Update on the Center for Engineering Strong Motion Data (CESMD) :

US Structure and Ground Motion Data

Virtual Data Center (VDC)

By

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Center for Engineering Strong Motion Data
CESMD - A Cooperative Effort

CESMD Objectives and Operation

- Established in 2006 by US Geological Survey and California Geological Survey
- Collect and disseminate records of ground and structural responses to earthquake strong motions of engineering interest
- Post Internet Quick Reports (IQR) within minutes for rapid response to earthquakes
- Provide information about station, site, geology, etc.
- Provide virtual access to US and international strong-motion records through the Virtual Data Center (VDC)

Two components of CESMD

NSMP stations, September 2012

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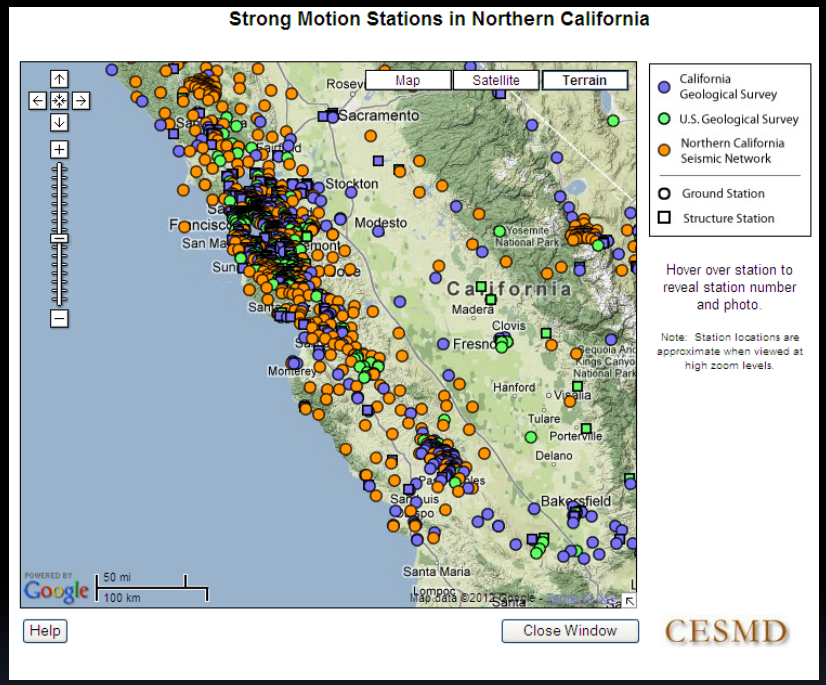
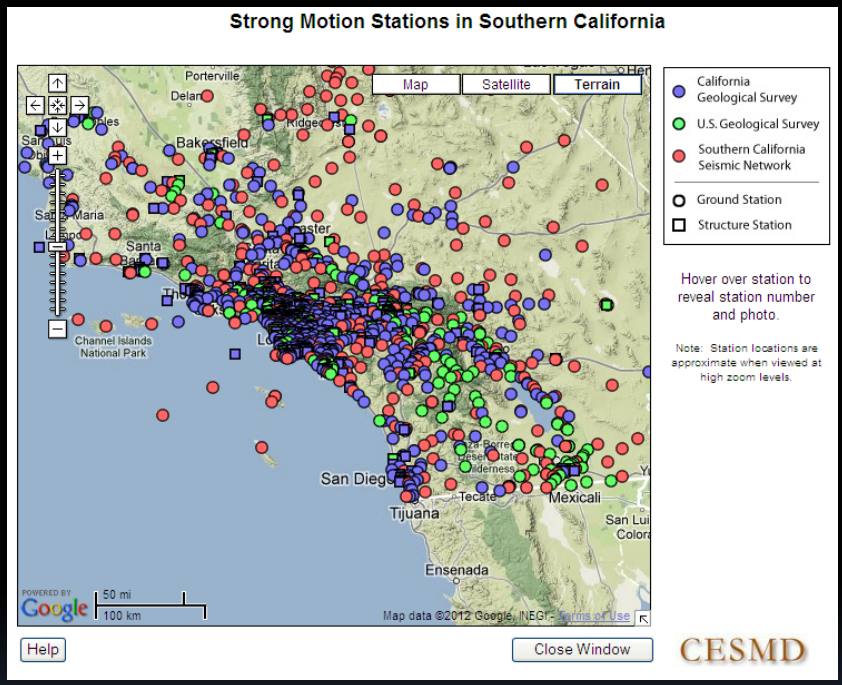
CSMIP NETWORK STATIONS
STATION TYPE
Building
Bridge or Dam
Ground
FAULTS
Historic
Holocene
Late Quaternary
Zip code boundary
Alquist-Priolo zone
Major road
County boundary
Stream
CGS
CALIFORNIA GEOLOGICAL SURVEY

