

The Hokkaido Earthquake: a (very) preliminary analysis revision 1

September 06, 2018, 03:08 JST

Woody Epstein, ARS

Where it happened

F-E Region: Hokkaido, Japan Region

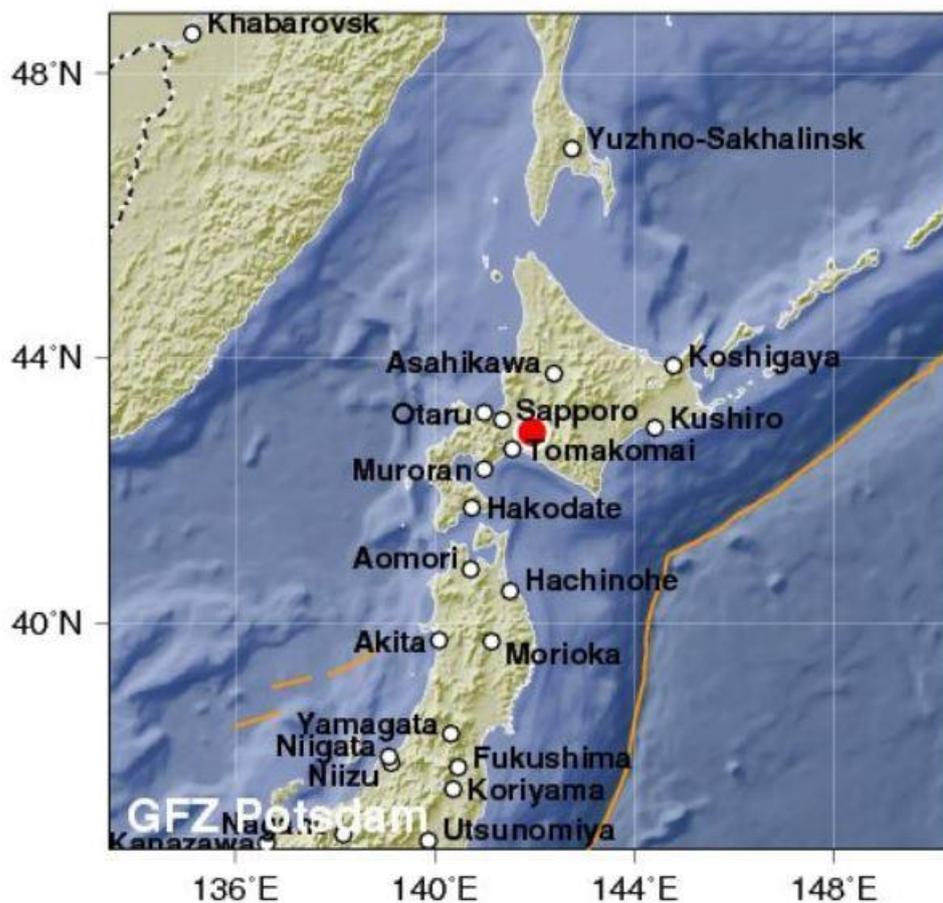
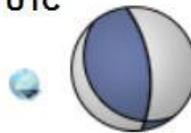
Time: 2018-09-05 18:08:04.3 UTC

Magnitude: 6.6 (Mw)

Epicenter: 141.95°E 42.90°N

Depth: 27 km

Status: **M** - manually revised





Map of Hokkaido indicating JMA Intensities (Shindo)

A First report from Reuters

Japanese homes engulfed in landslide after powerful quake hits Hokkaido

TOKYO (Reuters) - A powerful earthquake of magnitude 6.7 on Japan's northern island of Hokkaido caused a landslide that engulfed houses early on Thursday, injuring and trapping a number of people and cutting power in several areas.

A landslide along a long ridge in the rural town of Atsumi could be seen in aerial footage from public broadcaster NHK. Some 10 people had been taken to hospital with injuries, one of them serious, it said.

There were widespread power outages and blocked roads, NHK said, but no early reports of deaths. A man suffered cardiac arrest after falling down the stairs, local media reported.

The quake, which struck at 3:08 a.m. (1808 GMT on Wednesday) posed no tsunami risk, the Japan Meteorological Agency (JMA) said. The U.S. Geological Survey said it struck some 68 km (42 miles) southeast of Sapporo, Hokkaido's main city.

Prime Minister Shinzo Abe, arriving at his office before 6 a.m., told reporters his government had set up a command center to coordinate relief and rescue. His voice sounding haggard, Abe said saving lives was his government's top priority.

The Tomari Nuclear Power Station suffered a power outage but was cooling its fuel rods safely with emergency power, said Chief Cabinet Secretary Yoshihide Suga. Operator Hokkaido Electric Power Co (9509.T) reported no radiation irregularities at the plant, which has been shut since shortly after a massive 2011 earthquake, Suga told a news conference.

A fire broke out at a Mitsubishi Steel Mfg Co (5632.T) plant in the city of Muroran but has largely been brought under control, NHK said, quoting local officials.

A row of houses could be seen slanting at odd angles, leaning against one another in one town, while roof tiles and water covered floors at New Chitose Airport. Many schools were closed, and some 2.95 million homes were without power, NHK said.

A series of smaller shocks, including one with a magnitude of 5.4, followed the initial temblor, the Meteorological Agency said. Agency official Toshiyuki Matsumori, at a early morning news conference, warned residents to take precautions for potential major aftershocks in coming days.

Shinkansen bullet trains were halted in some areas of Hokkaido, NHK said.

NHK Footage showed a crumbled brick wall and broken glass in a home, and quoted local police as saying some people were trapped in collapsed structures.

Soldiers were shown looking for damage on a rural road that was blocked by fallen trees.

Japan, situated on the "Ring of Fire" arc of volcanoes and oceanic trenches that partly encircles the Pacific Basin, accounts for about 20 percent of the world's earthquakes of magnitude 6 or greater.

On March 11, 2011, a 9.0 magnitude earthquake, the most powerful ever recorded in Japan, struck under the ocean off the coast of the northern city of Sendai. The quake set off a series of massive tsunami that devastated a wide swathe of the Pacific coastline and killed nearly 20,000.

