieldDescription

- ***Date*** – Time of flowback rate
- ***Flowback_rate*** – Flowback rate

FieldType

- ***Date*** – 5
- ***Flowback_rate*** – 14

FieldUnit

- ***Date*** – datenum
- ***Flowback_rate*** – m^3/min

Files associated with format:

- *GDF_PREESEHALL_Flowback_Rate*

FLOWBACK VOLUME

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Flowback_volume*** – vector of real numbers containing the flowback volume

Field details

FieldDescription

- ***Date*** – Time of flowback volume
- ***Flowback_volume*** – Flowback volume

FieldType

- ***Date*** – 5
- ***Flowback_volume*** – 44

FieldUnit

- ***Date*** – datenum
- ***Flowback_volume*** – m^3

Files associated with format:

- *GDF_PREESEHALL_Flowback_Volume*

GEOAREA

Data details

'd' structure contains fields:

- ***Lat*** – array of real numbers containing vectors of latitude coordinate [in column]
- ***Long*** – array of real numbers containing vectors of longitude coordinate [in column]

Field details

FieldDescription

- ***Lat*** – Latitude of the… (USCB boundary)
- ***Long*** – Longitude of the… (USCB boundary)

FieldType

- ***Lat*** – 124
- ***Long*** – 134

FieldUnit

- ***Lat*** – deg
- ***Long*** – deg

Files associated with format:

- *GDF_USCB_boundary_of_USCB*

INJECTED VOLUME

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Injected_volume*** – vector of real numbers containing the volume of injected fluid

Field details

FieldDescription

- ***Date*** – Time of injected volume
- ***Injected_volume*** – Injected volume

FieldType

- ***Date*** – 5
- ***Injected_volume*** – 54

FieldUnit

- ***Date*** – datenum
- ***Injected_volume*** – m^3

Files associated with format:

- *GDF_PREESEHALL_Injected_Volume*

INJECTION RATE

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Injection_rate*** – vector of real numbers containing the injection rate measured at a defined point

Field details

FieldDescription

- ***Date*** – Time of fluid injection
- ***Injection_rate*** – Injection rate

FieldType

- ***Date*** – 5
- ***Injection_rate*** – 24 [34, 134]

FieldUnit

- ***Date*** – datenum
- ***Injection_rate*** – m^3/min [l/s]

Files associated with format:

- *GDF_GS_Injection_Rate*
- *GDF_PREESEHALL_Injection_Rate*
- *GDF_TG_daily_inj_rate_prati_9*
- *GDF_TG_daily_inj_rate_prati_9_29*
- *GDF_TG_daily_inj_rate_prati_29*
- *GDF_TG_inj_rate_prati_9*
- *GDF_TG_inj_rate_prati_9_29*
- *GDF_TG_inj_rate_prati_29*

MINE AREA

Data details

'd' structure contains fields:

- ***Name*** – vector of char type containing the name of mine area
- ***Lat*** – array of real numbers containing vectors of latitude coordinate [in column]
- ***Long*** – array of real numbers containing vectors of longitude coordinate [in column]

Field details

FieldDescription

- ***Name*** – Mine name
- ***Lat*** – Latitude of the mine boundary
- ***Long*** – Longitude of the mine boundary

FieldType

- ***Name*** – 3
- ***Lat*** – 124
- ***Long*** – 134

FieldUnit

- ***Name*** – char
- ***Lat*** – deg
- ***Long*** – deg

Files associated with format:

- *GDF_LGCD_mine_areas*
- *GDF_USCB_closed_mines_areas*
- *GDF_USCB_Experimental_Mine_Barbara_mine_area*
- *GDF_USCB_Jastrzebska_Spolka_Weglowa_SA_mines_areas*
- *GDF_USCB_Katowicki_Holding_Weglowy_SA_mines_areas*
- *GDF_USCB_Kompania_Weglowa_SA_mines_areas*
- *GDF_USCB_KWK_Bobrek_Centrum_mine_area*
- *GDF_USCB_NWR_KARBONIA_Sp_z_oo_mine_area*
- *GDF_USCB_coal_mine_areas_in_USCB*
- *GDF_USCB_Poludniowy_Koncern_Weglowy_SA_mines_areas*
- *GDF_USCB_ZG_EKO_Plus_Sp_z_oo_mine_area*
- *GDF_USCB_ZG_SILTECH_Sp_z_oo_mine_area*