All CISN Stations





U.S. Stations in CESMD

	Ground motion reference sites	Structures and geotechnical arrays
USGS and 13 partner agencies	490	150
CGS	805	380
CISN (non-USGS/CGS)	620	-

CESMD Internet Quick Report (IQR) for US Data

- In California, records are available automatically within minutes after M>=3.5 earthquakes
- Plans to extend IQR to all of US

Home | Archive | Search | Station Maps | More Info

CESMD *Internet Data Report*

USGS science for a changing world — ANSS — CGS California Geological Survey

Berkeley Earthquake of 20 Oct 2011
4.0Mw, 14:41:04 PM PDT, 37.86N 122.25W Depth 9.8 km

CISN Region of ANSS

Earthquake Info | Interactive Map | ShakeMap

Download Table

Last Update: 2011-11-17 16:32:24

Station	Code /ID	Network	Distance (km) Epic.	Distance (km) Fault	Horiz Apk (g) Ground	Horiz Apk (g) Struct.	View	Download
Swainland Rd., Oakland, CA	C004	NCSN	3.4	--	0.248	--	○	☐
Orinda - Valley View & Moraga	58211	CGS	7.9	--	0.240	--	○	☐
Eucalyptus Rd., Berkeley, CA	C028	NCSN	0.8	--	0.198	--	○	☐
Oakland - Hwys 13 & 24	58295	CGS	2.5	--	0.154	--	○	☐
Orinda - BART Station Grounds	58209	CGS	5.9	--	0.114	--	○	☐
McGee Ave., Berkeley, CA	C031	NCSN	2.3	--	0.114	--	○	☐
Oakland - 14th & Market	58463	CGS	6.6	--	0.108	--	○	☐
Piedmont - Jr. High School Grounds A	58790	CGS	4.9	--	0.094	--	○	☐
Oakland - 11-story Residential Bldg	58337	CGS	5.8	--	0.083	0.108	○	☐
Orinda - Via Las Cruces & Honey Hill	58362	CGS	7.9	--	0.076	--	○	☐
Glashaus Loop, Emeryville, CA	C033	NCSN	3.3	--	0.069	--	○	☐
Lafayette - Hwy 24 & U. Happy Valley	58361	CGS	9.2	--	0.069	--	○	☐
Piedmont - 3-story School Office Bldg	58334	CGS	4.0	--	0.068	0.206	○	☐
Oakland - 2-story Office Bldg	58224	CGS	5.8	--	0.057	0.114	○	☐
Oakland Firesta 12	1821	USGS	6.5	--	0.057	--	○	☐

