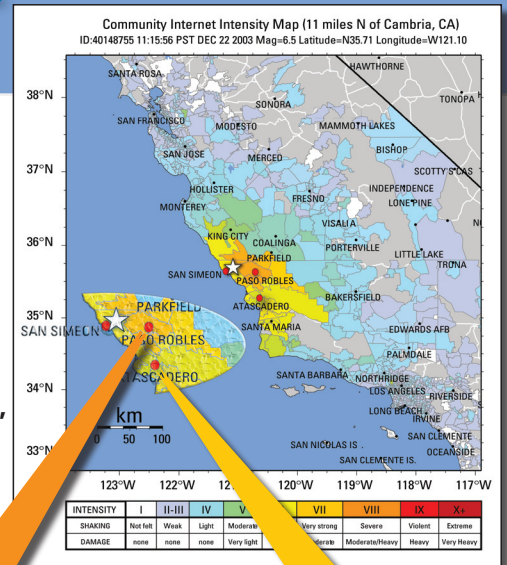


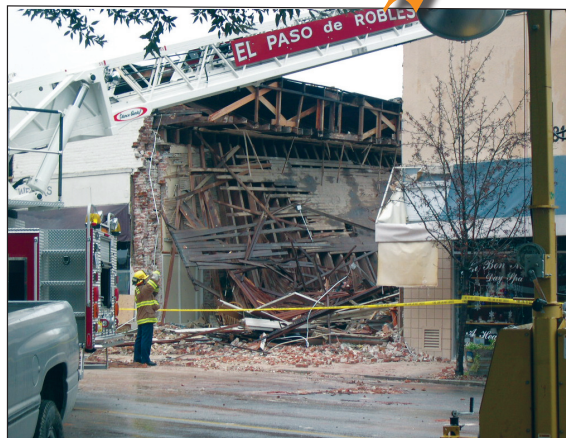
# Did You Feel It? Citizens Contribute to Earthquake Science

Since the early 1990s, the magnitude and location of an earthquake have been available within minutes on the Internet. Now, as a result of work by the U.S. Geological Survey and with the cooperation of various regional seismic networks, people who experience an earthquake can go online and share information about its effects to help create a map of shaking intensities and damage. Such "Community Internet Intensity Maps" (CIIMs) contribute greatly toward the quick assessment of the scope of an earthquake emergency and provide valuable data for earthquake research.



## Then and Now

Not so long ago, the first thing that most people did after feeling an earthquake was to turn on their radio for information. That practice is changing, however. After the 2003 San Simeon earthquake in central California, for example, many people logged onto the Internet, not only to get information, but also to share their own experience of the earthquake. After checking the U.S. Geological Survey (USGS) Web site for the location and magnitude of the earthquake, they went to a Web page called "Did You Feel It?" (at <http://earthquake.usgs.gov/>). They entered their ZIP Code and answered a list of questions such as "Did the earthquake wake you up?" and "Did objects fall off shelves?" In minutes a map began taking shape on the Internet, and in a few hours, with more than 14,000 responses for the central California event, a Community Internet Intensity Map (CIIM) showed where and how strongly the earthquake had been felt and where damage occurred.



Photographs represent effects of the 2003 San Simeon, Calif., earthquake. Following this event, over 18,000 responses to "Did You Feel It?" were shared with the USGS. The earthquake was Intensity VIII in Paso Robles (left) and Intensity VII near Atascadero (right).

## Macroseismic Intensity

Macroseismic intensity describes the strength of shaking from an earthquake at a particular location, as determined from effects that people can readily observe without special instruments or special training. Such macroseismic effects include damage caused by the earthquake and the strength of shaking as perceived by people.