MINING FRONT ADVANCE

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Lat*** – array of real numbers containing vectors of latitude coordinate [in row]
- ***Long*** – array of real numbers containing vectors of longitude [in row]
- ***Elevation*** – array of real numbers containing vectors of elevation in meters above sea level [in row]

Field details

FieldDescription

- ***Date*** – Time of front advance
- ***Lat*** – Latitude of mining front
- ***Long*** – Longitude of mining front
- ***Elevation*** – Elevation of mining front [meters above sea level]

FieldType

- ***Date*** – 5
- ***Lat*** – 124
- ***Long*** – 134
- ***Elevation*** – 144

FieldUnit

- ***Date*** – datenum
- ***Lat*** – deg
- ***Long*** – deg
- ***Elevation*** – m

Files associated with format:

- *GDF_BOBREK_mining_front_advance_EPSG4326*

MINING POLYGON ADVANCE

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Lat*** – array of real numbers containing vectors of latitude coordinate [in row]
- ***Long*** – array of real numbers containing vectors of longitude coordinate [in row]
- ***Elevation*** – array of real numbers containing vectors of elevation in meters above sea level [in row]

Field details

FieldDescription

- ***Date*** – Time of mining polygon advance
- ***Lat*** – Latitude of mining polygon
- ***Long*** – Longitude of mining polygon
- ***Elevation*** – Elevation of mining polygon [meters above sea level]

FieldType

- ***Date*** – 5
- ***Lat*** – 124
- ***Long*** – 134
- ***Elevation*** – 144

FieldUnit

- ***Date*** – datenum
- ***Lat*** – deg
- ***Long*** – deg
- ***Elevation*** – m

Files associated with format:

- *GDF_BOBREK_mining_polygon_advance_EPSG4326*

POWER PLANT LOCATION

Data details

'd' structure contains fields:

- ***Name*** – vector of char type specifying code name of the power plant
- ***Lat*** – vector of real numbers specifying latitude of the well
- ***Long*** – vector of real numbers specifying longitude of the well
- ***ID*** – vector of char type specifying ID of the power plant

Field details

FieldDescription

- ***Name*** – Name of the power plant
- ***Lat*** – Latitude of the power plant
- ***Long*** – Longitude of the power plant
- ***ID*** – ID of the power plant

FieldType

- ***Well_codename*** – 3
- ***Lat*** – 124
- ***Long*** – 134
- ***ID*** – 3

FieldUnit

- ***Well_codename*** – char
- ***Lat*** – deg
- ***Long*** – deg
- ***ID*** – char

Files associated with format:

- *GDF_TG_powerplants_location*

PROPPANT CONCENTRATION

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers specifying 'matlab' time
- ***Proppant_concentration*** – vector of real numbers specifying concentration of proppant

Field details

FieldDescription

- ***Date*** – Time of measurement
- ***Proppant_concentration*** – Proppant concentration

FieldType

- ***Date*** – 5
- ***Proppant_concentration*** – 54

FieldUnit

- ***Date*** – datenum
- ***Proppant_concentration*** – kg/m^3

Files associated with format:

- *GDF_PREESEHALL_Proppant_Concentration*

RADON 222 CONCENTRATION

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers specifying 'matlab' time
- ***Radon222*** – vector of real numbers specifying concentration of Radon 222

Field details

FieldDescription

- ***Date*** – Time of measurement
- ***Radon222*** – Radon 222

FieldType

- ***Date*** – 5
- ***Radon222*** – 34

FieldUnit

- ***Date*** – datenum
- ***Radon222*** – Bq/m^3

Files associated with format:

