

**UPDATE ON DATA AND FEATURES OF THE CENTER FOR ENGINEERING
STRONG MOTION DATA (CESMD)**

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Introduction

Strong-motion data from the United States and other seismically active countries are served to engineers, seismologists, and public safety authorities through the Center for Engineering Strong Motion Data (CESMD) at www.strongmotioncenter.org. The CESMD is a joint effort between the US Geological Survey and the California Geological Survey, in cooperation with US and international strong-motion seismic networks and data centers. The transfer of operational and maintenance responsibilities for the COSMOS Virtual Data Center from its original home at UC Santa Barbara to the CESMD have been completed, along with software upgrades and improvements in the virtual links to worldwide data providers. Two search options are now available at the CESMD: US structural and ground response data at the Engineering Data Center (EDC), and worldwide ground response data at the Virtual Data Center (VDC), shown in Figure 1.

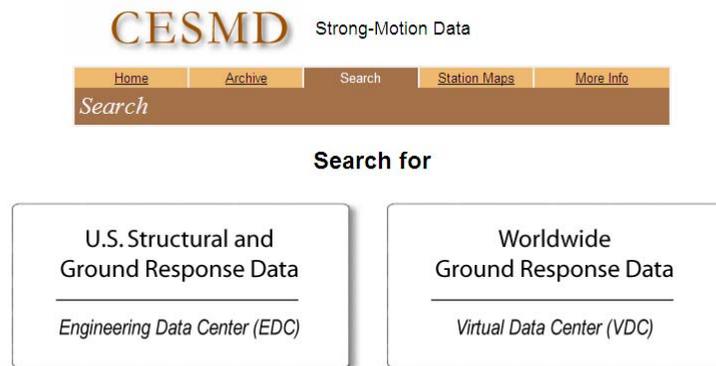


Figure 1. Two search options available at the EDC and VDC pages of the CESMD

New and Improved Search, Select, and Display Features of the CESMD

Automated Internet Quick Report

The CESMD now automatically posts strong-motion data from the California Integrated Seismic Networks (CSMIP, NSMP, SCSN, NCSN, BDSN) within minutes following an earthquake as an Internet Quick Report (IQR). In addition to related products such as ShakeMap, these reports are used by public safety authorities and engineers for rapid response to earthquakes. The IQR pages are reviewed and archived at the CESMD as Internet Data Reports (IDR). The IDR Page for the M4.8 Isla Vista earthquake of 29 May 2013 is shown in Figure 2 as an example.



Figure 2. CESMD Internet Data Report for the M4.8 Isla Vista earthquake of 29 May 2013

Small Records FTP Site

In response to engineering seismology needs in the US, the CESMD now also provides strong-motion records at the Small Records FTP site from lower magnitude ($<M3.5$) and smaller amplitude ($<0.5\%g$) records from California for use in studies such as developing ground-motion prediction equations in regions of the country with infrequent strong earthquakes.

The EDC web pages for earthquakes now show links (e.g., at the bottom of Figure 2) to the Small Records FTP site when low magnitude and small amplitude records are available. Figure 3 shows the Small Records FTP page for the M4.8 Isla Vista earthquake of 29 May 2013.

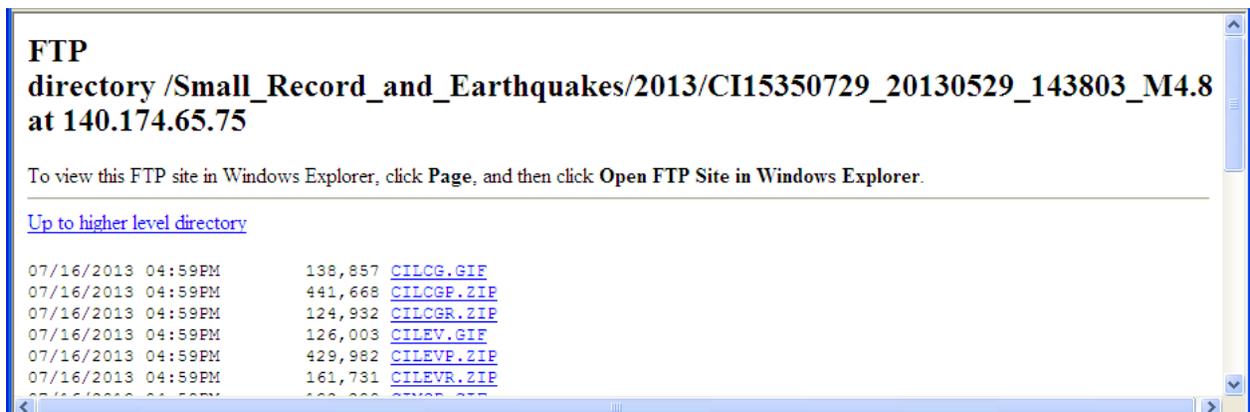


Figure 3. Small Records FTP page for the M4.8 Isla Vista earthquake of 29 May 2013