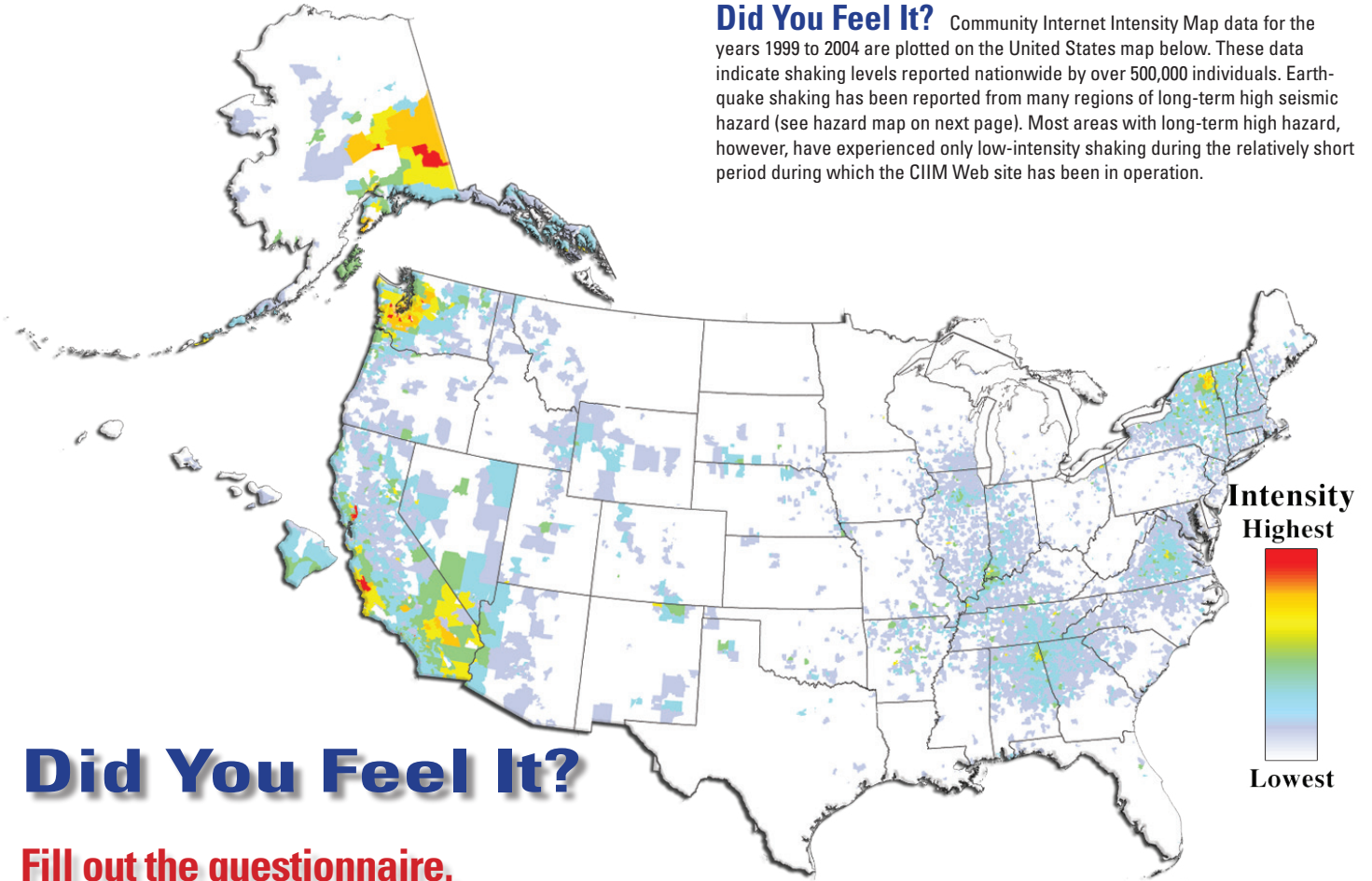
In general, the macroseismic intensity is highest near the earthquake source and decreases with distance from the source. However, a variety of factors—such as the direction in which the earthquake fault ruptures and variations in the soil conditions underlying different sites—may lead to complicated patterns of intensities that vary strongly from place to place.

Since 1931, the USGS has assigned macroscopic intensities to United States earthquakes on the basis of the Modified Mercalli Intensity (MMI) scale. Until recently, most of the macroseismic observations used to assign intensities were collected with questionnaires that were mailed to post offices in the earthquake region. The process of sending the questionnaires by standard mail, waiting for written responses, manually interpreting the responses, and preparing intensity maps could take months. In the late 1990s, the USGS began collecting data and publishing CIIMs on the "Did You Feel It?" Web page.

## Community Internet Intensity Maps

In contrast to the intensity maps prepared from paper-copy questionnaires, CIIMs take advantage of the Internet to generate intensity maps almost instantly. Data are received through questionnaires on the Internet answered by people who experienced the earthquake. The Internet approach reduces the time for preparing and distributing a shaking-intensity map from months to minutes.