The tsunami also damaged the Fukushima Daiichi Nuclear Power Plant, leading to a series of explosions and meltdowns in the world's worst nuclear disaster for 25 years.

Saturday marked the 95th anniversary of the Great Kanto earthquake, which had a magnitude of 7.9 and killed more than 140,000 people in the Tokyo area. Seismologists have said another such quake could strike the city at any time.

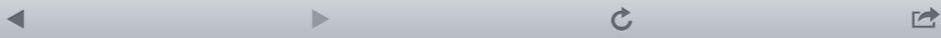


記事に戻る

[6/21]



周辺の山一帯が土砂崩れを起こし、山肌が露出していた＝2018年9月6日午前7時21分、北海道厚真町、朝日新聞社機から、山本壮一郎撮影



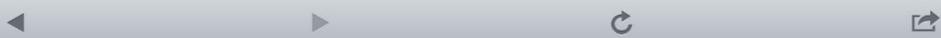
記事に戻る

[9/21]



陥没した車道＝2018年9月6日午前7時17分、北海道厚真町、朝日新聞社機から、山本壮一郎撮影

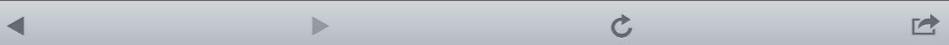
無断転載・複製を禁じます



amazon 欲しいものが きっと見つかります

記事に戻る

[13 / 21]



全米オープンテニス スマホでも 9/10[月]決勝まで独占生中継! W.O.W.O.W

記事に戻る

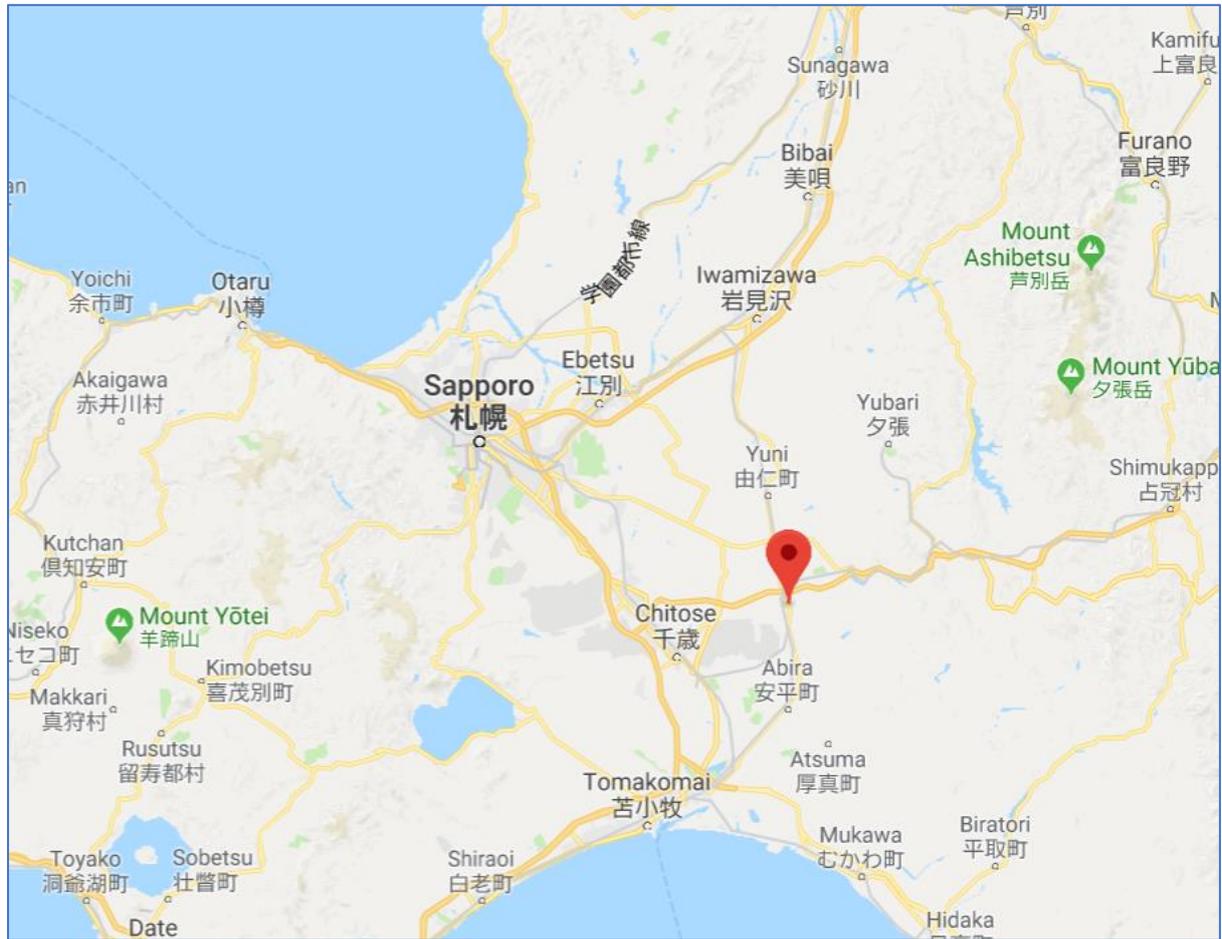
[1 / 21]



地震で山肌が崩れ住宅が土砂に巻き込まれていた＝2018年9月6日午前7時18分、北海道厚真町、朝日新聞社機から、山本壮一郎撮影



Strong Motion Analysis



The city of Oiwake, where the highest ground motion was recorded. Near Chitose airport which was closed because the roof fell.

