

Data Sharing at the **N**ational Research **I**nstitute for **E**arth Science and **D**isaster Resilience



Katsuhiko SHIOMI

Network Center for Earthquake, Tsunami and Volcano, NIED

1. Outline of the National Research Institute for Earth Science and Disaster Resilience

2. Earthquake observation by NIED

- Three kinds of seismograph networks on the land area and two networks on the seafloor
- Realtime data sharing between the related organizations
- Public service via the Internet

~ As an example of NIED Hi-net ~

3. Future plans

Nationwide Observation Stations

Rainfall & Wind

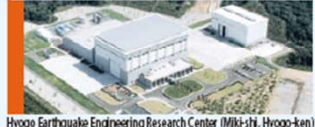
Every 5 min.

Snowfall

Every hour

No	観測地点	標高 (m)	2時	6時	12時	24時	36時	最新観測日時
201	岩木山	1238	----	----	----	----	----	12-03 10:00
202	藤崎	20	0.0	0.0	0.0	0.0	0.0	12-04 07:00
204	月山志津	700	1.7	3.4	3.5	3.9	74.7	12-04 07:00
205	新庄溜氷場環境実験所	127	0.0	0.0	0.0	0.0	0.0	12-04 09:00
301	西山薬師	320	0.0	0.0	0.0	0.0	0.0	12-04 08:31
302	長岡(溜氷防災研)	97	0.0	0.0	0.0	0.0	0.0	12-04 08:50
303	柳屋田代	423	0.0	0.3	0.3	0.3	0.9	12-04 08:40
304	魚沼大宇川	255	----	----	0.0	0.0	0.4	12-04 00:10

Volcanic, and meteorological activities installed throughout the country.



Earthquakes

Hi-net, KiK-net

Hi-net is an observation network composed of high-sensitivity seismographs installed at bottoms of boreholes to detect weak seismic signal from micro-earthquakes. KiK-net is a network of strong motion seismographs installed on ground surface and in the same boreholes as Hi-net. Those data are also transmitted to JMA and used in Earthquake Early Warning.



K-NET

K-NET is a strong motion seismograph network that accurately observes seismic motions strong enough to cause significant damage. K-NET can precisely record strong seismic motion up to thousands gals of acceleration.



F-net

F-net broadband seismograph can record ground motions in broad frequency range, from rapid to very slow oscillations. Using such a seismograph, we can analyze source mechanisms and source processes of large earthquakes all over the world.



V-net

V-net is a volcanic observation network which can monitor volcanic activities such as volcanic earthquakes, crustal movement, and volcanic eruptions.



MP Radar

MP (Multi-Parameter) Radar enables accurate rainfall estimation by transmitting and receiving polarized radiowaves. The developed technology was transferred to the MLIT's radar network (XRAIN).



Snow and Weather Observation Network

The observation network monitors valuable meteorological data including detailed snow information in mountainous areas, which cannot be observed by other organizations. These data are used for snow disaster prevention and snow removal.



S-net DONET

S-net and DONET are the ocean bottom earthquake and tsunami observation networks composed of seismometer and water-pressure gauge. S-net is installed along the Japan Trench from off the coast of Hokkaido to Chiba. DONET is deployed in the area off Kumano-nada in Nankai Trough and Kii channel. NIED boasts the world's largest-scale of ocean bottom observation networks of more than 200 observatories. They are expected to contribute to the early detection of earthquake and tsunami.



Weather & Snow

Earthquakes & Tsunamis

Volcanoes

Nationwide Observation Stations

Earthquake Info.
Every second /
when earthquake occurs

Volcano Info.
Every hour ~
(depends on the contents)

- Headquarters
- Research centers
- Seismograph networks
 - F-net
 - Hi-net / KiK-net
 - K-NET
- Seafloor observation networks for earthquakes and tsunamis
 - S-net
 - S-net (under construction)
 - DONET1
 - DONET2
- Volcanic observation network
 - V-net
- Meteorological observation facilities and others
 - MP radars
 - Snow and weather observation network

Hyogo Earthquake Engineering Research Center (Miki-shi, Hyogo-ken)

National Research Institute for Earth Science and Disaster Resilience Headquarters (Tsukuba-shi, Ibaraki-ken)