**Did You Feel It?** Community Internet Intensity Map data for the years 1999 to 2004 are plotted on the United States map below. These data indicate shaking levels reported nationwide by over 500,000 individuals. Earthquake shaking has been reported from many regions of long-term high seismic hazard (see hazard map on next page). Most areas with long-term high hazard, however, have experienced only low-intensity shaking during the relatively short period during which the CIIM Web site has been in operation.



# Did You Feel It?

**Fill out the questionnaire.  
Your input does make a difference!**

**1** Go to URL <http://earthquakes.usgs.gov/> and select "DID YOU FEEL IT?" Select the region where you felt the earthquake.

**2** From the list of recent earthquakes in your region, either select the earthquake that corresponds to your location and the time you felt the event or select "New or Unknown Earthquake."

### DID YOU FEEL IT? REPORT IT HERE!

Did you feel the earthquake?  
(If you were asleep, did the earthquake wake you up?)  No  Yes

Did others nearby feel the earthquake?

**Your experience:**

How would you best describe the ground shaking?

About how many seconds did the shaking last?

How would you best describe your reaction?

How did you respond? (Select one)

If other, please describe:

Was it difficult to stand or walk?

**Earthquake effects:**

Swinging/swaying of doors or hanging objects?

Creaking or other noises?

Did objects rattle, topple over, or fall off shelves?

Did pictures on walls move or get knocked askew?

Did furniture or appliances slide, tip over, or become displaced?

Was a heavy appliance (refrigerator or range) affected?

Were free-standing walls or fences damaged?

If you know the type of building (wood, brick, etc.) and/or your location indicate here:

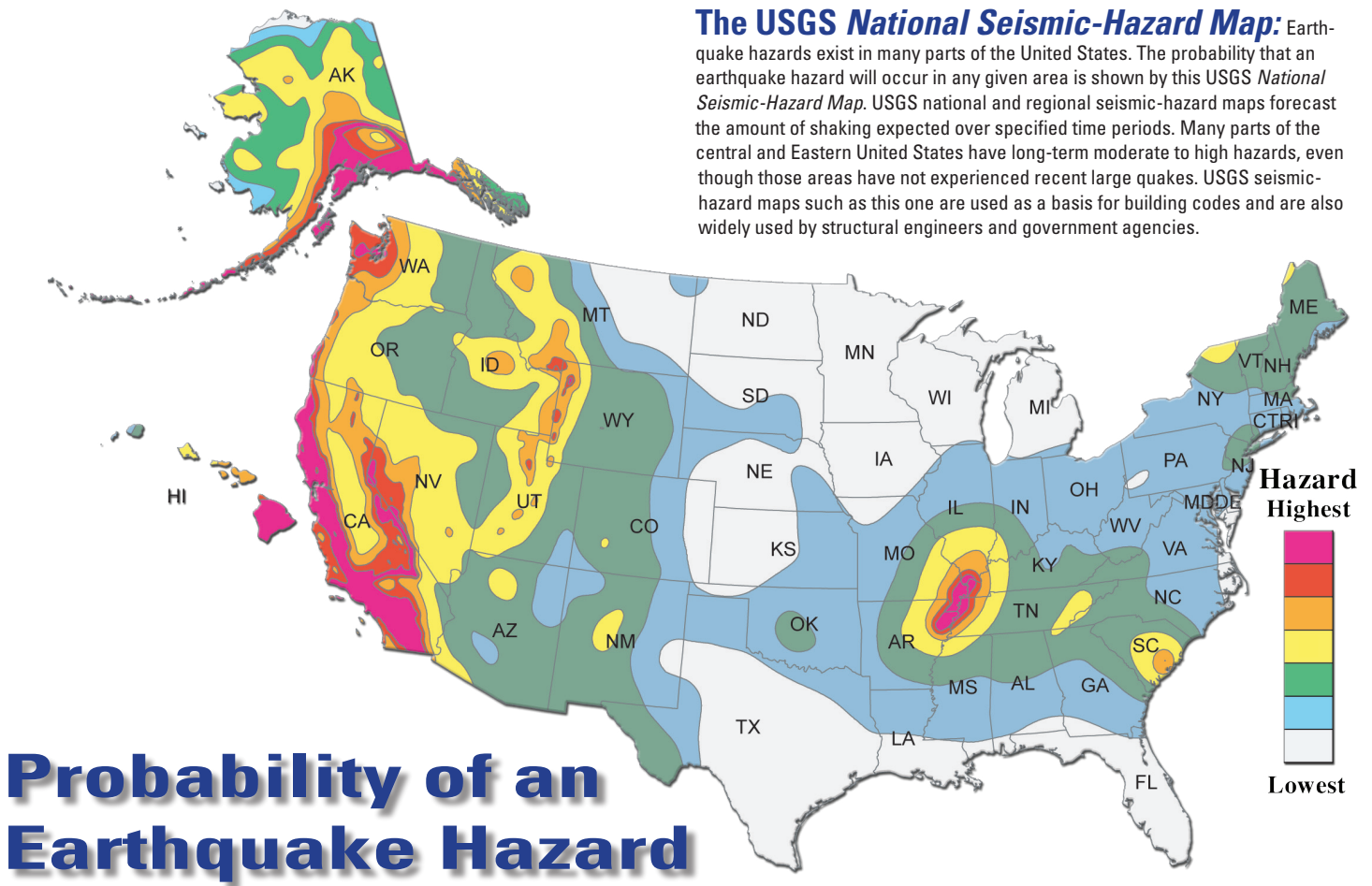
If you were inside, was there any damage to the building? Check all that apply:

- No damage
- Hairline cracks in walls
- A few large cracks in walls
- Many large cracks in walls
- Ceiling tiles or lighting fixtures fell
- Cracks in chimney
- One or several cracked windows
- Many windows cracked or some broken out
- Masonry fell from block or brick wall(s)
- Old chimney, major damage or fell down
- Modern chimney, major damage or fell down
- Outside wall(s) tilted over or collapsed completely
- Separation of porch, balcony, or other addition from building
- Building permanently shifted over foundation

**Additional comments:**  
You may use the next box to clarify answers or to make observations that are not accommodated by other questions. You may also use the following box to give first-person descriptions of how the earthquake affected you. USGS scientists may use some of the information that you enter in qualitative descriptions of shaking or damage in USGS publications. You would be identified as "an observer" and your location would be given in general terms. Parts of some first-person accounts may be reproduced as quotations in USGS publications.

**3** Fill out the questionnaire by selecting appropriate answers and filling in the blanks. You may also contribute longer descriptions of your experience. Review the CIIM Web site to see your response contribute to building the detailed map!

**The USGS National Seismic-Hazard Map:** Earthquake hazards exist in many parts of the United States. The probability that an earthquake hazard will occur in any given area is shown by this USGS *National Seismic-Hazard Map*. USGS national and regional seismic-hazard maps forecast the amount of shaking expected over specified time periods. Many parts of the central and Eastern United States have long-term moderate to high hazards, even though those areas have not experienced recent large quakes. USGS seismic-hazard maps such as this one are used as a basis for building codes and are also widely used by structural engineers and government agencies.



# Probability of an Earthquake Hazard

A CIIM summarizes the responses. An intensity number is assigned to each ZIP Code for which one or more CIIM questionnaires are completed. The intensity values in each ZIP-Code area are averaged, and the map is updated as additional data are received. ZIP-Code areas for which data have been received are color-coded according to the intensity scale shown below the map on the CIIM Web page; other areas are gray.

A CIIM is automatically made after each widely felt earthquake in the United States. The system can start receiving responses immediately after the earthquake. Internet users can also enter data for significant U.S. earthquakes they have experienced in the past.

The CIIM procedure was constructed so that CIIM intensities would agree on average with MMI values produced by the traditional procedure that is based on postal questionnaires. For some specific levels of shaking, differences are likely between intensities produced by the two procedures, just because the procedures are different. Five years' experience with the CIIM procedure, however, has shown that the CIIM values usually agree well with MMI values that would be assigned by the traditional procedure. In cases where the new CIIM methodology produces values that differ from those produced by the traditional procedure, the CIIM values are usually more self-consistent, because they are usually based on many more observations in a given ZIP Code.

## A Unique Tool for Understanding Earthquakes

In areas such as California where there are networks of seismic instruments, CIIMs provide a very rapid means of displaying the pattern of shaking *independent* of strong-motion seismographs. CIIMs provide descriptions of actual damage, rather than inferred damage indicated by instrumental shaking records. Also, the potential number of Internet responses far exceeds the number of seismic instruments, so very dense sampling of earthquake effects is possible, providing details that would not be possible with the instruments alone.