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USGS — CGS — ANSS

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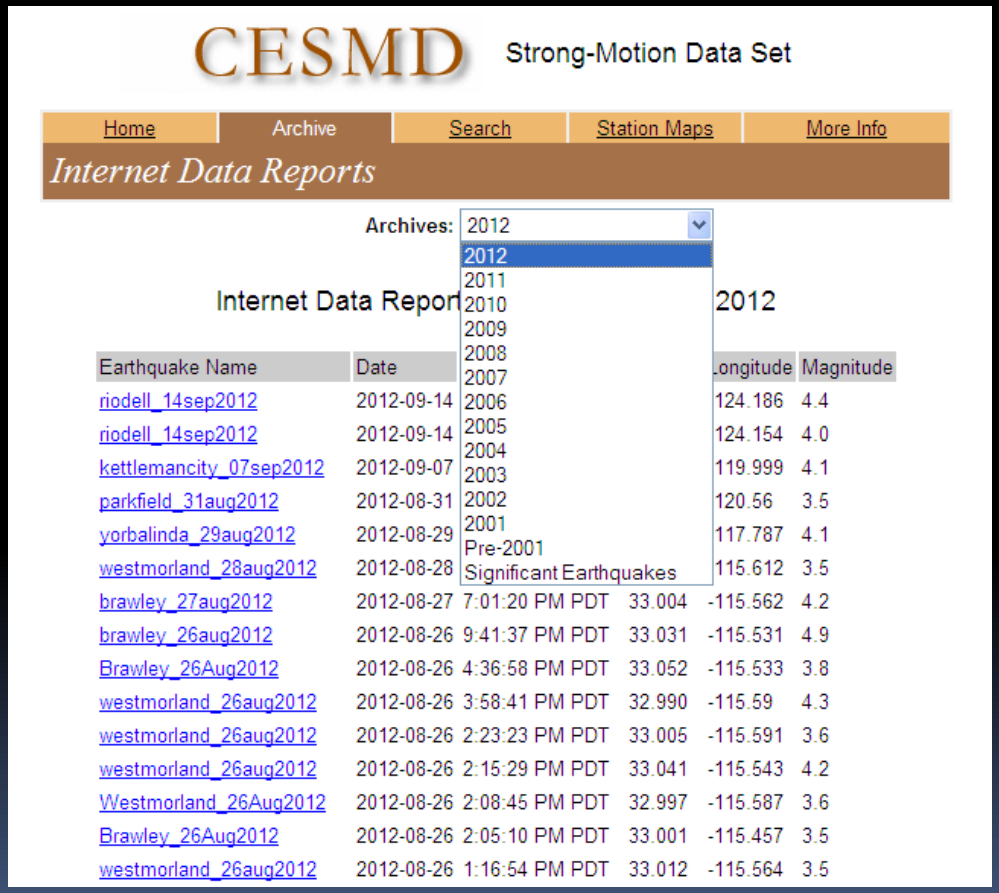
CESMD archive primarily of US earthquakes

- Quality-controlled raw and processed records for US earthquakes at CESMD archive
- Data were included for some global earthquakes that occurred before VDC was integrated into CESMD



Earthquake Name	Date				Longitude	Magnitude
riodell_14sep2012	2012-09-14				124.186	4.4
riodell_14sep2012	2012-09-14				124.154	4.0
kettlemancity_07sep2012	2012-09-07				119.999	4.1
parkfield_31aug2012	2012-08-31				120.56	3.5
yorbalinda_29aug2012	2012-08-29				117.787	4.1
westmorland_28aug2012	2012-08-28				115.612	3.5
brawley_27aug2012	2012-08-27	7:01:20 PM PDT	33.004	-115.562		4.2
brawley_26aug2012	2012-08-26	9:41:37 PM PDT	33.031	-115.531		4.9
Brawley_26Aug2012	2012-08-26	4:36:58 PM PDT	33.052	-115.533		3.8
westmorland_26aug2012	2012-08-26	3:58:41 PM PDT	32.990	-115.59		4.3
westmorland_26aug2012	2012-08-26	2:23:23 PM PDT	33.005	-115.591		3.6
westmorland_26aug2012	2012-08-26	2:15:29 PM PDT	33.041	-115.543		4.2
Westmorland_26Aug2012	2012-08-26	2:08:45 PM PDT	32.997	-115.587		3.6
Brawley_26Aug2012	2012-08-26	2:05:10 PM PDT	33.001	-115.457		3.5
westmorland_26aug2012	2012-08-26	1:16:54 PM PDT	33.012	-115.564		3.5

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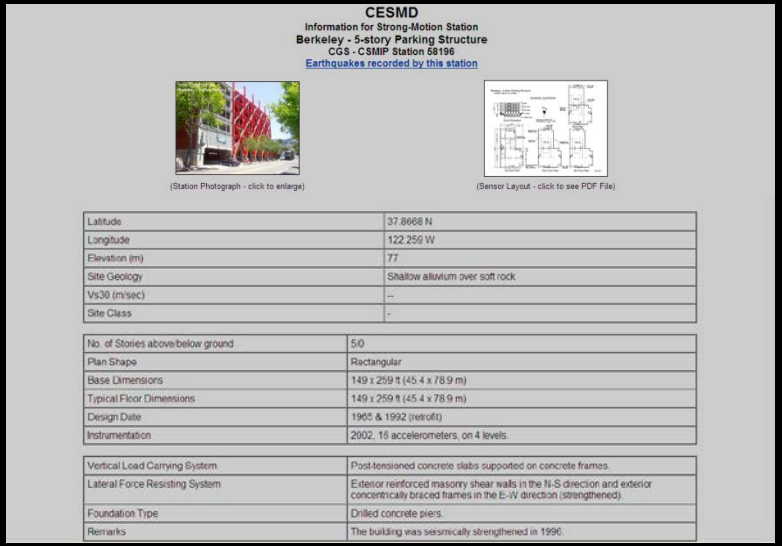
Metadata at CESMD