Strong Motion Database

File Import Strong Motion Data Strong Motion Reports QBF Help

Record ID: HKD1271809060308

Facility name: HKD127

Description: KNET record from Oiwake

Facility Type

- NPP
- Industrial
- Strong Motion Station
- Sub Station

Location: Oiwake [View Location Map](#)

Event Name: HOKKAIDO_090618

Event Date (UTC): 09/05/18

UD Step 151/151: Hz= 1.00E+02 g= 1.07E+00

Import Successful

Event Duration (sec): 284

Elevation (m): 63

Number of Data Points: 28400

Time Step (sec): 0.01

Units: cm/s/s

Calculation and Viewing Tools

Calculate CAV/PGA

CAV Threshold: 0.025 g

Calculate Spectra

Spectral Max Frequency: 100

Frequency Increments: 0.02

Damping: 5 %

Calculate JMA DIPs

Calculate Arias

View Acceleration Data

View Arias Data

View Spectral Data

[Double Click to View Source Data](#)

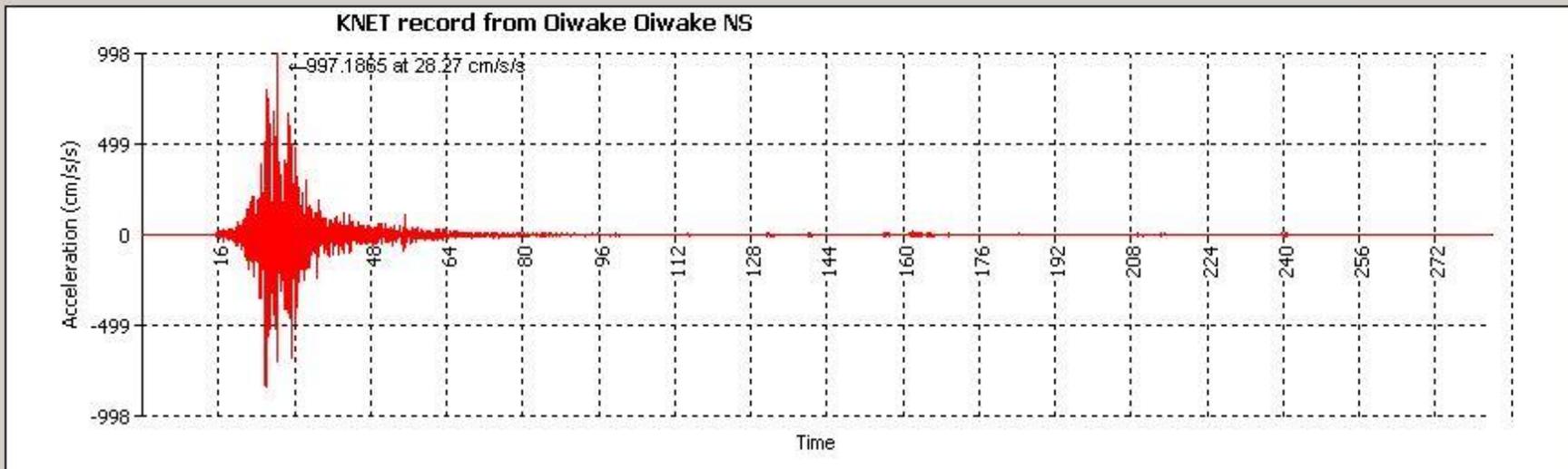
Average Acceleration Response Spectra

JMA Instrument Intensity: 6.40

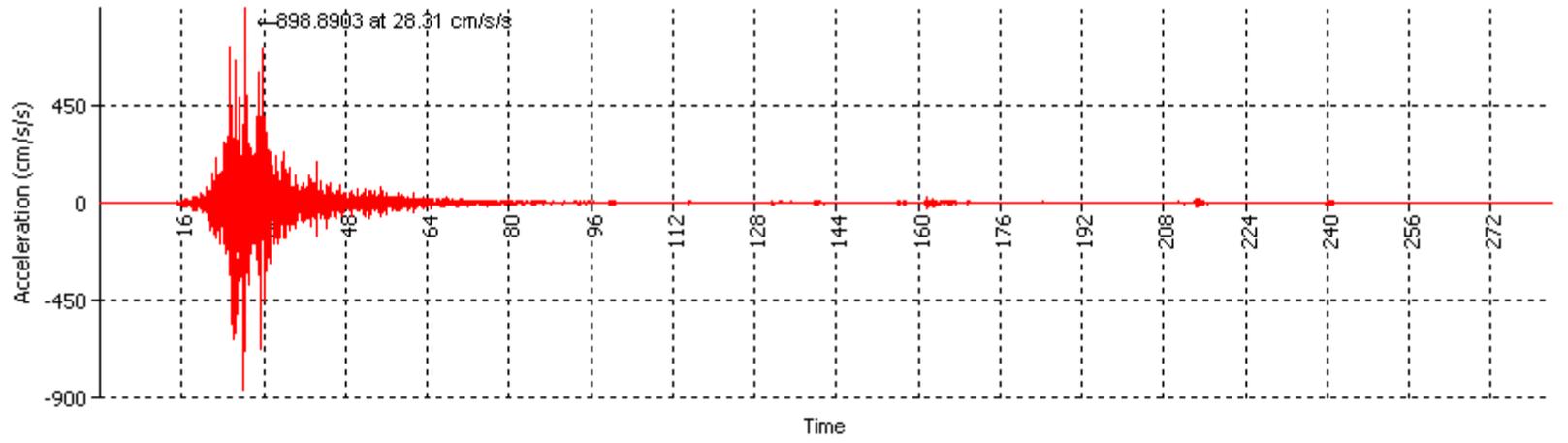
	Direction	PGA g	Max SA	CAV	Arias	ZPA g	2 to 10 Hz	10 to 20 Hz	20 to 33 Hz
1	North/South	1.0165	3.5727	3.3985	15.4889	1.0148	2.7704	1.2512	1.0939
2	East/West	0.9163	3.7217	3.2492	13.0401	0.9148	2.7140	1.7016	1.2414
3	Up/Down	1.6116	4.7343	1.7059	7.4832	1.6059	2.4512	3.0857	1.9911