IQR Station Map

The EDC provides earthquake-specific interactive station maps on which seismic stations are displayed with links to station information pages, plots of record waveforms, and data download pages. Recently, the capability has been added to the interactive station maps to show the list of all stations that are displayed on the map for the selected earthquake (Figure 4). The list is sorted alphabetically and helps the user find stations by name and then locate stations easily on the interactive map by clicking on the station entry on the list. The interactive maps for larger earthquakes also display a finite fault model when it becomes available.

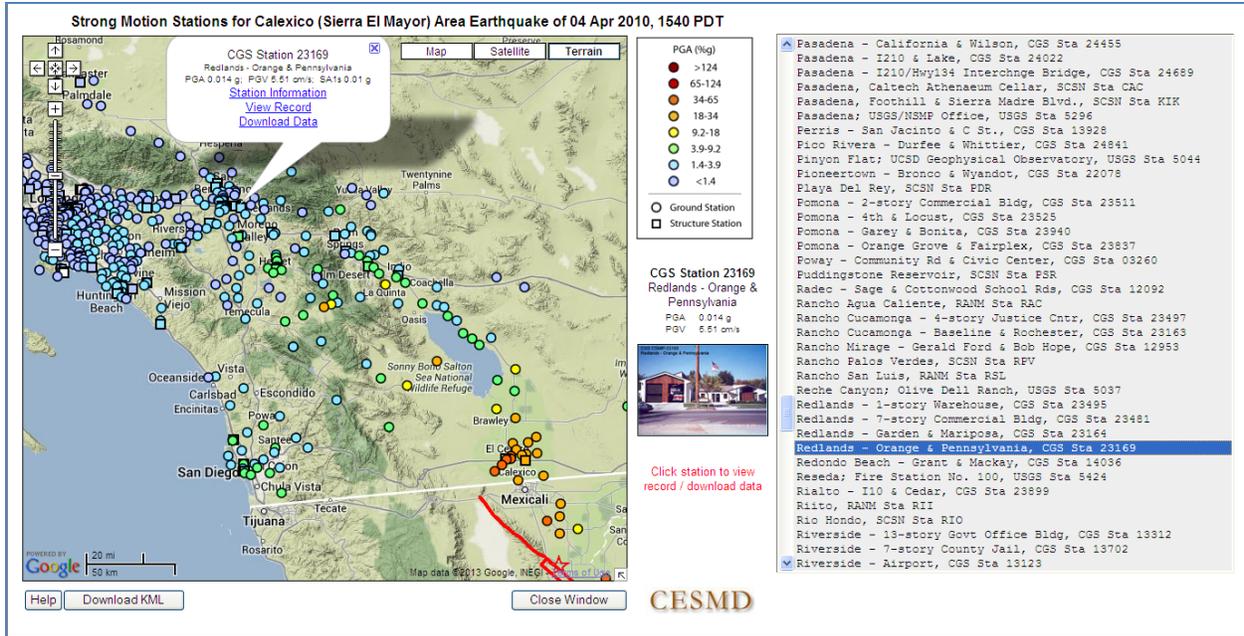


Figure 4. CESMD Interactive station map and list for the M7.2 Calexico (Sierra El Mayor) earthquake of 4 April 2010

Regional Stations Maps

Two interactive maps are served at CESMD to display all stations in Northern California and Southern California with links on the maps to the station information pages and all strong-motion data recorded at the stations. Because of the number of stations, it takes some time to download and display all stations. To reduce the delay, the stations have been divided into two groups. The Northern California Station Map shows all CISN strong-motion stations north of latitude 35°. This is complemented by the Southern California Station Map, which shows all stations south of latitude 36°. There is a one-degree overlap (35°N to 36°N latitude) in the maps. The user can switch back and forth between the maps by clicking on the “See...more stations” link provided. Also list of all stations that are shown on the maps are provided. Stations listed on the right side of the maps are sorted alphabetically. By clicking on a station’s name, the location of the station is shown on the map, with links to the station information page and to a table that shows all the strong motion records (if any) obtained at that station. Figure 5 shows the new features using the Northern California stations map as an example.

