Catalog - description

Catalog – General Description

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); the numbers description is shown below
- **val** – column array of For the text the column is an array type cell with text fields. For the remaining value the column is a numeric column.
- **unit** – description of unit for individual data (text value).
- **description** – short description of the parameter (text value).
- **fieldType** – semantic meaning of the field. When some field values are similar/related then fieldType name is entered and for another case is entered.

Table The general parameters in catalogue MAT format

field	type	val	unit	description	fieldType	Comments	Data format
ID	3	data vector		Event ID		**required field**	text
Time	5	data vector		Event origin time		**required field**, Matlab serial numerical time	double
Lat	14,15,24,25	data vector	deg	Latitude		deg – North positive	double
Long	14,15,24,25,34,35	data vector	deg	Longitude		deg – East positive	double
Depth	11-13	data vector	km	Hypocenter depth measured from the ground level		Hypocenter depth counted downwards from surface (positive values below surface)	double
Elevation	13	data vector	km	Hypocenter elevation measured over the sea level		Hypocenter elevation counted upwards from sea level (positive values above sea level, negative values below sea level)	double
X	10	data vector	m, km	X coordinate		Original coordinates if other than geographical. Description of coordinates in the metadata	double

Y	10	data vector	m, km	Y coordinate			double
Z	10	data vector	m, km	Z coordinate			double
EPI_err	10	data vector	M	Epicentral error			double
Depth_err	10	data vector	m	Depth error			double
NI	2	data vector		No of stations used in the localisation			double
M0	222	data vector	Nm	Scalar moment			double
Mw	4	data vector		Moment magnitude	'Magnitude'		double 0.1 [1]
ML	4	data vector		Local magnitude	'Magnitude'		double 0.1
Ns_decomp	2	data vector		No of stations used in MT inversion			double
DecompMethod	3	data vector	char	Method used to decompose moment tensor			text
MTrr	222	data vector	Nm	Full solution: Moment tensor rr component (r - up)			double

MTss	222	data vector	Nm	Full solution: Moment tensor ss component (s - South)			double
MTee	222	data vector	Nm	Full solution: Moment tensor ee component (e - East)			double
MTrs	222	data vector	Nm	Full solution: Moment tensor rs component			double
MTre	222	data vector	Nm	Full solution: Moment tensor re component			double
MTse	222	data vector	Nm	Full solution: Moment tensor se component			double
MT_err	222	data vector	Nm	Full solution: Moment tensor error			double
ISO	120	data vector	%	Isotropic MT component		% - positive or negative	double
CLVD	120	data vector	%	CLVD component		% - positive or negative	double
DC	20	data vector	%	Double-Couple component		% - only positive	double
StrikeA	30	data vector	deg	Strike of nodal plane A		The values range from 0 to 360	double
DipA	20	data vector	deg	Dip of nodal plane A		The values range from 0 to 90	double

RakeA	130	data vector	deg	Rake of nodal plane A		The values range from -180 to 180	double
SlopeA	20	data vector	deg	Inclination for nodal plane A		The values range from 0 to 90	double
StrikeB	30	data vector	deg	Strike of nodal plane B		The values range from 0 to 360	double
DipB	20	data vector	deg	Dip of nodal plane B		The values range from 0 to 90	double
RakeB	130	data vector	deg	Rake of nodal plane B		The values range from 180 to 180	double
SlopeB	20	data vector	deg	Inclination for nodal plane B		The values range from 0 to 90	double
Strike_err	10	data vector	deg	Strike error			double
Dip_err	10	data vector	deg	Dip error			double
Rake_err	10	data vector	deg	Rake error			double
Slope_err	10	data vector	deg	Inclination error			double
Plunge_T	10	data vector	deg	Plunge of T-axis		The values range from 0 to 360	double

Plunge T_err	10	data vector	deg	T-axis plunge error			double
Trend _T	10	data vector	deg	Trend of T-axis		The values range from 0 to 90	double
Trend T_err	10	data vector	deg	T-axis trend error			double
Plunge _P	10	data vector	deg	Plunge of P-axis		The values range from 0 to 360	double
Plunge P_err	10	data vector	deg	P-axis plunge error			double
Trend _P	10	data vector	deg	Trend of P-axis		The values range from 0 to 90	double
Trend P_err	10	data vector	deg	P-axis trend error			double
DCrr	222	data vector	Nm	Double-Couple solution: Moment tensor rr component (r - up)			double
DCss	222	data vector	Nm	Double-Couple solution: Moment tensor ss component (s - South)			double
DCee	222	data vector	Nm	Double-Couple solution: Moment tensor ee component (e - East)			double
DCrs	222	data vector	Nm	Double-Couple solution: Moment tensor rs component			double

