

- The global (previously Harvard) Centroid Moment Tensor project (www.globalcmt.org); whose solutions have been systematically reproduced in the PDE (US contributor and catalog, gCMT or HRV author).

gCMT-Mwc Catalog (gCMT Contributor)

Surface wave centroid moment tensor solutions directly from the gCMT project catalog (Ekström et al.), loaded by the USGS using the NDK format.

Mwb

Moment magnitude derived from a moment tensor inversion of long-period body-waves (P-, SH- and SR-) at tele seismic distances (~30 to ~90 degrees). The basic methodology for this approach has been modified from Sipkin (1982), and is very similar to that used for regional moment tensors (Mwr), with the exception that Mwb isolates the body-wave phases it inverts rather than using the full waveform.

Mwr

Moment magnitude derived from a moment tensor inversion of broadband waveforms at regional distances (RMT; distances < 13 degrees), generally used for the analysis of small to moderate size earthquakes (typically Mw 3.5-6.0). Several different approaches are used depending on the Contributor and Author of the RMT:

- US/SLU Author: This approach inverts full waveforms (P-wave through surface waves) for the deviatoric moment tensor using a time-domain inversion scheme, following the approach of Herrmann, Ammon and Benz (Bull. Seis. Soc. Amer. 101, 2609, 2011). The waveforms are interpreted in terms of regionalized models of the Earth's velocity structure.
- BRK/PAL Author: Time domain full-waveform inversion of regional data (< 13 degrees) for the complete moment tensor, following Minson and Dreger (Geophys. J. Int. 174, 585-, 2007) and Herrmann and Hutchensen (Tech. Rep. PL-TR-93-2070, Phillips Lab., 1993). As with US solutions, waveforms are interpreted in terms of regional (CA-based) velocity model.
- Other Contributors/Authors: Several other agencies also contribute regional moment tensor solutions, using techniques and velocity models that may differ from those listed above.

- **Origins**

- [**PAGER**](#)

- **Phase Data**

- [**ShakeMap**](#)

Product Terms

content

Data Type

Object

Description

A file or group of bytes associated with a product.

- *contentType* String mime type of this content.
- *lastModified* Millisecond timestamp when this content was modified.
- *length* Integer number of bytes in this content.
- *<path>* String relative path within this product, frequently a filename.
- *url* Link to download this content. When `<path>` is empty (""), there will be `bytes` property with content inline.

id

Data Type

String

Description

Unique identifier for a specific version of a product. The id is made of of these four attributes:

- *source* The product contributor, usually a [network code](#).
- *type* The type of product. See <http://ehppdl1.cr.usgs.gov/userguide/products/> for a list of product types.
- *code* A unique identifier from the product `source`, for this `type` of product.
- *updateTime* A millisecond timestamp that indicates when this version of the product was created.

Two products with the same `source`, `type`, and `code`, with different `updateTime`s indicate different versions of the same product. The latest `updateTime` for a product supersedes any earlier `updateTime` for the same product.

link

Data Type

String

Description

Products have zero or more links, which consist of:

- *<relation>* Relation describes how the link is related to the product.
- *href* Link is a URI, and may be a URL or a URN depending on product type and `relation`.

Links vary depending on [product type](#).

property

Data Type

String

Description

Products have zero or more key/value properties, which are both Strings. Properties vary depending on [product type](#).

preferredWeight

Data Type

Integer

Description

Relative weight of product. When multiple products of the same type are associated to an event, one product of each type is considered “most preferred” This is defined as the product of that type with the largest `preferredWeight`, and when two products have equal `preferredWeight` the most recent `updateTime` is more preferred.

status

Data Type

String

Description

Status of the product. There is only one reserved status `DELETE`, which indicates the product has been deleted. Any other value indicates a product update, and may vary depending on [product type](#).