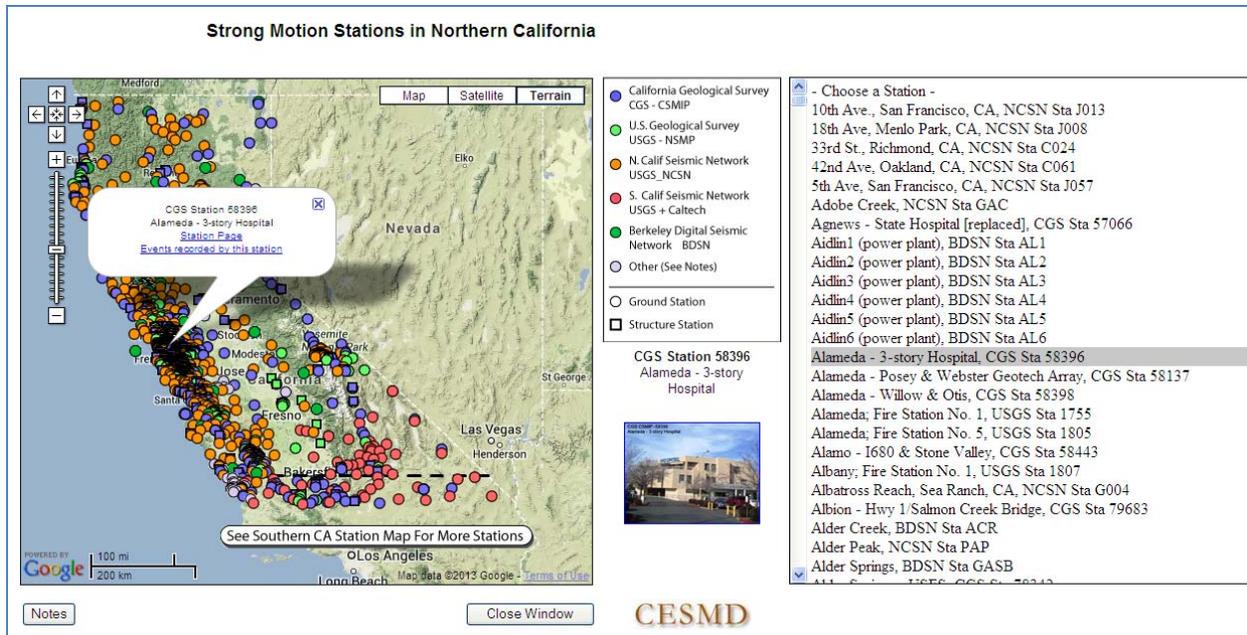


Figure 5. Regional stations map for Northern California that displays stations from different seismic networks in that region

Earthquake map

Similar to the interactive regional stations maps, the interactive earthquake map now provides a list of all earthquakes shown on the map in alphabetical order. Also, recently a new tool was added to the earthquake map to select, display and list all earthquakes within an area of interest by drawing a polygon on the map. Figure 6 shows the earthquake map with a polygon drawn to select earthquakes within the user-drawn area of interest. The result of the selection is shown in Figure 7 on the map as well as on the earthquake list.