Earthquakes

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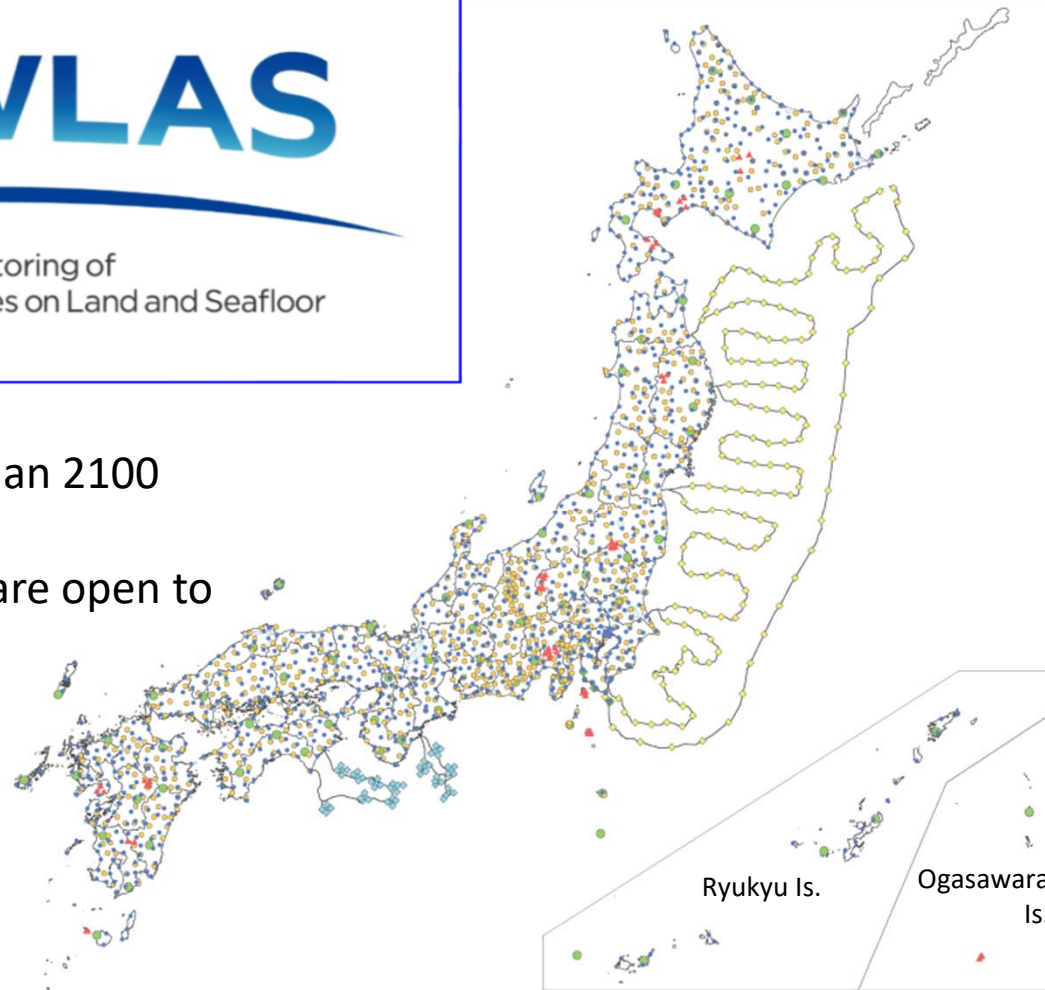
Earthquakes & Tsunamis

Volcanoes

Monitoring of Waves on Land and Seafloor



- Composed by more than 2100 observation stations.
- All seismograph data are open to the public.
(S-net data is preparing.)



- Hi-net / KiK-net
- K-NET
- F-net
- ▲ V-net
- ◆ S-net
- ◆ DONET

Earthquakes

● Hi-net, KiK-net

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X-band MP radar (Ebina City)

▲ Snow and Weather Observation Network

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Exterior view of an observation station