- *GDF_WYSIN_radon_222*

RAY TRACING ANGLES

Data details

'd' structure contains fields:

- ***Epicentral_distance*** – vector of real numbers containing distance from event to point
- ***Depth*** – vector of real numbers containing depth below elevation
- ***Vp*** – vector of real numbers containing velocity of P wave
- ***Distance*** – vector of real numbers containing ray path distance
- ***Take_off_angle*** – vector of real numbers containing take-off angle
- ***Incidence_angle*** – vector of real numbers containing incidence angle

Field details

FieldDescription

- ***Epicentral_distance*** – Distance from event to point
- ***Depth*** – Depth below elevation
- ***Vp*** – Velocity of P wave
- ***Distance*** – Raypath distance
- ***Take_off_angle*** – Take-off angle
- ***Incidence_angle*** – Incidence angle

FieldType

- ***Epicentral_distance*** – 24
- ***Depth*** – 34
- ***Vp*** – 14
- ***Distance*** – 24
- ***Take_off_angle*** – 34
- ***Incidence_angle*** – 24

FieldUnit

- ***Epicentral_distance*** – m
- ***Depth*** – m
- ***Vp*** – m/s
- ***Distance*** – m
- ***Take_off_angle*** – angle
- ***Incidence_angle*** – angle

Files associated with format:

- *GDF_BOBREK_ray_tracing_table*
- *GDF_CZORSZTYN_ray_tracing_table*
- *GDF_GS_ray_tracing_table*
- *GDF_LGCD_ray_tracing_table*
- *GDF_SONG_TRANH_ray_tracing_table*
- *GDF_USCB_ray_tracing_table*

SHEAR WAVE VELOCITY

Data details

'd' structure contains fields:

- ***Lat*** – vector of real numbers containing Latitude
- ***Long*** – vector of real numbers containing Longitude
- ***Elevation*** – vector of real numbers containing elevation above sea level
- ***Vs30*** – vector of real numbers containing shear wave velocities

Field details

FieldDescription

- ***Lat*** – Latitude of the station
- ***Long*** – Longitude of the station
- ***Elevation*** – Elevation of the station
- ***Vs30*** – 30-meter shear wave velocitiy

FieldType

- ***Lat*** – 124
- ***Long*** – 134
- ***Elevation*** – 144
- ***Vs30*** – 30

FieldUnit

- ***Lat*** – deg
- **Long** – deg
- ***Elevation*** – m
- ***Vs30*** – m/s

Files associated with format:

- *GDF_USCB_Vs30*

SHORELINE

Data details

'd' structure contains fields:

- ***Lat*** – vector of real numbers containing latitude
- ***Long*** – vector of real numbers containing longitude

Field details

FieldDescription

- ***Lat*** – Latitude coordinate of the shoreline
- ***Long*** – Longitude coordinate of the shoreline

FieldType

- ***Lat*** – 124
- ***Long*** – 134

FieldUnit

- ***Lat*** – deg
- ***Long*** – deg

Files associated with format:

- *GDF_CZORSZTYN_reservoir_shoreline*
- *GDF_LGCD_Zelazny_Most_reservoir_shoreline*
- *GDF_SONG_TRANH_reservoir_shoreline*

STATION NETWORK

Data details

'd' structure contains fields:

- ***Station_codename*** – vector of char type specifying code name of the measurement device
- ***Lat*** – vector of real numbers specifying latitude of logger
- ***Long*** – vector of real numbers specifying longitude of logger

optional:

- ***Depth*** – vector of real numbers specifying depth of logger
- ***Elevation*** – vector of real numbers containing elevation in meters above sea level
- ***Station_type*** – vector of char type specifying type of measurement and sampling point

Field details

FieldDescription

- ***Station_codename*** – Code name of the station
- ***Lat*** – Latitude of the station
- ***Long*** – Longitude of the station

optional:

- ***Depth*** – Depth of the station
- ***Elevation*** – Elevation of the station
- ***Station_type*** – Type of measurement and sampling point