Metadata Terms

api

Data Type

String

Description

Version of API that generated feed.

count

Data Type

Integer

Description

Number of earthquakes in feed.

generated

Data Type

Long Integer

Description

Time when the feed was most recently updated. Times are reported in *milliseconds* since the epoch.

title**Data Type**

String

Typical Values

“USGS Magnitude 1+ Earthquakes, Past Day”, “USGS Magnitude 4.5+ Earthquakes, Past Month”

Description

The title of the feed.

url**Data Type**

String

Description

Url of the feed.

status**Data Type**

Integer

Description

HTTP status code of response.

Event Terms**alert****Data Type**

String

Typical Values

“green”, “yellow”, “orange”, “red”.

Description

The alert level from the [PAGER earthquake impact scale](#).

cdi**Data Type**

Decimal

Typical Values

[0.0, 10.0]

Description

The maximum reported [intensity](#) for the event. Computed by [DYFI](#). While typically reported as a roman numeral, for the purposes of this API, intensity is expected as the **decimal** equivalent of the roman numeral. Learn more about [magnitude vs. intensity](#).

code

Data Type

String

Typical Values

"2013lgaz", "c000f1jy", "71935551"

Description

An identifying code assigned by - and **unique** from - the [corresponding source](#) for the event.

depth

Data Type

Decimal

Typical Values

[0, 1000]

Description

Depth of the event in kilometers.

Additional Information

The depth where the earthquake begins to rupture. This depth may be relative to the WGS84 geoid, mean sea-level, or the average elevation of the seismic stations which provided arrival-time data for the earthquake location. The choice of reference depth is dependent on the method used to locate the earthquake, which varies by seismic network. Since ComCat includes data from many different seismic networks, the process for determining the depth is different for different events. The depth is the least-constrained parameter in the earthquake location, and the error bars are generally larger than the variation due to different depth determination methods.

Sometimes when depth is poorly constrained by available seismic data, the location program will set the depth at a fixed value. For example, 33 km is often used as a default depth for earthquakes determined to be shallow, but whose depth is not satisfactorily determined by the data, whereas default depths of 5 or 10 km are often used in mid-continental areas and on mid-ocean ridges since earthquakes in these areas are usually shallower than 33 km.

depthError

Data Type

Decimal

Typical Values

[0, 100]

Description

Uncertainty of reported depth of the event in kilometers.

Additional Information

The depth error, in km, defined as the largest projection of the three principal errors on a vertical line.

detail

Data Type

String

Description

Link to [GeoJSON detail](#) feed from a [GeoJSON summary](#) feed.

NOTE: When searching and using geojson with callback, no callback is included in the `detail` url.

dmin

Data Type

Decimal

Typical Values

[0.4, 7.1]

Description

Horizontal distance from the epicenter to the nearest station (in degrees). 1 degree is approximately 111.2 kilometers. In general, the smaller this number, the more reliable is the calculated depth of the earthquake.

felt

Data Type

Integer

Typical Values

[44, 843]

Description

The total number of felt reports submitted to the [DYFI?](#) system.

gap

Data Type

Decimal

Typical Values

[0.0, 180.0]

Description

The largest azimuthal gap between azimuthally adjacent stations (in degrees). In general, the smaller this number, the more reliable is the calculated horizontal position of the earthquake. Earthquake locations in which the azimuthal gap exceeds 180 degrees typically have large location and depth uncertainties.

horizontalError

Data Type

Decimal

Typical Values

[0, 100]

Description

Uncertainty of reported location of the event in kilometers.

Additional Information

The horizontal location error, in km, defined as the length of the largest projection of the three principal errors on a horizontal plane. The principal errors are the major axes of the error ellipsoid, and are mutually perpendicular. The horizontal and vertical uncertainties in an event's location varies from about 100 m horizontally and 300 meters vertically for the best located events, those in the middle of densely spaced seismograph networks, to 10s of kilometers for global events in many parts of the world. We report an "unknown" value if the contributing seismic network does not supply uncertainty estimates.

id

Data Type

String

Typical Values

A (generally) [two-character network identifier](#) with a (generally) [eight-character network-assigned code](#).