- Data about stations, sites
  Vs30, Geology, Photo


CESMD
Information for Strong-Motion Station
Berkeley - 5-story Parking Structure
CGS - CSMIP Station 58196
Earthquakes recorded by this station

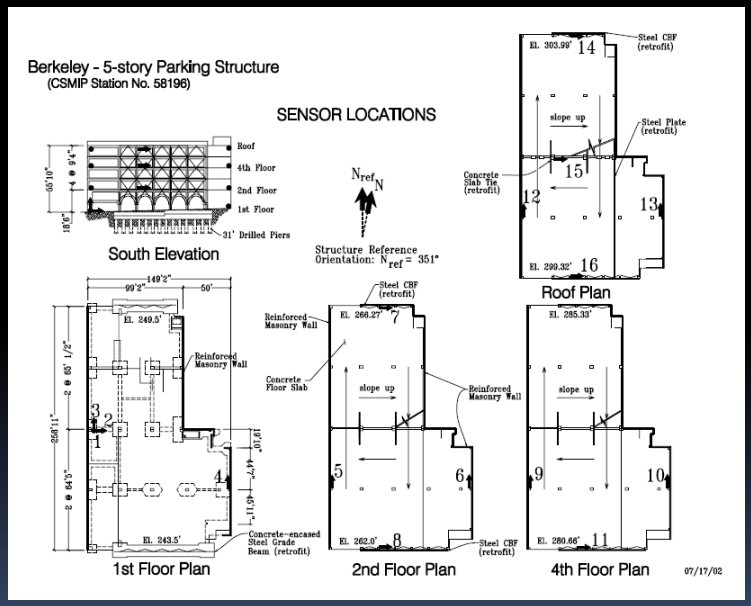
(Station Photograph - click to enlarge)

(Sensor Layout - click to see PDF File)

Latitude	37.8668 N
Longitude	122.259 W
Elevation (m)	77
Site Geology	Shallow alluvium over soft rock
Vs30 (m/sec)	--
Site Class	-

No. of Stories above/below ground	5/0
Plan Shape	Rectangular
Base Dimensions	149 x 259 ft (45.4 x 78.9 m)
Typical Floor Dimensions	149 x 259 ft (45.4 x 78.9 m)
Design Date	1965 & 1992 (retrofit)
Instrumentation	2002, 16 accelerometers, on 4 levels.

Vertical Load Carrying System	Post-tensioned concrete slabs supported on concrete frames.
Lateral Force Resisting System	Exterior reinforced masonry shear walls in the N-S direction and exterior concentrically braced frames in the E-W direction (strengthened).
Foundation Type	Drilled concrete piers.
Remarks	The building was seismically strengthened in 1990.



- Sensor Layout for instrumented buildings, bridges, dams, etc.