JMA Effective PGA: 536.07 gal

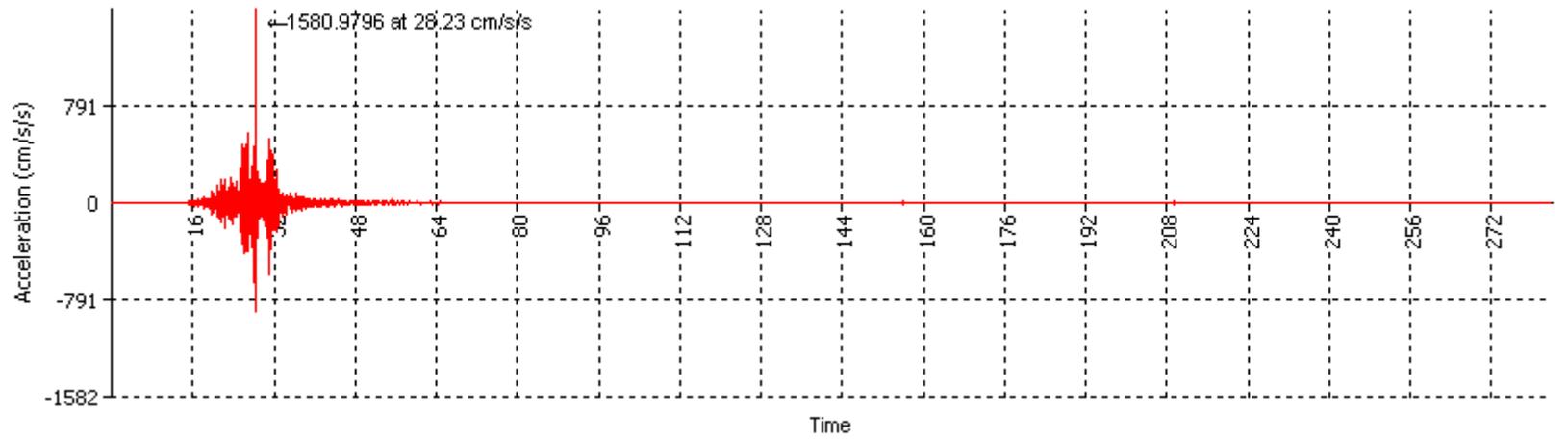
CAV SRSS: 5.0017



KNET record from Oiwake Oiwake EW



KNET record from Oiwake Oiwake UD



Record ID:

Facility name:

UD Step 151/151: Hz= 1.00E+02 g= 1.07E+00

Description:

Facility Type

- NPP
- Industrial
- Strong Motion Station
- Sub Station

Location:

Event Name:

Event Date (UTC):

Import Successful

Event Duration (sec):

Calculation and Viewing Tools

CAV Threshold: g

Spectral Max Frequency:

Frequency Increments:

Damping: %

Elevation (m):

Number of Data Points:

Time Step (sec):

Units:

[Double Click to View Source Data](#)