Description

A unique identifier for the event. This is the current preferred id for the event, and may change over time. [See the "ids" GeoJSON format property](#).

ids

Data Type

String

Typical Values

",ci15296281,us2013mqbd,at00mji9pf,"

Description

A comma-separated list of [event ids](#) that are associated to an event.

latitude**Data Type**

Decimal

Typical Values

[-90.0, 90.0]

Description

Decimal degrees latitude. Negative values for southern latitudes.

Additional Information

An earthquake begins to rupture at a hypocenter which is defined by a position on the surface of the earth (epicenter) and a depth below this point (focal depth). We provide the coordinates of the epicenter in units of latitude and longitude. The latitude is the number of degrees north (N) or south (S) of the equator and varies from 0 at the equator to 90 at the poles. The longitude is the number of degrees east (E) or west (W) of the prime meridian which runs through Greenwich, England. The longitude varies from 0 at Greenwich to 180 and the E or W shows the direction from Greenwich. Coordinates are given in the [WGS84](#) reference frame. The position uncertainty of the hypocenter location varies from about 100 m horizontally and 300 meters vertically for the best located events, those in the middle of densely spaced seismograph networks, to 10s of kilometers for global events in many parts of the world.

locationSource**Data Type**

String

Typical Values

ak, at, ci, hv, ld, mb, nc, nm, nn, pr, pt, se, us, uu, uw

Description

The network that originally authored the reported location of this event.

longitude**Data Type**

Decimal

Typical Values

[-180.0, 180.0]

Description

Decimal degrees longitude. Negative values for western longitudes.

Additional Information

An earthquake begins to rupture at a hypocenter which is defined by a position on the surface of the earth (epicenter) and a depth below this point (focal depth). We provide the coordinates of the epicenter in units of latitude and longitude. The latitude is the number of degrees north (N) or south (S) of the equator and varies from 0 at the equator to 90 at the poles. The longitude is the number of degrees east (E) or west (W) of the prime meridian which runs through Greenwich, England. The longitude varies from 0 at Greenwich to 180 and the E or W shows the direction from Greenwich. Coordinates are given in the [WGS84](#) reference frame. The position uncertainty of the hypocenter location varies from about 100 m horizontally and 300 meters vertically for the best located events, those in the middle of densely spaced seismograph networks, to 10s of kilometers for global events in many parts of the world.

mag

Data Type

Decimal

Typical Values

[-1.0, 10.0]

Description

The magnitude for the event. See also [magType](#).

Additional Information

The magnitude reported is that which the U.S. Geological Survey considers official for this earthquake, and was the best available estimate of the earthquake's size, at the time that this page was created. Other magnitudes associated with web pages linked from here are those determined at various times following the earthquake with different types of seismic data. Although they are legitimate estimates of magnitude, the U.S. Geological Survey does not consider them to be the preferred "official" magnitude for the event.

Earthquake magnitude is a measure of the size of an earthquake at its source. It is a logarithmic measure. At the same distance from the earthquake, the amplitude of the seismic waves from which the magnitude is determined are approximately 10 times as large during a magnitude 5 earthquake as during a magnitude 4 earthquake. The total amount of energy released by the earthquake usually goes up by a larger factor: for many commonly used magnitude types, the total energy of an average earthquake goes up by a factor of approximately 32 for each unit increase in magnitude.

There are various ways that magnitude may be calculated from seismograms. Different methods are effective for different sizes of earthquakes and different distances between the earthquake source and the recording station. The various magnitude types are generally defined so as to yield magnitude values that agree to within a few-tenths of a magnitude-unit for earthquakes in a middle range of recorded-earthquake sizes, but the various magnitude-types may have values that differ by more than a magnitude-unit for very large and very small

earthquakes as well as for some specific classes of seismic source. This is because earthquakes are commonly complex events that release energy over a wide range of frequencies and at varying amounts as the faulting or rupture process occurs. The various types of magnitude measure different aspects of the seismic radiation (e.g., low-frequency energy vs. high-frequency energy). The relationship among values of different magnitude types that are assigned to a particular seismic event may enable the seismologist to better understand the processes at the focus of the seismic event. The various magnitude-types are not all available at the same time for a particular earthquake.