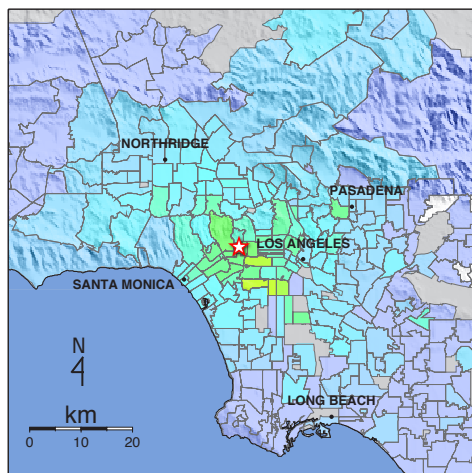
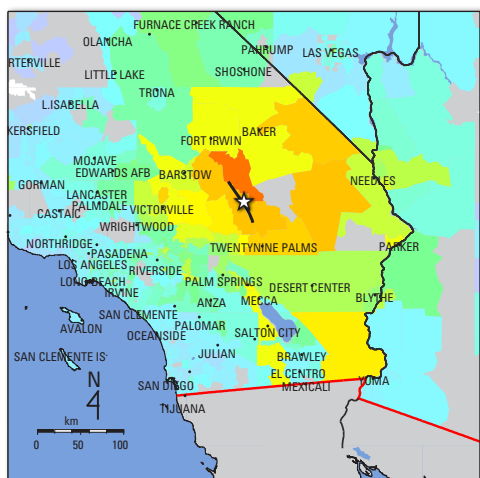
In regions with few seismic instruments, which includes most of the United States and most of the World, intensity observations for a small to moderate event can indicate which areas will be more prone to shaking in larger, but less frequent earthquakes. After a damaging earthquake in those sparsely instrumented areas, CIIMs can provide information about which areas experienced the most shaking and, therefore, the most potential damage. This information can serve not only as a tool for postearthquake response, but also for estimating losses from future earthquakes.

The interactive nature of the Internet questionnaire and mapping provides an unprecedented opportunity for community involvement. The CIIM interactive Web site provides an avenue for feedback among the communities affected by earthquakes, scientists studying earthquake effects, and agencies responding to the events. By allowing people in an area struck by an earthquake to share their experiences, the CIIM Web site may help them cope with the emotional impact of the earthquake.

## Typical Effects of Different Intensity Levels.

[Most of the effects are sometimes observed in special circumstances at lower intensities than suggested by the table. Some of the effects are used to help define intensity levels in the CIIM procedure; other effects do not influence calculation of intensity values, but are nonetheless commonly observed]

CIIM Intensity	People's Reaction	Furnishings	Built Environment	Natural Environment
I	Not felt			Changes in level and clarity of well water are occasionally associated with great earthquakes at distances beyond which the earthquake is felt by people.
II	Felt by a few.	Delicately suspended objects may swing.		
III	Felt by several; vibration like passing of truck.	Hanging objects may swing appreciably.		
IV	Felt by many; sensation like heavy body striking building.	Dishes rattle.	Walls creak; windows rattle.	
V	Felt by nearly all; frightens a few.	Pictures swing out of place; small objects move; a few objects fall from shelves within the community.	A few instances of cracked plaster and cracked windows within the community.	Trees and bushes shaken noticeably.
VI	Frightens many; people move unsteadily.	Many objects fall from shelves within the community.	A few instances of fallen plaster, broken windows, and damaged chimneys within the community.	Some fall of tree limbs and tops, isolated rockfalls and landslides, and isolated liquefaction.
VII	Frightens most; some lose balance.	Heavy furniture overturned.	Damage negligible in buildings of good design and construction, but considerable in some poorly built or badly designed structures; weak chimneys broken at roof line, fall of unbraced parapets.	Tree damage, rockfalls, landslides, and liquefaction are more severe and widespread with increasing intensity.
VIII	Many find it difficult to stand.	Very heavy furniture moves conspicuously.	Damage slight in buildings designed to be earthquake resistant, but severe in some poorly built structures. Widespread fall of chimneys and monuments.	
IX	Some forcibly thrown to the ground.		Damage considerable in some buildings designed to be earthquake resistant; buildings shift off foundations if not bolted to them.	
X			Most ordinary masonry structures collapse; damage moderate to severe in many buildings designed to be earthquake resistant.	



Comparison of intensity distribution for magnitude 7.1 (*left*) and magnitude 4.4 (*right*) earthquakes in southern California. Note that the small event produced intensity IV to V near the epicenter (star), whereas the large event produced intensity VIII to IX near the causative fault (black line) and intensities IV to V (comparable to the smaller event) at great distances from the epicenter and fault.

### For More Information:

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