Small records served via FTP

- Small records (M<3.5, PGA<0.005g) at FTP

FTP directory /Small_Record_and_Earthquakes

Up to higher level directory

08/09/2011 06:29PM	Directory	19980812_0710_M5.4
08/09/2011 06:21PM	Directory	20010113_1826_M4.3
08/09/2011 06:32PM	Directory	20010413_0450_M3.5
08/09/2011 07:01PM	Directory	20010523_1210_M3.8
08/09/2011 06:18PM	Directory	20010909_1659_M4.2
08/09/2011 06:12PM	Directory	20011214_0401_M4.0
08/09/2011 06:18PM	Directory	20020128_2153_M4.2
08/09/2011 06:22PM	Directory	20030107_1429_M4.3
08/09/2011 06:19PM	Directory	20030202_1022_M4.2
08/09/2011 07:01PM	Directory	20030525_0709_M4.8
08/09/2011 06:13PM	Directory	20030729_2150_M4.0
08/09/2011 06:13PM	Directory	20030730_0450_M4.0
08/09/2011 07:01PM	Directory	20030826_2302_M3.8
08/09/2011 07:06PM	Directory	20030904_1839_M3.9
08/09/2011 06:35PM	Directory	20031007_1035_M3.6
08/09/2011 06:52PM	Directory	20031029_1544_M3.7
08/09/2011 06:22PM	Directory	20040316_0638_M4.3
08/09/2011 06:11PM	Directory	20040509_0857_M4.2
08/09/2011 06:29PM	Directory	20041129_0054_M4.4
08/09/2011 06:20PM	Directory	20050106_1435_M4.2
08/09/2011 06:13PM	Directory	20050112_0810_M4.0
08/09/2011 06:14PM	Directory	20050416_1218_M5.1
08/09/2011 06:52PM	Directory	20050516_0024_M4.7
08/09/2011 06:27PM	Directory	20050616_1353_M5.3
08/09/2011 06:20PM	Directory	20050626_1146_M5.2
08/09/2011 06:29PM	Directory	20060615_1224_M4.4
08/09/2011 07:03PM	Directory	20060709_1954_M3.8
08/09/2011 06:30PM	Directory	20060803_0308_M4.4
08/09/2011 06:52PM	Directory	20061129_2120_M3.7
08/09/2011 06:53PM	Directory	20061220_1912_M3.7

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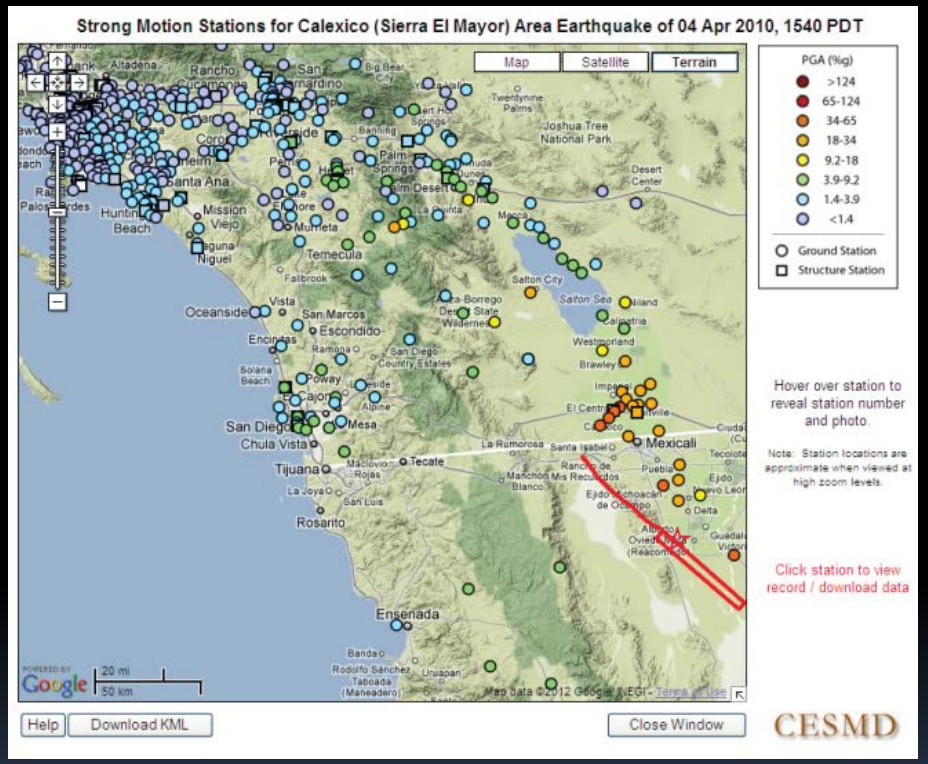
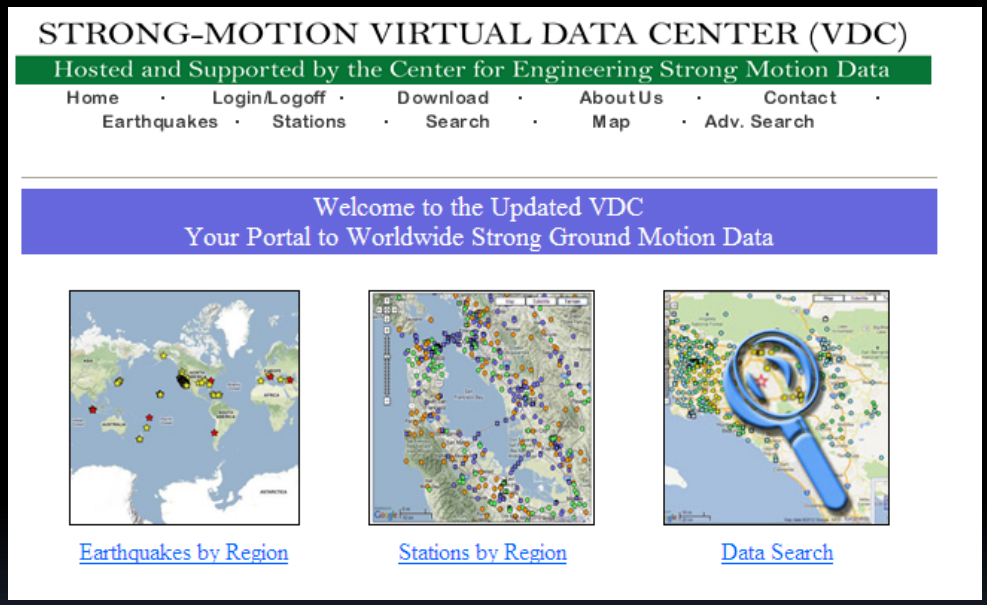
Tools at CESMD