● S-net ● DONET

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S-net observation unit



DONET observation unit

Earthquakes & Tsunamis

Volcanoes

Three-kind Seismograph Networks on the Land Area

K-NET/KiK-net: Event trigger recording with 100 Hz

Hi-net/F-net: Continuous data recording with 100 Hz

Strong



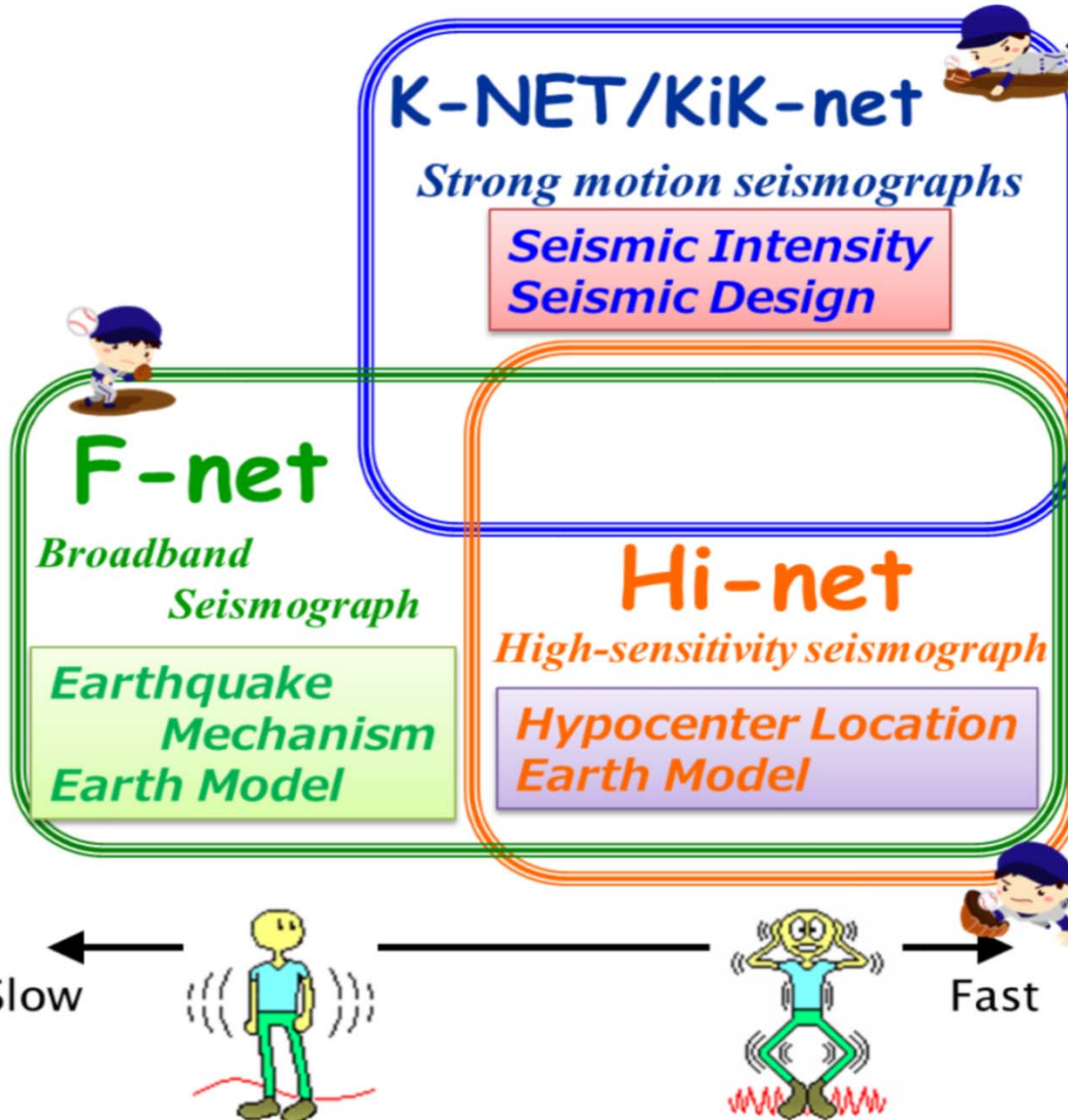
Weak



Slow



Fast



Earthquakes

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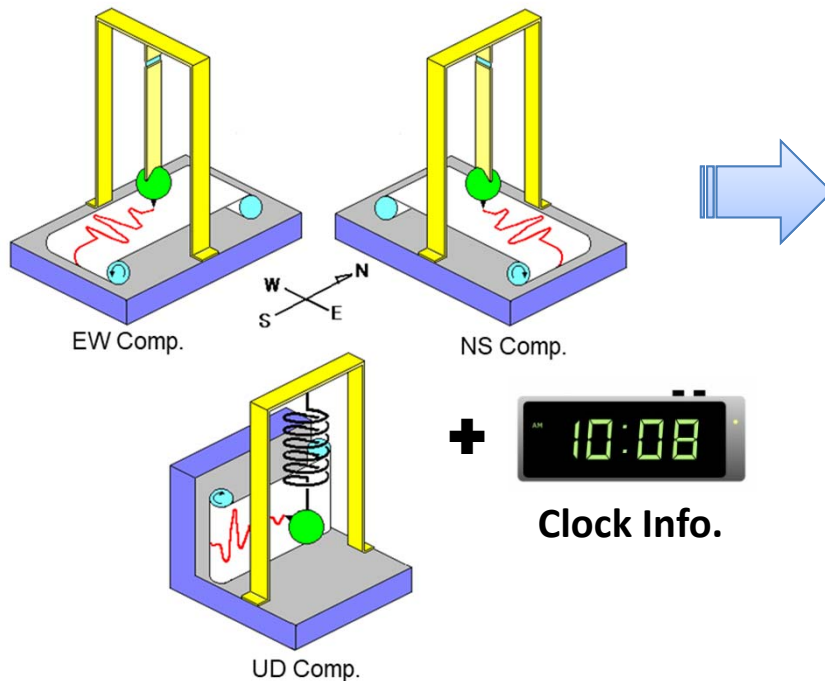