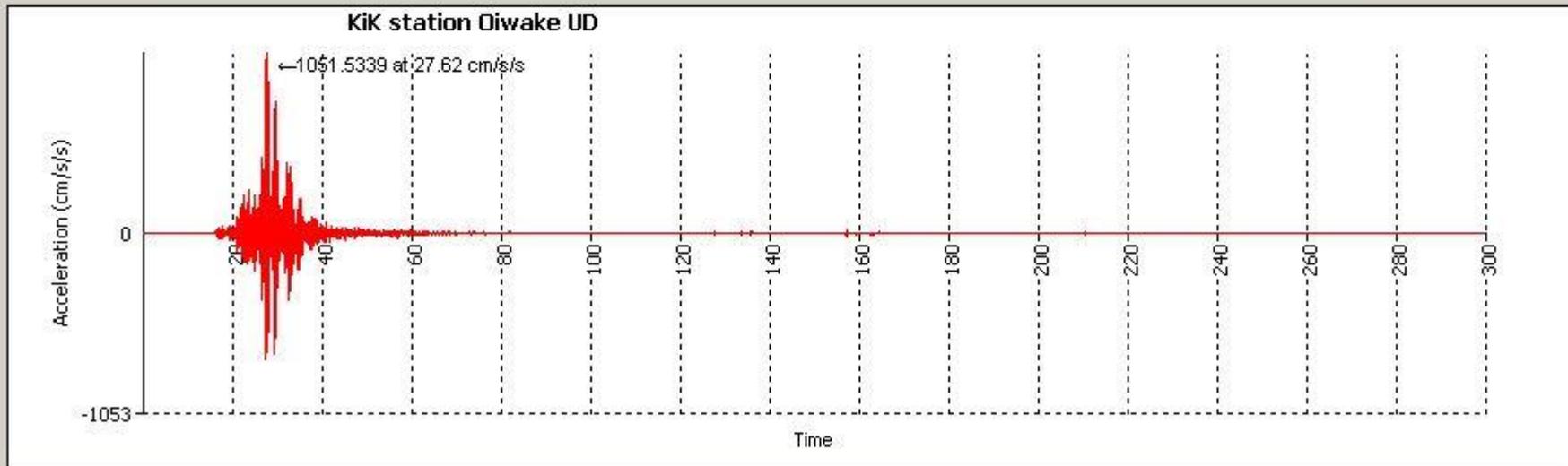
Average Acceleration Response Spectra

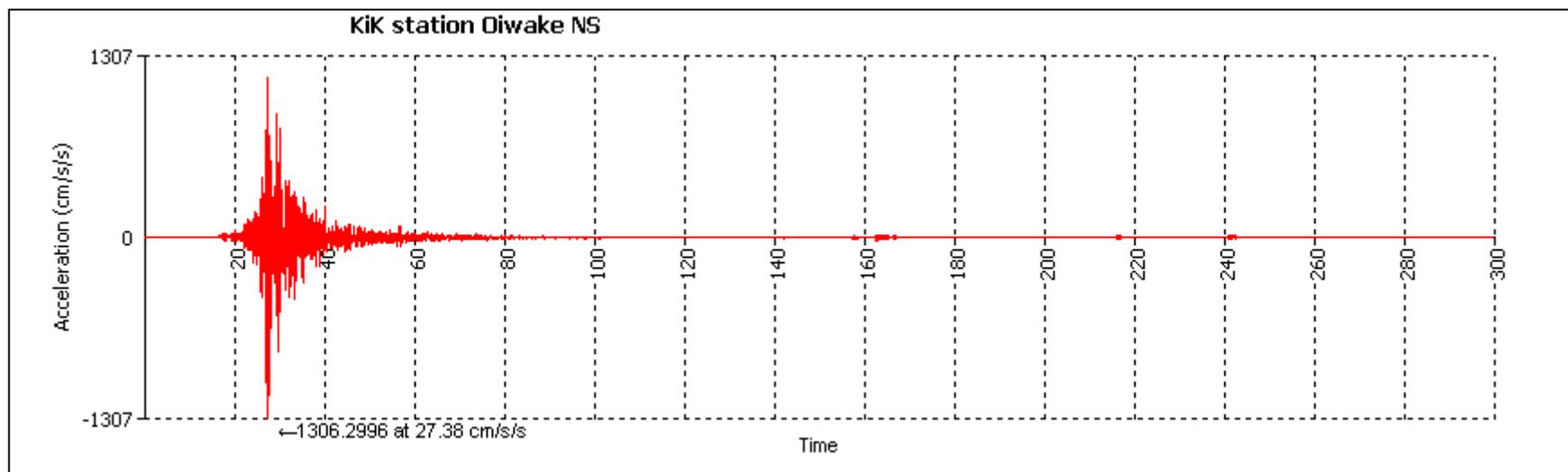
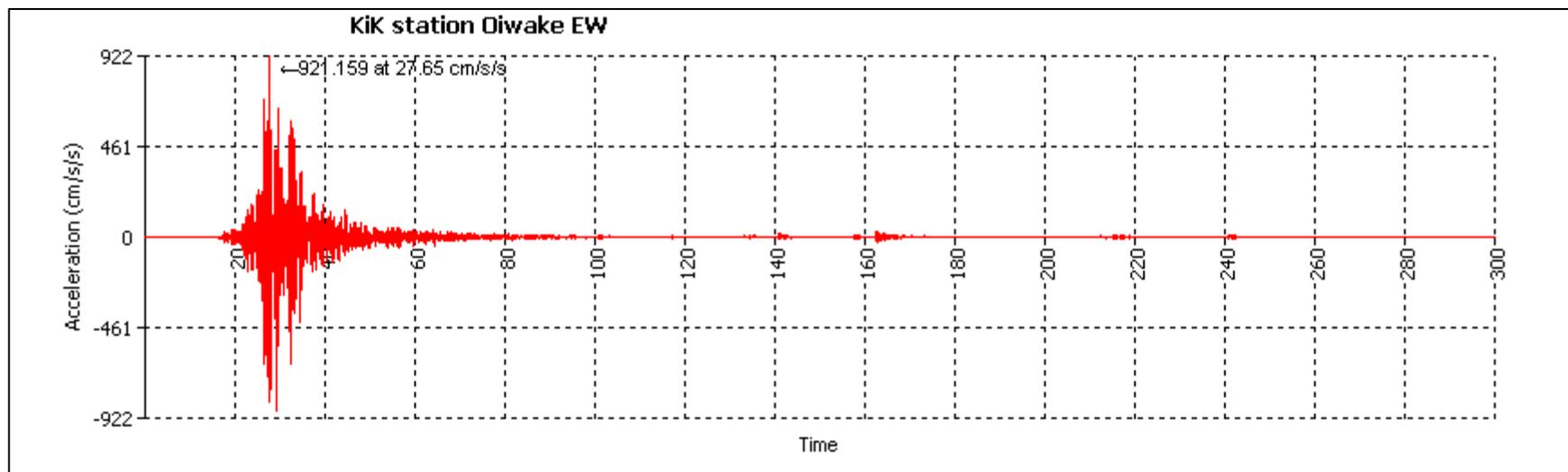
JMA Instrument Intensity:

	Direction	PGA g	Max SA	CAV	Arias	ZPA g	2 to 10 Hz	10 to 20 Hz	20 to 33 Hz
1	North/South	1.3316	4.9832	3.6826	20.1005	1.3294	3.0049	1.6352	1.4190
2	East/West	0.9390	3.7502	3.4959	15.6075	0.9374	2.4543	1.1385	0.9895
3	Up/Down	1.0719	4.8328	2.1660	9.5218	1.0697	2.5484	1.6263	1.1592

JMA Effective PGA: gal

CAV SRSS:





For Comparison

Damage Indicating Parameters during the Osaka Earthquake at Takatsuki, 6/3/18

cm/s/s [Double Click to View Source Data](#) **Average Acceleration Response Spectra** JT

	Direction	PGA g	Max SA	CAV	Arias	ZPA g	2 to 10 Hz	10 to 20 Hz	20 to 33 Hz
1	North/South	0.5292	1.1921	0.3926	0.7453	0.5285	0.9385	0.6071	0.5499
2	East/West	0.8062	2.2624	0.5071	1.9187	0.8046	1.7375	0.9358	0.8942
3	Up/Down	0.2413	0.6705	0.2604	0.2410	0.2406	0.3606	0.4755	0.3983