Preliminary magnitudes based on incomplete but rapidly-available data are sometimes estimated and reported. For example, the Tsunami Warning Centers will calculate a preliminary magnitude and location for an event as soon as sufficient data are available to make an estimate. In this case, time is of the essence in order to broadcast a warning if tsunami waves are likely to be generated by the event. Such preliminary magnitudes are superseded by improved estimates of magnitude as more data become available.

For large earthquakes of the present era, the magnitude that is ultimately selected as the preferred magnitude for reporting to the public is commonly a moment magnitude that is based on the scalar seismic-moment of an earthquake determined by calculation of the seismic moment-tensor that best accounts for the character of the seismic waves generated by the earthquake. The scalar seismic-moment, a parameter of the seismic moment-tensor, can also be estimated via the multiplicative product rigidity of faulted rock x area of fault rupture x average fault displacement during the earthquake.

magError

Data Type

Decimal

Typical Values

[0, 100]

Description

Uncertainty of reported magnitude of the event. The estimated standard error of the magnitude. The uncertainty corresponds to the specific magnitude type being reported and does not take into account magnitude variations and biases between different magnitude scales. We report an "unknown" value if the contributing seismic network does not supply uncertainty estimates.

magNst

Data Type

Integer

Description

The total number of seismic stations used to calculate the magnitude for this earthquake.

magSource

Data Type

String

Typical Values

ak, at, ci, hv, ld, mb, nc, nm, nn, pr, pt, se, us, uu, uw

Description

Network that originally authored the reported magnitude for this event.

magType

Data Type

String

Typical Values

“Md”, “Ml”, “Ms”, “Mw”, “Me”, “Mi”, “Mb”, “MLg”

Description

The method or algorithm used to calculate the preferred magnitude for the event.

Additional Information

See [Magnitude Types Table](#).

mmi

Data Type

Decimal

Typical Values

[0.0, 10.0]

Description

The maximum estimated instrumental [intensity](#) for the event. Computed by [ShakeMap](#). While typically reported as a roman numeral, for the purposes of this API, intensity is expected as the **decimal** equivalent of the roman numeral. Learn more about [magnitude vs. intensity](#).

net

Data Type

String

Typical Values

ak, at, ci, hv, ld, mb, nc, nm, nn, pr, pt, se, us, uu, uw

Description

The ID of a data contributor. Identifies the network considered to be the preferred source of information for this event.

nph

Number of Phases Used

String

Description

Number of P and S arrival-time observations used to compute the hypocenter location.

Increased numbers of arrival-time observations generally result in improved earthquake locations.

nst

Data Type

Integer

Description

The total number of seismic stations used to determine earthquake location.

Additional Information

Number of seismic stations which reported P- and S-arrival times for this earthquake. This number may be larger than the Number of Phases Used if arrival times are rejected because the distance to a seismic station exceeds the maximum allowable distance or because the arrival-time observation is inconsistent with the solution.

place

Data Type

String

Description

Textual description of named geographic region near to the event. This may be a city name, or a [Flinn-Engdahl Region](#) name.

Additional Information

We use a [GeoNames](#) dataset to reference populated places that are in close proximity to a seismic event. GeoNames has compiled a list of cities in the United States where the population is 1,000 or greater (cities1000.txt). This is the primary list that we use when selecting nearby places. In order to provide the public with a better understanding for the location of an event we try to list a variety of places in our nearby places list. This includes the closest known populated place in relation to the seismic event (which based on our dataset will have a population of 1,000 or greater). We also include the next 3 closest places that have a population of 10,000 or greater, and finally make sure to include the closest capital city to the seismic event.