V-net

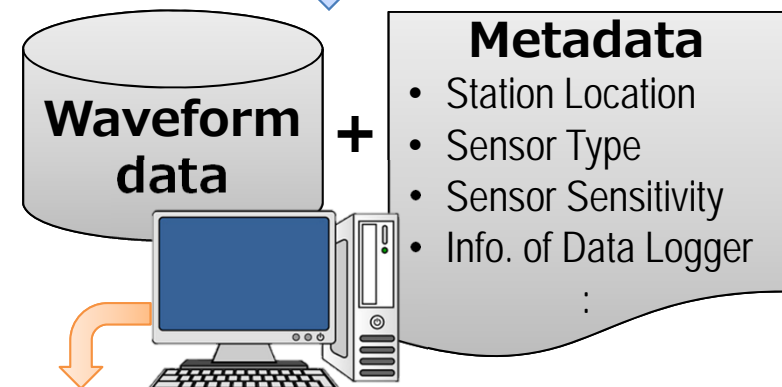
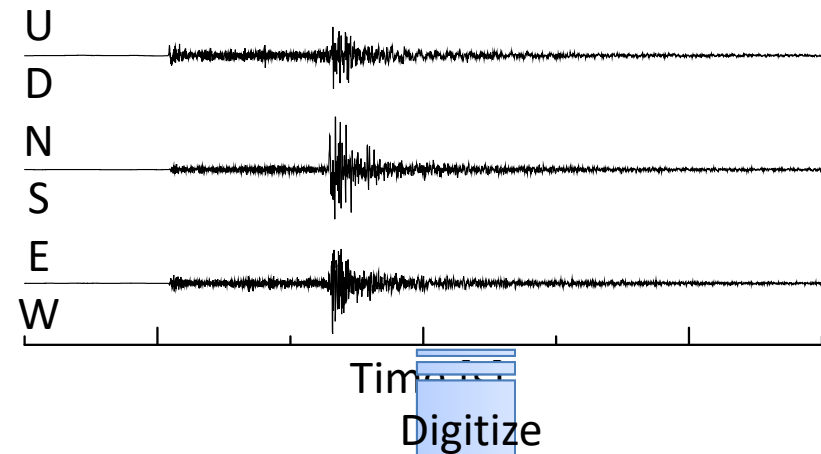
Volcanoes

What is “Earthquake Data”?