JMA Instrument Intensity

JMA Effective PGA gal

CAV SRSS

Damage Indicating Parameters during the 3/11/11 Great Eastern Japan Earthquake

Onagawa

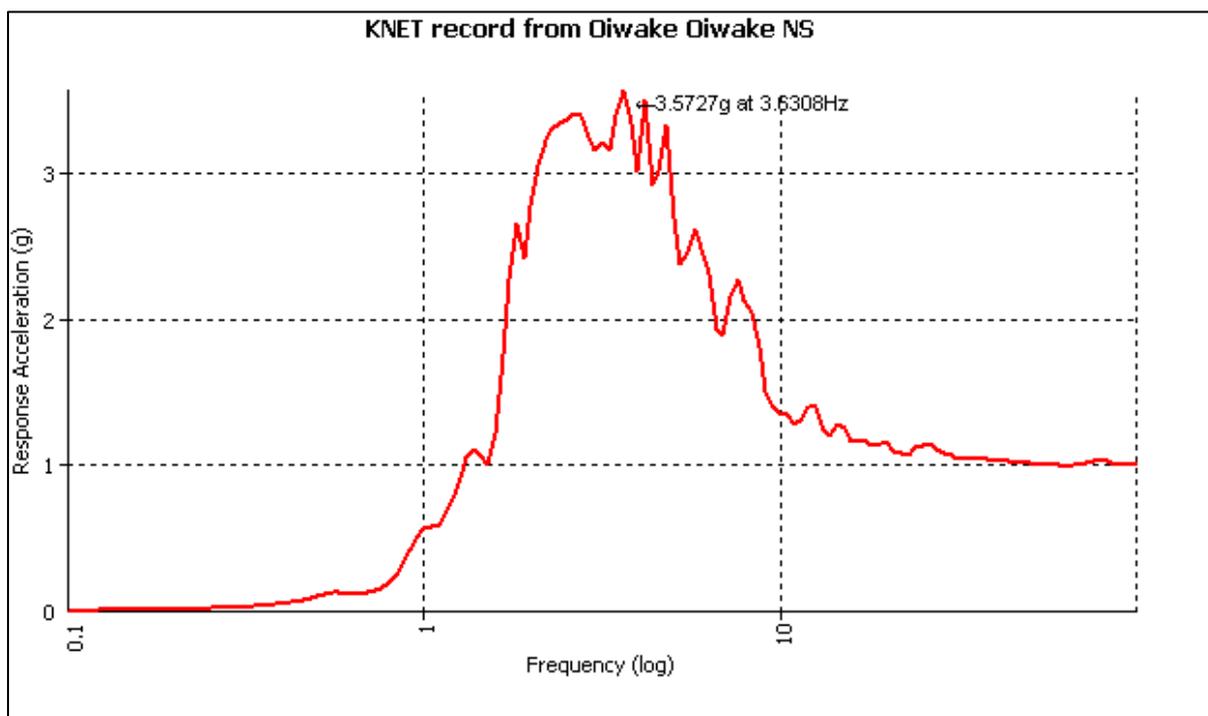
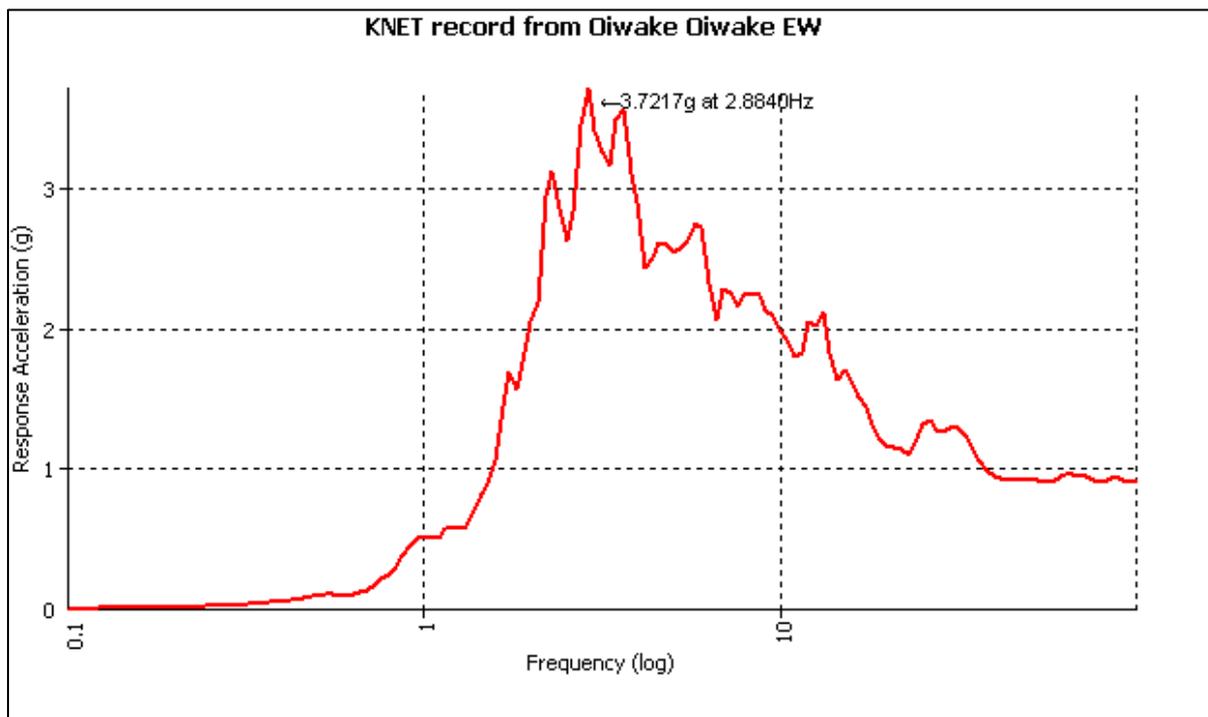
Average Spectral Response