- Interactive maps facilitate data search and download
- Basic and advanced searches on earthquakes, stations, record parameters
- Visualization: acceleration/response spectra
- Development of new data selection and manipulation tools in concert with COSMOS



New face of the Strong-Motion Virtual Data Center (VDC)

- VDC is incorporated into CESMD
- Metadata upload process is improved
- VDC is updated with the M≥5.0 US and New Zealand records since 2007



New Strong-Motion Data at VDC

Data from 23 US and 21 New Zealand earthquakes have been added.

New Zealand

Earthquake	Date	Magnitude	Type	Stations
West of South Island New Zealand	2012-01-19 06:48:48 UTC	5.9	Mw	15
South Island of New Zealand (2)	2011-12-23 02:18:03 UTC	5.9	Mw	124
South Island of New Zealand	2011-12-23 00:58:38 UTC	5.8	Mw	107
South of the Kermadec Islands	2011-12-21 13:37:14 UTC	5.5	Mw	6
East of North Island, New Zealand (2)	2011-11-18 07:51:27 UTC	6.0	Mw	2
East of North Island, New Zealand	2011-11-18 04:34:03 UTC	5.6	Mw	6
Kermadec Islands New Zealand	2011-07-06 19:03:16 UTC	7.6	Mw	16
South Island, New Zealand	2011-06-13 02:20:49 UTC	5.9	Mw	119
South of the Kermadec Islands	2011-04-18 13:03:03 UTC	6.6	Mw	17
South Island New Zealand	2011-02-22 01:50:29 UTC	5.6	Mw	32
South Island, New Zealand	2011-02-22 00:04:19 UTC	5.5	Mw	76
Christchurch	2011-02-21 23:51:42 UTC	6.1	Mw	51
North Island New Zealand	2011-01-13 12:04:56 UTC	5.5	Mw	8
South Island of New Zealand	2010-09-03 16:52:55 UTC	5.1	ML	1
South Island of New Zealand	2010-09-03 16:35:46 UTC	7.0	Mw	155
Auckland Islands, New Zealand Region	2010-01-06 01:48:46 UTC	5.7	Mw	5

Projects in Progress

- Complete software to convert Japan K-NET and KiK-net data for uploading record metadata to the VDC and accommodate recent changes in data organization at NIED
- Collaborate with ITACA (Italy) to finalize conversion of ITACA records to COSMOS format
- Interact with other strong-motion networks internationally to develop protocols for serving their data through the VDC
- Partner with COSMOS to develop new tools for VDC

Summary

- Serves quality-controlled strong-motion data of engineering interest from the US and other seismically active countries
- Automatically processes and posts strong-motion data from networks in California to aid in rapid response to earthquakes
- Has incorporated the COSMOS Virtual Data Center (VDC) and added US and New Zealand data for M ≥ 5 since 2007
- Currently updating VDC to include ITACA and Japan K-NET and KiK-net data; other networks?

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Some challenges of virtual data access (for discussion session)

- Data format for exchange
- Awareness of datasets
- Proper acknowledgement
- Stable data organization within networks
- Not all data are virtual (data hosting for small networks?)
- Added records / Updates to metadata