DCre	222	data vector	Nm	Double-Couple solution: Moment tensor re component			double
DCse	222	data vector	Nm	Double-Couple solution: Moment tensor se component			double
DC_err	222	data vector	Nm	Double-Couple solution: Moment tensor error			double
DCStrikeA	30	data vector	deg	Double-Couple solution: Strike of nodal plane A		The values range from 0 to 360	double
DCDipA	20	data vector	deg	Double-Couple solution: Dip of nodal plane A		The values range from 0 to 90	double
DCRakeA	130	data vector	deg	Double-Couple solution: Rake of nodal plane A		The values range from -180 to 180	double
DCStrikeB	20	data vector	deg	Double-Couple solution: Strike of nodal plane B		The values range from 0 to 90	double
DCDipB	30	data vector	deg	Double-Couple solution: Dip of nodal plane B		The values range from 0 to 360	double
DCRakeB	20	data vector	deg	Double-Couple solution: Rake of nodal plane B		The values range from 0 to 90	double
DCStrike_err	10	data vector	deg	Double-Couple solution: Strike error			double
DCDip_err	10	data vector	deg	Double-Couple solution: Dip error			double

DCRake_err	10	data vector	deg	Double-Couple solution: Rake error			double
DCPlunge_T	10	data vector	deg	Double-Couple solution: Plunge of T-axis		The values range from 0 to 90	double
DCPlungeT_err	10	data vector	deg	Double-Couple solution: T-axis plunge error			double
DCTrend_T	10	data vector	deg	Double-Couple solution: Trend of T-axis		The values range from 0 to 360	double
DCTrendT_err	10	data vector	deg	Double-Couple solution: T-axis trend error			double
DCPlunge_P	10	data vector	deg	Double-Couple solution: Plunge of P-axis		The values range from 0 to 90	double
DCPlungeP_err	10	data vector	deg	Double-Couple solution: P-axis plunge error			double
DCTrend_P	10	data vector	deg	Double-Couple solution: Trend of P-axis		The values range from 0 to 360	double
DCTrendP_err	10	data vector	deg	Double-Couple solution: P-axis trend error			double
TNrr	222	data vector	Nm	TN solution: Moment tensor rr component (r - up)			double
TNss	222	data vector	Nm	TN solution: Moment tensor ss component (s - South)			double

TNee	222	data vector	Nm	TN solution: Moment tensor ee component (e - East)			double
TNrs	222	data vector	Nm	TN solution: Moment tensor rs component			double
TNre	222	data vector	Nm	TN solution: Moment tensor re component			double
TNse	222	data vector	Nm	TN solution: Moment tensor se component			double
TN_err	222	data vector	Nm	TN solution: Moment tensor error			double
TNStrikeA	30	data vector	deg	TN solution: Strike of nodal plane A		The value range from 0 to 360	double
TNDipA	20	data vector	deg	TN solution: Dip of nodal plane A		The value range from 0 to 90	double
TNRakeA	130	data vector	deg	TN solution: Rake of nodal plane A		The value range from -180 to 180	double
TNStrikeB	20	data vector	deg	TN solution: Strike of nodal plane B		The value range from 0 to 90	double
TNDipB	30	data vector	deg	TN solution: Dip of nodal plane B		The value range from 0 to 360	double
TNRakeB	20	data vector	deg	TN solution: Rake of nodal plane B		The value range from 0 to 90	double

TNStrike_err	10	data vector	deg	TN solution: Strike error			double
TNDip_err	10	data vector	deg	TN solution: Dip error			double
TNRake_err	10	data vector	deg	TN solution: Rake error			double
TNPlunge_T	20	data vector	deg	TN solution: Plunge of T-axis		The value range from 0 to 90	double
TNPlungeT_err	10	data vector	deg	TN solution: T-axis plunge error			double
TNTrend_T	30	data vector	deg	TN solution: Trend of T-axis		The value range from 0 to 360	double
TNTrendT_err	10	data vector	deg	TN solution: T-axis trend error			double
TNPlunge_P	20	data vector	deg	TN solution: Plunge of P-axis		The value range from 0 to 90	double
TNPlungeP_err	10	data vector	deg	TN solution: P-axis plunge error			double
TNTrend_P	30	data vector	deg	TN solution: Trend of P-axis		The value range from 0 to 360	double
TNTrendP_err	10	data vector	deg	TN solution: P-axis trend error			double

NsP	2	data vector		No of stations used in the P-wave spectral analysis			double
E	222	data vector	J	Total seismic energy			double
E_err	222	data vector	J	Total seismic energy error			double
Ep	222	data vector	J	P-wave energy			double
Ep_err	222	data vector	J	P-wave energy error			double
fp	12	data vector	Hz	P-wave corner frequency			double
fp_err	12	data vector	Hz	P-wave corner frequency error			double
rad_eff_P	12	data vector		Radiation efficiency P			double
Qp	10	data vector		Quality factor Pwaves			double
NsS	2	data vector		No of stations used in the S-wave spectral analysis			double
Es	222	data vector	J	S-wave energy			double