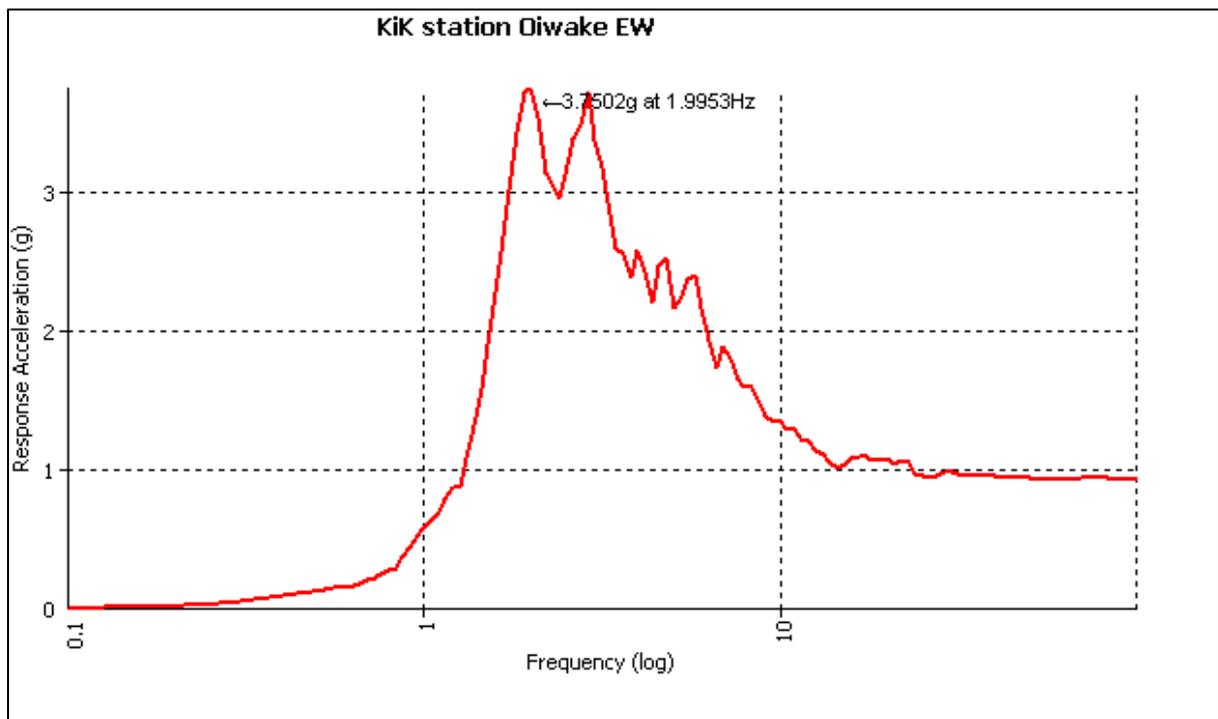
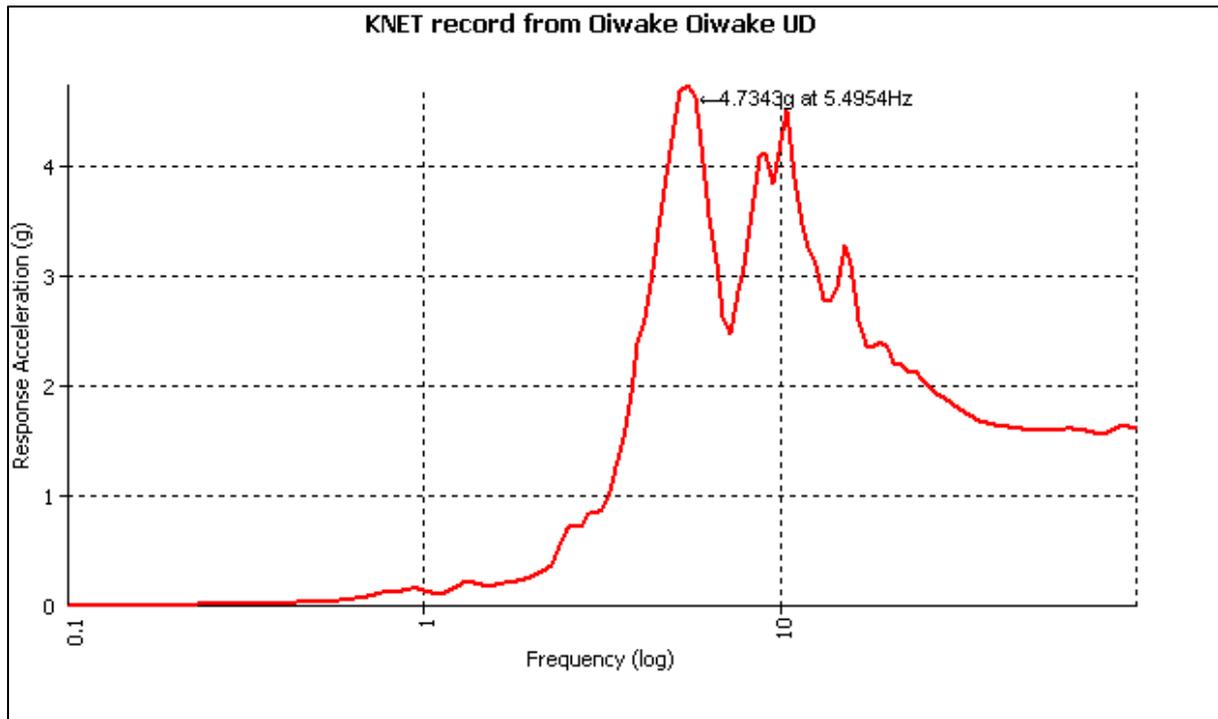
	Direction	PGA g	Max SA	CAV	Arias	ZPA g	2 to 10 Hz	10 to 20 Hz	20 to 33 Hz
1	North/South	0.7057	2.5495	8.3270	18.3160	0.7036	1.7872	0.9956	0.7984
2	East/West	0.5656	2.7811	7.8450	15.0298	0.5641	1.8298	1.0209	0.6845
3	Up/Down	0.4908	1.6583	6.0311	9.9109	0.4890	0.7564	1.4432	0.7824