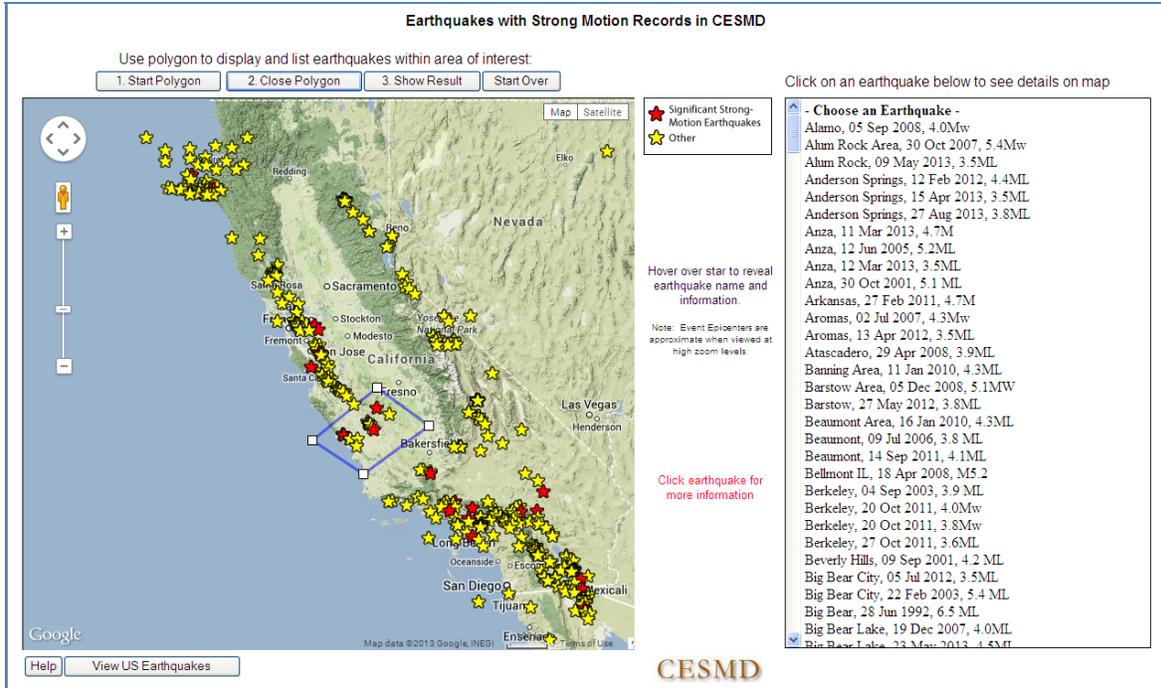


Figure 6. Selection of earthquakes on the earthquake interactive map using a polygon

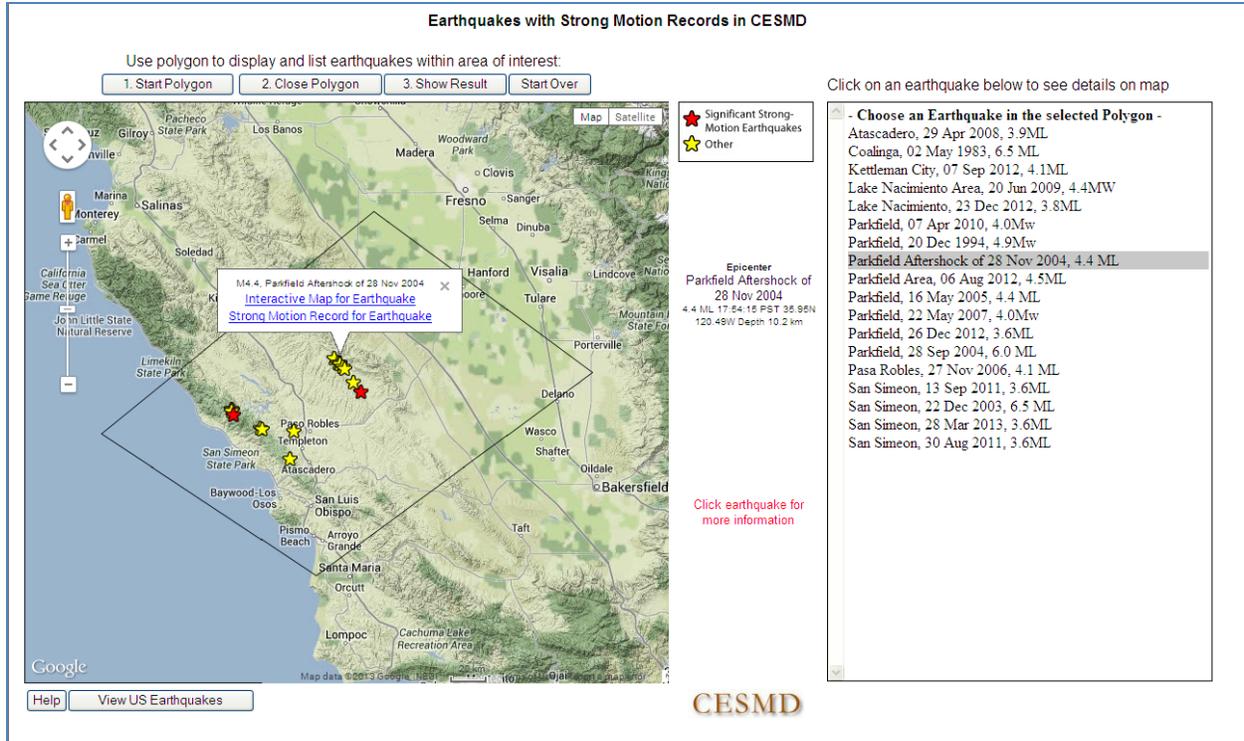


Figure 7. The results of using a polygon to display and list earthquakes in an area of interest

