

# The Strong-Motion Virtual Data Center Fact Sheet 2012

Hosted and supported by the CESMD ([strongmotioncenter.org/vdc](http://strongmotioncenter.org/vdc))

Facilitated by the COSMOS ([www.cosmos-eq.org](http://www.cosmos-eq.org))



## About the VDC

The Strong-Motion **Virtual Data Center** (VDC) is an unrestricted web-based search engine for access to worldwide earthquake strong-motion data. It provides an interactive resource for research and practicing earthquake engineers, earth scientists, and government and emergency response professionals. The VDC is the only on-line strong-motion resource continuing to expand and significantly improve the accessibility and the use of worldwide strong-motion records.

Users have a wide range of access options; using the VDC, they may search for records with specific characteristics, view data in a geographical perspective, pre-view records, compare recorded data to design spectra, and retrieve the data and metadata of interest to them.

## VDC Assimilated by CESMD

Transfer of the operational and maintenance responsibilities of the Consortium of Organizations for Strong-Motion Observation Systems (COSMOS) Virtual Data Center (VDC) from the University of California, Santa Barbara, to the Center for Engineering Strong Motion Data (CESMD) is complete. The VDC Tagged Format (VTF) that was developed by Evans et al. in 2008 has been adopted by the CESMD as the standard to facilitate the process of uploading metadata (data about seismic stations, instruments, records, and sites) into the VDC database. The software utilities used to convert strong-motion data from the local network formats of CGS, USGS (NSMP), and New Zealand to XML format are in place, and work is in progress to develop converters for K-NET and KiK-net data from Japan and for the Italian Accelerometric Archive (ITACA) data from Italy.

*The World Bank's estimated economic cost of the 2011 M9.0 Tohoku earthquake was US\$235 billion, making it the most expensive natural disaster in world history.*

*Strong-motion time histories acquired by seismic networks are critical to earth scientists for understanding the physics of the earthquake process and to improve our ability to predict ground shaking from future earthquakes.*

*The role of VDC is to provide access to the significant strong-motion data recorded anywhere in the world.*



*An aerial view of damage of the M9.0 Tohoku earthquake of 11 March 2011 in Sendai area (photo courtesy of Wikipedia)*

The VDC database has been updated by CESMD to include strong-motion records for all  $M \geq 5.0$  events that have occurred in the U.S. and New Zealand, and provides access to view, search, and download these records through the VDC website at:

[www.strongmotioncenter.org/vdc](http://www.strongmotioncenter.org/vdc)

## VDC Database Updated

The VDC database is now updated with the records of 23 U.S. earthquakes and 22 New Zealand earthquakes that have occurred from 2007 to 2012. Recent data sets from these sources include the Mw7.0 Christchurch earthquake of 3 September 2010, and the Mw6.3 Darfield earthquake of 21 February 2011 in New Zealand; the Mw7.2 Sierra El Mayor earthquake of 4 April 2010 in Mexico (close to the U.S. border); and the Mw5.8 Mineral earthquake of 23 August 2011 in Virginia, U.S.

## Search for Data at the VDC

The new VDC under CESMD preserves much of the look and feel of the COSMOS VDC. Important features include:

The [Map Interface](#) displays earthquakes and stations on a world map that users may reconfigure by entering latitude and longitude ranges, by zooming in and clicking on a station or earthquake symbol to transfer to station or earthquake pages, or by highlighting the stations reporting a selected earthquake. The [Earthquakes Page](#) lists earthquake name, magnitude, number of stations, and data provider for all earthquakes available through the VDC by region, with a drop-down list of regions at the top of the page for quicker navigation.

The [Stations Page](#) lists owner and station name for all stations available through the VDC by region, and also has a drop-down list of regions at the top of the page.

The [Basic Search Page](#) allows the user to enter the most common parameters. The user may also tailor the output to reflect station information only, earthquake information only, or all data for the search result.

The [Advanced Search Page](#) allows the user to query and recover almost every field in the database. The user may select an html table or a station page as the output of the advanced search, or download the metadata as an rtf file.

## Increase in Data Available via the VDC

	Sept 2001	July 2012	Increase
Earthquakes	199	663	233%
Stations	1744	4421	153%
Accelerograms	11,537	47,212	309%

## Previewing Data

Each html search result page has the following links: to a new map showing the results of the search, to each station and earthquake represented, to acceleration plots for each station, and to both logarithmic and linear plots of acceleration response spectra (for the networks that provide response spectra). The user may configure the units in which the spectra are displayed, scale the spectra, and enter parameters to define the shape of overlays of design spectra that correspond to several building code standards.

## Downloading Data

There are three ways to download data:

- on many Earthquake Pages, there is a link to a zipped archive of files for that event, allowing the user to download all data for the selected earthquake.
- on the Download Page, users may select individual files for downloading.
- on the Download Page, users select files and receive them as a set of zipped files containing up to 30 data files each, together with a log of files included.