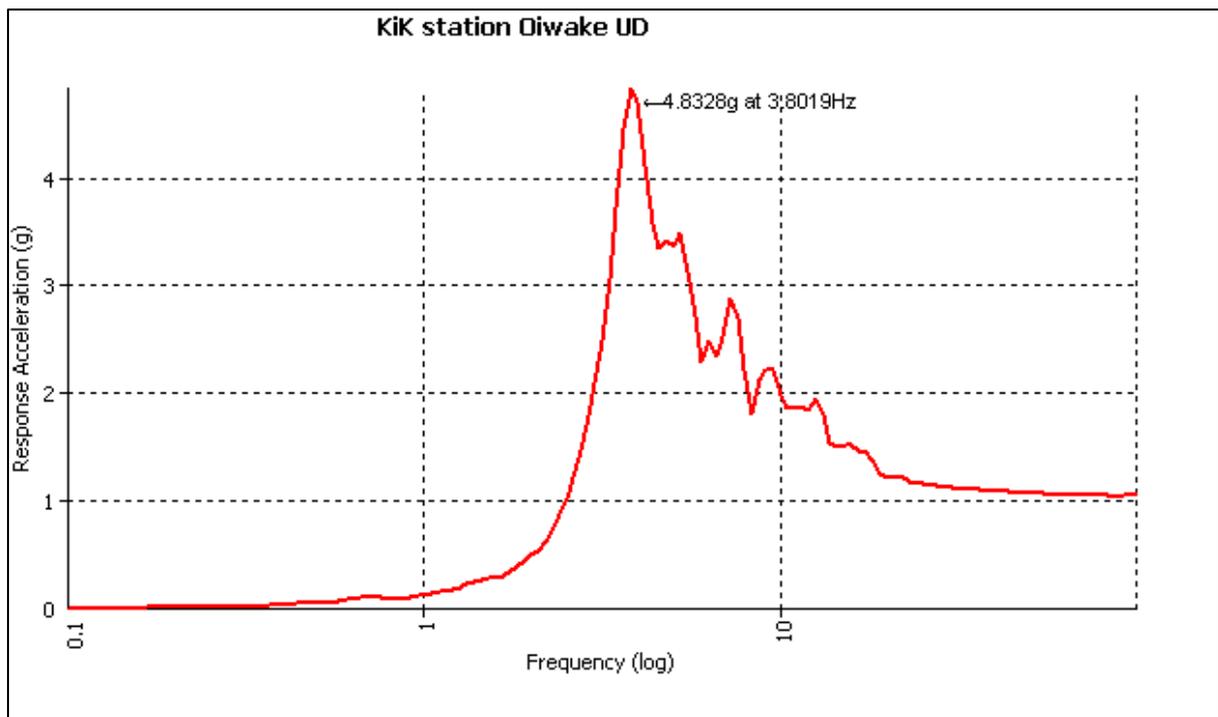
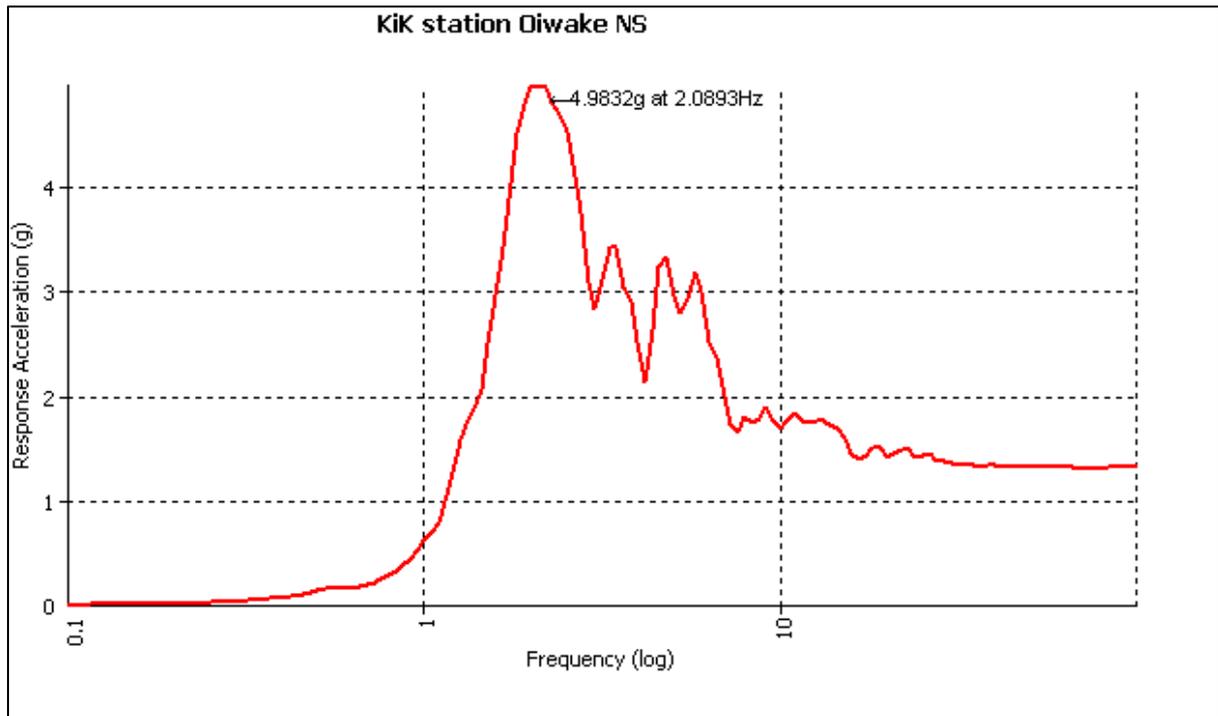
JMA Instrument Intensity

JMA Effective PGA gal

CAV SRSS







Notes

- The PGAs at Oiwake were all greater than 0.90 g, with 4 of 6 directions greater than 1.0g, much greater than that experienced in all strong motion records during the 3/11/11 Great Eastern Japan Earthquake. Many, many landslides.
- Much structural damage and will report about that in the next revision.

- The calculated JMA intensities (called Shindo) were 6.73 and 6.40 on a scale of 7.0 ... extraordinarily high, and again, stronger than anyplace during 3.11.11.
- The CAVs (cumulative absolute velocity) were all above 3.0 g/s; 8.32 g/s at Onagawa. EPRI considers a CAV greater than 0.16 should begin to show damage.
- From the EPRI report: The CAV was determined to be the best damage indicating parameter and a CAV value of 0.16 g-sec was found to be a conservative characterization of the threshold between damaging earthquake motions and non-damaging earthquake motions for buildings of good design and construction as defined by the Modified Mercalli Scale.
- It seems to me that the CAVs during 3.11.11 were an artifact of the very long shaking period of about 300 seconds; perhaps it is not the best damage indicating parameter.
- The Tomari NPP suffered an LOSP; however, it was in cold shutdown and the EDGs cut in without a hitch.