Virtual Data Center

Transfer and upgrade of operational and maintenance responsibilities for the COSMOS Virtual Data Center (VDC) from its original home at UC Santa Barbara to the CESMD have been completed. The VDC Tagged Format (VTF) was adopted as the standard at the CESMD for converting strong-motion data from each originating network's format to facilitate incorporating data into the VDC. The revised process of uploading metadata to the database and generating display images for groups of records automatically without detailed human interaction is a major improvement in the VDC operation. Figure 8 shows the new face of the VDC.

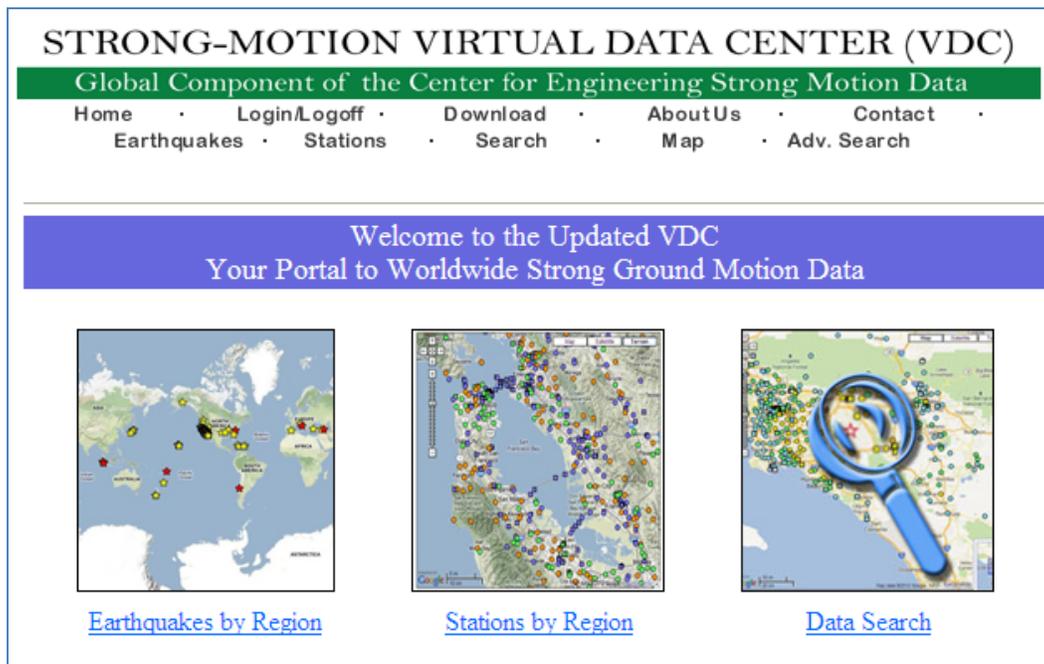


Figure 8. The new face of the CESMD Virtual Data Center

Data Available at CESMD

As of early October 2013, the EDC has posted over 9300 station records, each including three or more accelerogram component, from a total of about 310 earthquakes mostly in the United States. The VDC has posted parametric information and plots of time histories for over 11500 accelerogram component from about 700 national and international earthquakes, and has provided virtual access to the seismic networks data servers to to download records.

The CESMD benefits from ongoing cooperation with COSMOS, which assists in facilitating access to strong-motion data from other countries, and also provides advice on the development of user applications.

More information about the Center for Engineering Strong Motion Data (CESMD), its objective, operation and the web portal, can be found at the proceedings of the 15th World Conference on Earthquake Engineering held in September 2012 in Lisbon, Portugal ([Haddadi et al, 2012](#)).

Reference

Haddadi H., A. Shakal, M. Huang, J. Parrish, C. Stephens, W. Savage and W. Leith (2012).
Report on Progress at the Center for Engineering Strong Motion Data (CESMD),
Proceedings of the 15th World Conference on Earthquake Engineering, Lisbon, Portugal.