Es_err	222	data vector	J	S-wave energy error J			double
fs	12	data vector	Hz	S-wave corner frequency Hz			double
fs_err	12	data vector	Hz	S-wave corner frequency error Hz			double
Qs	10	data vector		Quality factor Swaves			double
rad_eff_S	12	data vector		Radiation efficiency S			double
R	10	data vector	m	Source radius			double
R_err	10	data vector	m	Source radius error			double
R_model	3	data vector	char	Source radius model used (Brune, Madariaga, Sato&Hirasawa)			text
rad_eff	12	data vector		Radiation efficiency			double
sigma_a	13	data vector	MPa	Apparent stress			double
delta_sigma	13	data vector	MPa	Static stress drop			double

sigma_d	13	data vector	MPa	Dynamic stress drop			double
sigma_rms	13	data vector	MPa	RMS dynamic stress drop			double
vr	10	data vector	m/s	Rupture velocity			double
vr_model	3	data vector	char	Rupture velocity model (unilateral etc.)			text
SW_eff	12	data vector		Savage-Wood efficiency			double
u	12	data vector	m	Fault slip			double
RMS_time_residual	13	data vector	sec	Time residual after location in a 3D model			double

Hypocenter_quality_index	2	data vector		Average number of station, azimuthal coverage, stability of location against noise		Apart from the regular parameters used to select best earthquake location, including min RMS values, max recording stations, max phase numbers and gap values, we further used for lacq catalogue the following criteria as derived from 3D inversion of hypocenters using REL3D code (e.g. Guyoton et al GRL1992, Roecker JGR1982, Boyer 1996). 3 quality levels are used for the Lacq seismicity hypocenters quality level 1: -conditioning value <100 Specifically , the conditioning value threshold aims to remove ill-conditioned matrix patterns. - max location error (e.g. Tarantola Valette 1982) as estimated for 3D velocity model solutions <1 km - last iteration step for convergence before location completed < 0.5 km quality level 2: - conditioning value <100 quality level 3: - all selected events (in the lacq case study it correspond to Nmin=6 stations and a residual variance <0.2 s) Reference: Boyer, E. (1996). Sismicité induite et production pétrolière. Mémoire de diplôme d'ingénieur, Université Joseph Fourier - Grenoble I. Guyoton F, J.R.Grasso, and P.Volant,Interrelation between induced seismic instabilities and complex geological structure Geophys. Res. Lett., 19, 705-708, 1992. Roecker, S., Velocity structure of the Pamir-Hindu Kush region: Possible evidence for subjected crust, JGR, 87, 945-959, 1982 Tarantola, A., & Valette, B. (1982). Generalized nonlinear inverse problems solved using the least squares criterion. Reviews of Geophysics, 20(2), 219-232.	double
Comments	3		char	Particularities of the respective event (main shock, aftershock etc.) and parameter estimation issues /uncertainties description			text
M0_p	222	data vector	Nm	P-wave scalar moment			double
M0_s	222	data vector	Nm	S-wave scalar moment			double
M0_Dev_p	222	data vector	Nm	P-wave scalar moment error			double
M0_Dev_s	222	data vector	Nm	S-wave scalar moment error			double
M0_Dev	222	data vector	Nm	Scalar moment error			double

P	222	data vector	m^3	Seismic potency			double
X-relErr	4	data vector	m	Relative error in X coordintate			double
Y-relErr	4	data vector	m	Relative error in Y coordintate			double
Z-relErr	4	data vector	m	Relative error in Z coordintate			double
ML-rel	4	data vector		Relative magnitude calibrated with local magnitude of larger event in the sequence	'Magnitude'		double
NCCP	2	data vector		Number of cross-correlated P-wave data			double
NCCS	2	data vector		Number of cross-correlated S-wave data			double
NCTP	2	data vector		Number of catalog P-wave data			double
NCTS	2	data vector		Number of catalog S-wave data			double
RMSCC	13	data vector		RMS residual for CC-derived differential arrivals			double
RMSCT	13	data vector		RMS residual for catolog-derived differential arrivals			double

CID	2	data vector		Cluster ID			double
usedStationLocation	3	data vector		Name of stations from which data was used for localization computation			text
unusedStationLocation	3	data vector		Name of stations from which data was not used for localization computation			text

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, (obsolete, recommended 2cd)

7 – the real data display in an engineering manner with two decimal place, (obsolete, recommended 2cd)

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 „-”)

2cd– (c and d are code digits), the real data is displayed in an engineering manner, with place for a sign (space for sign „+”, sign ‘-’ for sign „-”), with c decimal place and exponent expressed by d places. The sign in exponent is always displayed.