FieldType

- ***Station_codename*** – 3
- ***Lat*** – 124
- ***Long*** –134

optional:

- ***Depth*** – 114
- ***Elevation*** – 144
- ***Station_type*** – 3

FieldUnit

- ***Station_codename*** – char
- ***Lat*** – deg
- ***Long*** – deg

optional:

- ***Depth*** – km
- ***Elevation*** – m
- ***Station_type*** – char

Files associated with format:

- *GDF_LUBOCINO_water_stations*
- *GDF_Wysin_air_station*
- *GDF_WYSIN_barometric_and_water_level_loggers_location*

STEAM PRODUCTION

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Steam_production*** – vector of real numbers containing steam production

Field details

FieldDescription

- ***Date*** – Time of steam production
- ***Steam_production*** – Steam production

FieldType

- ***Date*** – 5
- ***Steam_production*** – 6

FieldUnit

- ***Date*** – datenum
- ***Steam_production*** – ton

Files associated with format:

- *GDF_TG_total_steam_production*
- *TG_total_steam_production_yearly*

TECTONICS

Data details

'd' structure contains fields:

- ***Lat*** – array of real numbers containing vectors of latitude coordinate of the fault [in column]
- ***Long*** – array of real numbers containing vectors of longitude coordinate of the fault [in column]

optional:

- ***Name*** – vector of char type specifying name of the fault

Field details

FieldDescription

- ***Lat*** – Latitude of the faults
- ***Long*** – Longitude of the faults

optional:

- ***Name*** – Name of the fault or fault zone

FieldType

- ***Lat*** – 124
- ***Long*** – 134

optional:

- ***Name*** – 3

FieldUnit

- ***Lat*** – deg
- ***Long*** – deg

optional:

- ***Name*** – char

Files associated with format:

- *GDF_USCB_main_faults*
- *GDF_USCB_all_faults*

VELOCITY MODEL

Data details

'd' structure contains fields:

- ***Depth*** – vector of real numbers containing the depth of measured velocity (depth of the layer)
- ***Vp*** – vector of real numbers containing the velocity of P wave
- ***Vs*** – vector of real numbers containing the velocity of S wave

optional:

- ***Density*** – vector of real numbers containing density of the rocks in measured layer
- **Qp** – vector of real numbers containing the Q factor of P wave in measured layer
- **Qs** – vector of real numbers containing the Q factor of S wave in measured layer

Field details

FieldDescription

- ***Depth*** – Depth
- ***Vp*** – Velocity of P wave
- ***Vs*** – Velocity of S wave

optional:

- ***Density*** – Density of the rocks
- **Qp** – Q factor of P wave
- **Qs** – Q factor of S wave

FieldType

- ***Depth*** – 34 [20]
- ***Vp*** – 14 [12]
- ***Vs*** – 14 [12]

optional:

- ***Density*** – 14 [12]
- ***Qp*** – 30
- ***Qs*** – 30

FieldUnit

- ***Depth*** – km
- ***Vp*** – km/s
- ***Vs*** – km/s

optional:

- ***Density*** – g/cm^3
- ***Qp*** – dimensionless
- ***Qs*** – dimensionless

Files associated with format:

- *GDF_BOBREK_1D_velocity_model*
- *GDF_CZORSZTYN_1D_velocity_model*
- *GDF_GS_1D_velocity_model*
- *GDF_LGCD_1D_velocity_model*
- *GDF_SONG_TRANH_1D_velocity_model*
- *GDF_USCB_1D_velocity_model*
- *GDF_PREESEHALL_1D_Velocity_Structure*

WATER LEVEL

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Water_level*** – vector of real numbers containing the water level measured at a defined point [m above sea level]

Field details

FieldDescription

- ***Date*** – Date of water level measure
- ***Water_level*** – Water level above sea level

FieldType

- ***Date*** – 5
- ***Water_level*** – 34

FieldUnit

- ***Date*** – datenum
- ***Water_level*** – m

Files associated with format:

- *GDF_CZORSZTYN_Water_Level*
- *GDF_SONG_TRANH_Water_Level*

WATER VOLUME

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Water_volume*** – vector of real numbers containing the water volume measured at a defined point [mln m^3]

Field details

FieldDescription

- ***Date*** – Date of water volume measure
- ***Water_volume*** – Water volume

FieldType

- ***Date*** – 5
- ***Water_volume*** – 44

FieldUnit

- ***Date*** – datenum
- ***Water_volume*** – mln m^3

Files associated with format:

- *GDF_CZORSZTYN_Water_Volume*

WELL PATH

Data details

'd' structure contains fields:

- ***Lat*** –vector of real numbers specifying latitude
- ***Long*** –vector of real numbers specifying longitude
- ***Elevation*** – vector of real numbers containing elevation in meters above sea level

Field details

FieldDescription

- ***Lat*** – Latitude of the borehole`s trajectory
- ***Long*** – Longitude of the borehole`s trajectory
- ***Elevation*** – Elevation of the borehole`s trajectory

FieldType

- ***Lat*** – 124
- ***Long*** – 134
- ***Elevation*** – 144

FieldUnit

- ***Lat*** – deg
- ***Long*** – deg
- ***Elevation*** – m

Files associated with format:

- *GDF_GS_Trajectory_of_GS3_borehole*
- *GDF_GS_Trajectory_of_GS4_borehole*
- *GDF_PREESEHALL_Well_Trajectory*

WELL POSITION

Data details

'd' structure contains fields:

- ***Well_codename*** – vector of char type specifying code name of the station
- ***Lat*** – vector of real numbers specifying latitude of the well
- ***Long*** – vector of real numbers specifying longitude of the well

optional:

- ***Depth*** – vector of real numbers specifying depth of the well
- ***Operator_name*** – vector of char type specifying operator name of the well
- ***Well_number*** – vector of char type specifying well number
- ***Lease_name*** – vector of char type specifying lease name
- ***Year_drilling*** – vector of real numbers specifying year of well drilling
- ***Well_type*** – vector of char type specifying type of well
- ***District*** – vector of real numbers specifying district
- ***Status*** – vector of char type specifying status
- ***Status_code*** – vector of char type specifying status code
- ***Section*** – vector of real numbers specifying section
- ***Township*** – vector of char type specifying township
- ***Range*** – vector of char type specifying range
- ***Base_meridian*** – vector of char type specifying base meridian
- ***Source_code*** – vector of char type specifying source code

Field details

FieldDescription

- ***Well_codename*** – Code name of the well (…/description)
- ***Lat*** – Latitude of the well
- ***Long*** – Longitude of the well

optional:

- ***Depth*** – Depth of the well
- ***Operator_name*** – Well operator name
- ***Well_number*** – Well number
- ***Lease_name*** – Lease name
- ***Year_drilling*** – Year of drilling
- ***Well_type*** – Type od well (…/description)
- ***District*** – District (…/description)
- ***Status*** – Well status (…/description)
- ***Status_code*** – Well status code (…/description)
- ***Section*** – Section
- ***Township*** – Township
- ***Range*** – Range
- ***Base_meridian*** – Base meridian
- ***Source_code*** – Source code

FieldType

- ***Well_codename*** – 3
- ***Lat*** – 124
- ***Long*** – 134

optional:

- ***Depth*** – 34
- ***Operator_name*** – 3
- ***Well_number*** – 3
- ***Lease_name*** – 3
- ***Year_drilling*** – 2
- ***Well_type*** – 3
- ***District*** – 2

- ***Status*** – 3
- ***Status_code*** – 3
- ***Section*** – 2
- ***Township*** – 3
- ***Range*** – 3
- ***Base_meridian*** – 3
- ***Source_code*** – 3

FieldUnit

- ***Well_codename*** – char
- ***Lat*** – deg
- ***Long*** – deg

optional:

- ***Depth*** – km
- ***Operator_name*** – char
- ***Well_number*** – char
- ***Lease_name*** – char
- ***Year_drilling*** – year
- ***Well_type*** – char
- ***District*** – dimensionless
- ***Status*** – char
- ***Status_code*** – char
- ***Section*** – dimensionless
- ***Township*** – char
- ***Range*** – char
- ***Base_meridian*** – char
- ***Source_code*** – char

Files associated with format:

- *GDF_LUBOCINO_well_position*
- *GDF_TG_injection_wells_position*
- *GDF_TG_wells_data_for_California*
- *GDF_WYSIN_well_position*

WELLHEAD PRESSURE

Data details

'd' structure contains fields:

- ***Date*** – vector of real numbers containing 'matlab' time
- ***Wellhead_pressure*** – vector of real numbers containing the wellhead pressure

Field details

FieldDescription

- ***Date*** – Time of wellhead pressure
- ***Wellhead_pressure*** – Wellhead pressure

FieldType

- ***Date*** – 5
- ***Wellhead_pressure –*** 34

FieldUnit

- ***Date*** – datenum
- ***Wellhead_pressure*** – MPa

Files associated with format:

- *GDF_GS_Wellhead_Pressure*
- *GDF_PREESEHALL_Wellhead_Pressure*

MDDF - MULTI DIMENSIONAL DATA FORMAT

This structure contains 9 variables, where *d* and *TestParameters* are the most essential, because they contains the data which can be further processed. The other variables are used for the correct data description – coordinate system, time zone, etc.

The structure of Multi Dimensional Data Format

Variable name	Type	Description
FormatName	char	Name of data format MDDF (Multi Dimensional Data Format).
FormatVersion	real	When changing/expansion of the format change its version. It can have one number after the decimal point.
CRS	char	Coordinate Reference System EPSG code (or local) mapping surveying (http://epsg.io), standard WGS84 (EPSG: 4326)
TimeZone	char	Acronym of Time Zone (http://en.wikipedia.org/wiki/List_of_time_zone_abbreviations), normally UTC
Description	char	The text description of the data contained in the file
d	struct	The variable containing the data. The data may be as a single variable, a vector or an array.
TestParameters	struct	The variable containing the parameters of data. The data may be as a single variable, a vector or an array.
dDescription	cell	Description of the fields of 'd' variable. A cell contains two columns: the first contains the name of the field/column of data, the second contains a description of them. All data must be specified.
TestParametersDescription	cell	Description of the fields of 'TestParameters' variable. A cell contains two columns: the first contains the name of the field/column of data, the second contains a description of them. All data must be specified.

Examples: LUBOCINO_MDDF_lab_analyses.mat , WYSIN_MDDF_hydrochemical_data_site_visit.mat

Data details

'**d**' structure contains the following fields:
Station_codename – Code name of the station
Measurements – Number of measurements or sample collection in the field. Structure containing the following fields:
Date – Time of measured parameter/sample collection
Tests – Number of test performed/ measured parameters.. Structure containing the following fields:
Test_name_id – Id of measured parameter/test
Result – Result of measured parameter/test
Result_duplicate *(optional)* – Quality assurance check
Stage *(optional)* – Stage of monitoring
Measurement_method *(optional)* – Method of measurement

'**TestParameters**' structure contains the following fields:
Test_name – Name of test/measured parameter
Unit – Unit of test/measured parameter
Type – Data type number
Technique *(optional)* – Technique
LOD *(optional)* – Limit of detection (Lower and Upper)
LODType *(optional)* – Data type number of LOD
Accreditation *(optional)* – Accreditation body

The format of fields ‘d’ and ‘TestParameters’ variables

Variable	Field name	Storage format
d	Station_codename	char
	Measurements	struct
	Measurements.Date	double
	Measurements.Tests	struct
	Measurements.Tests.Test_name_id	double
	Measurements.Tests.Result	double
	Measurements.Tests.Result_duplicate	double
	Measurements.Stage	char
	Measurements.Measurement_method	char
TestParameters	Test_name	char
	Unit	char
	Type	double
	Technique	char
	LOD	double
	LODType	double
	Accreditation	char