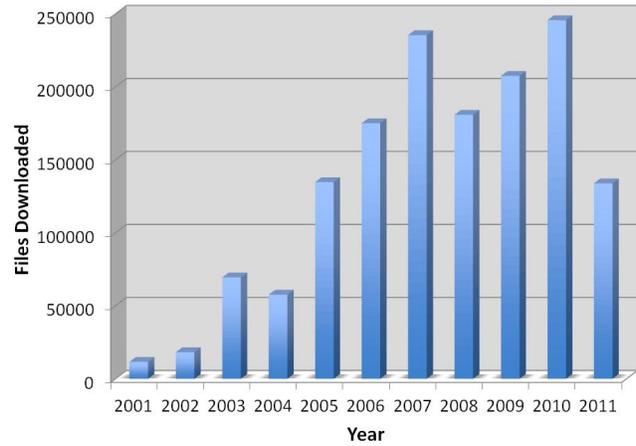
The VDC is virtual in that the accelerograms reside with the source agencies. At the time a user issues a

download request, the selected data files are pulled in real time from the servers at the agencies that have collected and archived the data. Thus, users will always receive the most recent and authenticated version of the data.

When you use strong-motion data via the VDC in your publications, please acknowledge both the data owners and the VDC.

## In Development

- A converter from Japanese K-NET and KiK-net data formats to VDC



*The number of files downloaded has grown from a few hundred per month in 2001 to peak of almost ¼ million in 2010.*

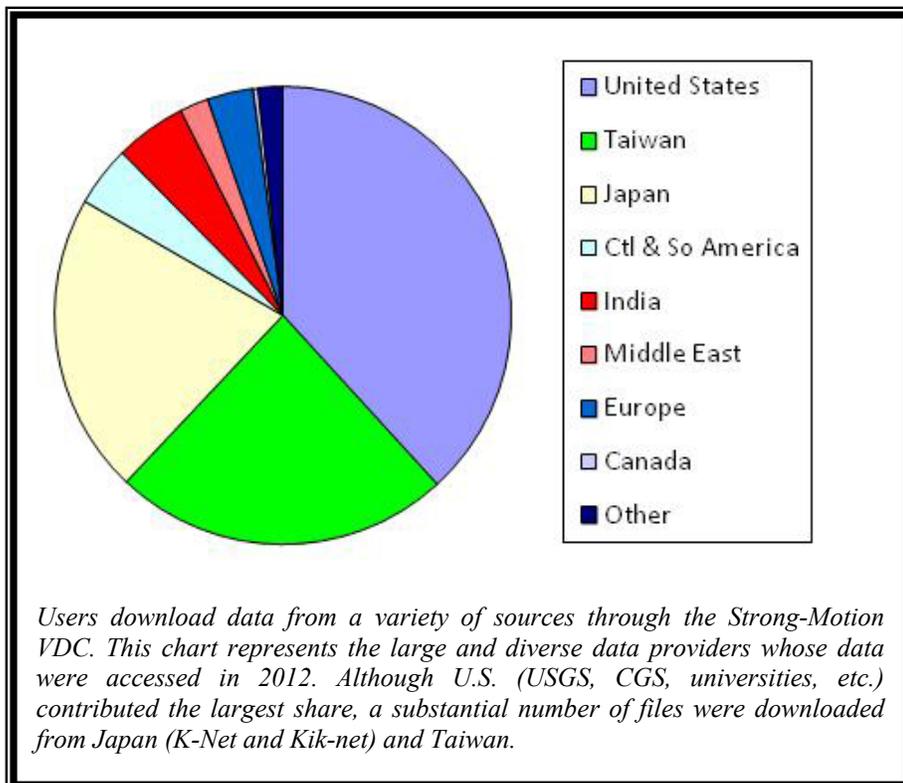
XML format in order to extract metadata to upload to the VDC database.

- In collaboration with colleagues at the ITACA, a protocol for the VDC to receive the ITACA data in COSMOS V1.2 format (COSMOS publication 2001), which will then be converted to VDC XML format for loading the metadata into the VDC database.
- Collaboration with other international strong motion networks to facilitate developing converters from local network formats to the VDC XML in order to include significant strong-motion data.

## COSMOS the Facilitator

The COSMOS serves as a liaison in facilitating data access from international strong-motion networks. As an advocate promoting the use of strong-motion data, COSMOS provides input and advice on developing tools and software applications. The COSMOS Strong-Motion Forum at the 15th World Conference of Earthquake Engineering is an excellent opportunity for representatives of strong-motion networks worldwide to discuss how to broaden cooperation and data exchange among the networks.

*The VDC provides a one-stop shopping approach for finding strong-motion data collected anywhere in the world. Please send comments to: [cesmd@strongmotioncenter.org](mailto:cesmd@strongmotioncenter.org)*



*Users download data from a variety of sources through the Strong-Motion VDC. This chart represents the large and diverse data providers whose data were accessed in 2012. Although U.S. (USGS, CGS, universities, etc.) contributed the largest share, a substantial number of files were downloaded from Japan (K-Net and Kik-net) and Taiwan.*