Past
Past 8–30 days
Significant Earthquakes
Earthquake Lists & Maps
Search for an Earthquake

Present
Real-time - CA/NV
Real-time - USA
Real-time - Worldwide
About Earthquake Maps
KML / RSS Feeds & Data
Earthquake Notifications
Did You Feel It?
ShakeMaps
PAGER
Earthquake Animations
Seismogram Displays
Google Gadget
TED-Twitter EQ Dispatch
EQ Summary Posters

Future
Earthquake Scenarios
Prediction
Probabilities

Location
Info by State/Territory
Info by Country/Region

Glossary of Terms on EQ Maps

Maps

Maps at various scales show the location of the event. Some maps for locations in California and Nevada also show faults with fault names revealed as you move the mouse over the fault (if you have Javascript enabled in your browser). Links to additional location maps are often listed farther down in the event description page.

Magnitude

Seismologists indicate the size of an earthquake in units of magnitude. There are many different ways that magnitude is measured from seismograms because each method only works over a limited range of magnitudes and with different types of seismometers. Some methods are based on body waves (which travel deep within the structure of the earth), some based on surface waves (which primarily travel along the uppermost layers of the earth), and some based on completely different methodologies. However, all of the methods are designed to agree well over the range of magnitudes where they are reliable.

Preliminary magnitudes based on incomplete but available data are sometimes estimated and reported. For example, the Tsunami Centers will calculate a preliminary magnitude and location for an event as soon as sufficient data is 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magnitudes, which may be off by one-half magnitude unit or more, are sufficient for the purpose at hand, and are superseded by more exact estimates of magnitude as more data become available.

Earthquake magnitude is a logarithmic measure of earthquake size. In simple terms, this means that at the same distance from the earthquake, the shaking will be 10 times as large during a magnitude 5 earthquake as during a magnitude 4 earthquake. The total amount of energy released by the earthquake, however, goes up by a factor of 32.

Magnitudes commonly used by seismic networks include:

Magnitude type	Applicable magnitude range	Distance range	Comments
Duration (Md)	<4	0-400 km	Based on the duration of shaking as measured by the time decay of the amplitude of the seismogram. Often used to compute magnitude from seismograms with "clipped" waveforms due to limited dynamic recording range of analog instrumentation, which makes it impossible to measure peak amplitudes.
Local (ML)	2-6	0-400 km	The original magnitude relationship defined by Richter and Gutenberg for local earthquakes in 1935. It is based on the maximum amplitude of a seismogram recorded on a Wood-Anderson torsion seismograph. Although these instruments are no longer widely in use, ML values are calculated using modern instrumentation with appropriate adjustments.
Surface wave (Ms)	5-8	20-180 degrees	A magnitude for distant earthquakes based on the amplitude of Rayleigh surface waves measured at a period near 20 sec.
Moment (Mw)	>3.5	all	Based on the moment of the

			earthquake, which is equal to the rigidity of the earth times the average amount of slip on the fault times the amount of fault area that slipped.
Energy (Me)	>3.5	all	Based on the amount of recorded seismic energy radiated by the earthquake.
Moment (Mi)	5-8	all	Based on the integral of the first few seconds of P wave on broadband instruments (Tsuboi method).
Body (Mb)	4-7	16-100 degrees (only deep earthquakes)	Based on the amplitude of P body-waves. This scale is most appropriate for deep-focus earthquakes.
Surface wave (MLg)	5-8	all	A magnitude for distant earthquakes based on the amplitude of the Lg surface waves.

Date and Time

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 text pages, times are also provided in local US timezones

Location

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.

Depth

The depth where the earthquake begins to rupture. This depth may be relative to 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. 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.

Region

The region name is an automatically generated name from the Flinn-Engdahl (F-E) seismic and geographical regionalization scheme, proposed in 1965, defined in 1974 and revised in 1995. 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. This revision includes 28 additional regions, which were defined by subdividing larger regions to provide better coverage for Northwest Africa, Southeast Asia and seismic zones along oceanic ridges. (More info here.)

Distances

We provide distances and directions from nearby geographical reference points to the earthquake. The reference points are towns, cities, and major geographic features (Gazetteer info). We realize that these distances are uncertain both because of the errors inherent in locating earthquake (typically one or more kilometers) and because of the impossibility of describing the location of a city by a single

longitude-latitude entry in a table. For places in the US, rather than rounding off distances to, say, the nearest 10 kilometers, we chose to trust the user's common sense in interpreting the accuracy of these distances. For places outside the US, distances are rounded depending on the location uncertainty. If the computed location is close to an operating quarry which is known to use explosives in its operations, we indicate that the event may be a quarry explosion. We try to always provide at least one widely recognized reference point in the list on the event page, even if the earthquake occurs in a remote location.

Location Uncertainty

The horizontal and vertical uncertainties in an event's location are based on values Ehro and Erzz described below. We assign an "unknown" value if the contributing seismic network does not supply the necessary information to generate uncertainty estimates. 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.

Parameters

These parameters provide information on the reliability of the earthquake location. Zero values usually indicate that the contributing seismic network did not supply the information.

Nst Number of seismic stations which reported P- and S-arrival times for this earthquake. This number may be larger than Nph 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.

Nph 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.

Dmin Horizontal distance from the epicenter to the nearest station (in km). In general, the smaller this number, the more reliable is the calculated depth of the earthquake.

Rmss 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.

Erho 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. Erho thus approximates the major axis of the epicenter's error ellipse.

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

Gp 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 Erho and Erzz values.

M-type Magnitude type, discussed at greater length above under Magnitude

Version Computers automatically update the WWW pages as more reliable information about the earthquake is computed, particularly in the first 10 minutes following the earthquake. The highest version number is always considered authoritative.

Source

The organization supplying the information provided here.

Event ID

A combination of a 2-letter Seismic Network Code and a number assigned by the contributing seismic network.

Additional Information

Depending on the magnitude of the earthquake, additional information is sometimes available. Location map links point to maps on which the earthquake appears. "Waveforms" are commonly available for a number of instruments which detected the event. If the event is large enough, focal mechanisms, aftershock probabilities and other kinds of information may also be available.

Past - Present - Future
Info by State
Info by Country/Region

Faults
Hazard Maps & Data
Seismic Design
Seismic Analysis Tools
NSHM Project

Earthquake Topics
FAQ
Earthquake Glossary
For Kids
Students & Teachers
Photos
Publications
Google Earth/KML Files

How do I prepare?
A quake just happened...

ANSS - United States
GSN - World
Volunteer Monitoring
ASL - Albuquerque
Network Operations
NSMP - Strong Motion
Crustal Deformation

Projects
Data
Software
External Support

Accessibility FOIA Privacy Policies and Notices In partnership with nehrp