e.g. For number 0.001:

211: „1.0E-3”

221: „1.00E-3”

212: „1.0E-03”

222: „1.00E-03”

e.g. For number 1000:

211: „1.0E+3”

221: „1.00E+3”

212: „1.0E+03”

222: „1.00E+03”

Examples catalogs

Bobrek Catalog

field	type	val	unit	description	fieldType
ID	3	data vector		Event ID	
Time	5	data vector		Event occurrence time	
Lat	25	data vector	deg	Latitude	
Long	25	data vector	deg	Longitude	
Depth	13	data vector	km	Hypocenter depth measured from the ground level	
Elevation	13	data vector	km	Hypocenter elevation measured over the see level	
X	10	data vector	m	X coordinate	
Y	10	data vector	m	Y coordinate	
Z	10	data vector	m	Z coordinate	
ML	4	data vector		Local magnitude	'Magnitude'
E	222	data vector	J	Total seismic energy	

LGCD Catalog

field	type	val	unit	description	fieldType
ID	3	data vector		Event ID	
Time	5	data vector		Event occurrence time	
Lat	24	data vector	deg	Latitude	
Long	24	data vector	deg	Longitude	
Depth	13	data vector	km	Hypocenter depth measured from the ground level	
Elevation	13	data vector	km	Hypocenter elevation measured over the see level	
M0	222	data vector	Nm	Scalar moment	
Mw	4	data vector		Moment magnitude	'Magnitude'
MTrr	222	data vector	Nm	Full solution: Moment tensor rr component (r - up)	
MTss	222	data vector	Nm	Full solution: Moment tensor ss component (s - South)	
MTee	222	data vector	Nm	Full solution: Moment tensor ee component (e - East)	
MTrs	222	data vector	Nm	Full solution: Moment tensor rs component	
MTre	222	data vector	Nm	Full solution: Moment tensor re component	
MTse	222	data vector	Nm	Full solution: Moment tensor se component	
MT_err	222	data vector	Nm	Full solution: Moment tensor error	
ISO	120	data vector	%	Isotropic MT component	
CLVD	120	data vector	%	CLVD component	
DC	20	data vector	%	Double-Couple component	
StrikeA	30	data vector	deg	Strike of nodal plane A	

DipA	20	data vector	deg	Dip of nodal plane A	
RakeA	130	data vector	deg	Rake of nodal plane A	
SlopeA	20	data vector	deg	Inclination for nodal plane A	
StrikeB	30	data vector	deg	Strike of nodal plane B	
DipB	20	data vector	deg	Dip of nodal plane B	
RakeB	130	data vector	deg	Rake of nodal plane B	
fp	12	data vector	Hz	P-wave corner frequency	
fs	12	data vector	Hz	S-wave corner frequency Hz	

Song Tranh Catalog

field	type	val	unit	description	fieldType
ID	3	data vector		Event ID	
Time	5	data vector		Event occurrence time	
Lat	24	data vector	deg	Latitude	
Long	24	data vector	deg	Longitude	
Depth	13	data vector	km	Hypocenter depth measured from the ground level	
Elevation	13	data vector	km	Hypocenter elevation measured over the see level	
M0	222	data vector	Nm	Scalar moment	
Mw	4	data vector		Moment magnitude	'Magnitude'
ML	4	data vector		Local magnitude	'Magnitude'
MTrr	222	data vector	Nm	Full solution: Moment tensor rr component (r - up)	
MTss	222	data vector	Nm	Full solution: Moment tensor ss component (s - South)	
MTee	222	data vector	Nm	Full solution: Moment tensor ee component (e - East)	
MTrs	222	data vector	Nm	Full solution: Moment tensor rs component	
MTre	222	data vector	Nm	Full solution: Moment tensor re component	
MTse	222	data vector	Nm	Full solution: Moment tensor se component	
MT_err	222	data vector	Nm	Full solution: Moment tensor error	
ISO	120	data vector	%	Isotropic MT component	
CLVD	120	data vector	%	CLVD component	
DC	20	data vector	%	Double-Couple component	
StrikeA	30	data vector	deg	Strike of nodal plane A	
DipA	20	data vector	deg	Dip of nodal plane A	
RakeA	130	data vector	deg	Rake of nodal plane A	
SlopeA	20	data vector	deg	Inclination for nodal plane A	
StrikeB	30	data vector	deg	Strike of nodal plane B	
DipB	20	data vector	deg	Dip of nodal plane B	
RakeB	130	data vector	deg	Rake of nodal plane B	
fp	12	data vector	Hz	P-wave corner frequency	
fs	12	data vector	Hz	S-wave corner frequency Hz	

[1] The values rounded to 0.1.

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