The reference point for the descriptive locations is usually either the City Hall of the town (or prominent intersection in the middle of town if there is no City Hall), but please refer to the GeoNames website for the most accurate information on their data.

If there is no nearby city within 300 kilometers (or if the nearby cities database is unavailable for some reason), the [Flinn-Engdahl \(F-E\)](#) seismic and geographical regionalization scheme is used.

The boundaries of these regions are defined at one-degree intervals and therefore differ from irregular political boundaries. For example, F-E region 545 (Northern Italy) also includes small parts of France, Switzerland, Austria and Slovenia and F-E region 493 (Chesapeake Bay Region) includes all of the State of Delaware, plus parts of the District of Columbia, Maryland, New Jersey, Pennsylvania and Virginia. Beginning with January 2000, the 1995 revision to the F-E code has been used in the QED and PDE listings.

As an agency of the U.S. Government, we are expected to use the names and spellings approved by the [U.S. Board on Geographic Names](#). Any requests to approve additional names should be made to the U.S. Board on Geographic Names.

rms

Data Type

Decimal

Typical Values

[0.13,1.39]

Description

The root-mean-square (RMS) travel time residual, in sec, using all weights. This parameter provides a measure of the fit of the observed arrival times to the predicted arrival times for this location. Smaller numbers reflect a better fit of the data. The value is dependent on the accuracy of the velocity model used to compute the earthquake location, the quality weights assigned to the arrival time data, and the procedure used to locate the earthquake.

sig

Data Type

Integer

Typical Values

[0, 1000]

Description

A number describing how significant the event is. Larger numbers indicate a more significant event. This value is determined on a number of factors, including: magnitude, maximum MMI, felt reports, and estimated impact.

sources

Data Type

String

Typical Values

",us,nc,ci,"

Description

A comma-separated list of [network contributors](#).

status

Data Type

String

Typical Values

“automatic”, “reviewed”, “deleted”

Description

Indicates whether the event has been reviewed by a human.

Additional Information

Status is either automatic or reviewed. Automatic events are directly posted by automatic processing systems and have not been verified or altered by a human. Reviewed events have been looked at by a human. The level of review can range from a quick validity check to a careful reanalysis of the event.

time

Data Type

Long Integer

Description

Time when the event occurred. Times are reported in *milliseconds* since the epoch (`1970-01-01T00:00:00.000Z`), and do not include [leap seconds](#). In certain output formats, the date is formatted for readability.

Additional Information

We indicate the date and time when the earthquake initiates rupture, which is known as the "origin" time. Note that large earthquakes can continue rupturing for many 10's of seconds. We provide time in UTC (Coordinated Universal Time). Seismologists use UTC to avoid confusion caused by local time zones and daylight savings time. On the individual event pages, times are also provided for the time at the epicenter, and your local time based on the time your computer is set.

tsunami

Data Type

Integer

Description

This flag is set to "1" for large events in oceanic regions and "0" otherwise. **The existence or value of this flag does not indicate if a tsunami actually did or will exist.** If the flag value is "1", the event will include a link to the NOAA Tsunami website for tsunami information. The USGS is not responsible for Tsunami warning; we are simply providing a link to the authoritative NOAA source.

See <http://www.tsunami.gov/> for all current tsunami alert statuses.

type

Data Type

String

Typical Values

“earthquake”, “quarry”

Description

Type of seismic event.

types

Data Type

String

Typical Values

“,cap,dyfi,general-link,origin,p-wave-travel-times,phase-data,”

Description

A comma-separated list of product types associated to this event.

tz

Data Type

Integer

Typical Values

[-1200, +1200]

Description

Timezone offset from UTC in minutes at the event epicenter.

updated

Data Type

Long Integer

Description

Time when the event was most recently updated. Times are reported in *milliseconds* since the *epoch*. In certain output formats, the date is formatted for readability.

url

Data Type

String

Description

Link to USGS Event Page for event.