Basic Data: 3-component time series measuring the size of ground shaking

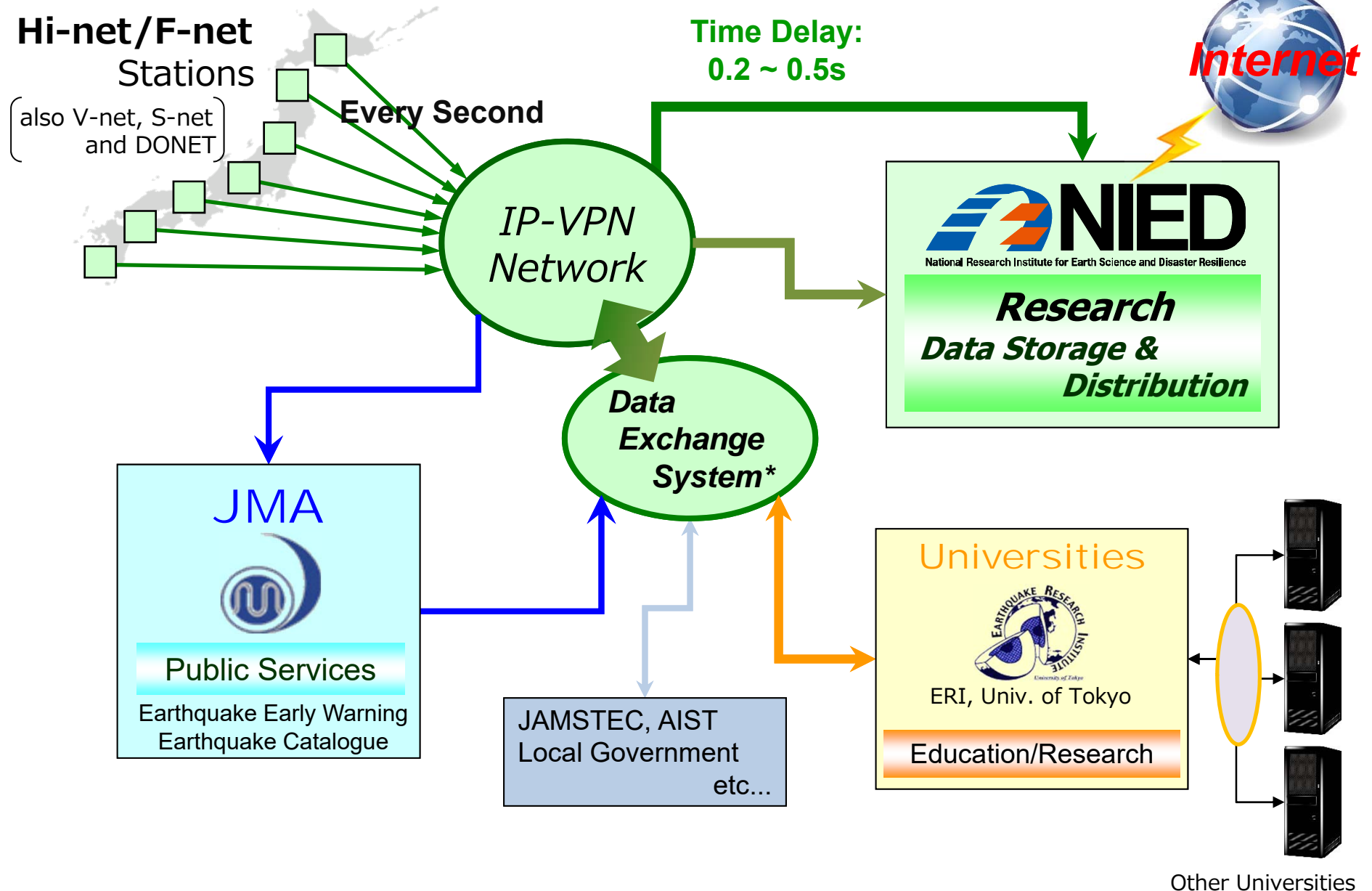


3 seismometers orthogonal to each other (e.g., UD/NS/EW)



Primary products:
Seismic Intensity / Hypocentre Catalogue etc.

Real-time Data Collection and Sharing



*Based on the agreement on March, 2004.

Member of the agreement is 9 universities, 6 research institutes, 3 local governments and JMA (as of Sep. 2014)

NIED National Research Institute for Earth Science and Disaster Resilience

Hi-net β Ver.

High Sensitivity Seismograph Network Japan

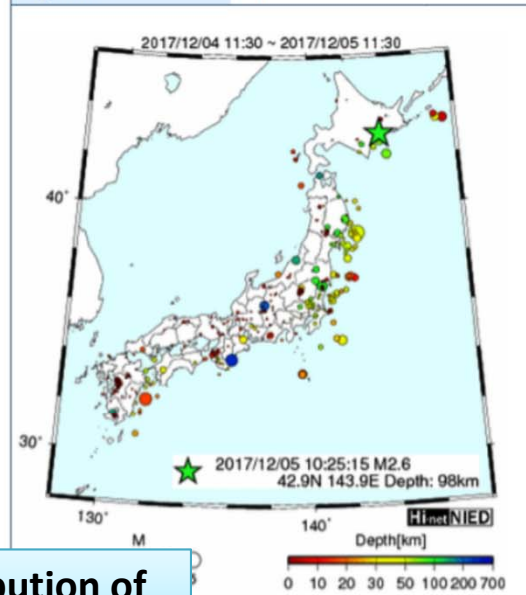
Today: 7192 Yesterday: 16860 Total: 139008309 [Toppage access counter since 2003/6/3]

Japanese English (β Ver.)

Summary / Results : Hypocenter / Waveform : Station Information : FAQ / Registration : For Registered Users :

Latest Earthquake Info.(M \geq 2.5)

Information	
Information was automatically determined by AQUA-CMT. See for details	
Hypocenter Region	KUSHIRO REGION
Origin Time (JST)	Dec 05, 2017 10:25:15.85
Latitude	42.931N
Longitude	143.903E
Depth	97.8km
Magnitude	2.6



Hypocenter Distribution of the Last 24 Hours

Earthquake Information by AQUA system

An earthquake occurred in/around the "HYUGANADA REGION" on Dec 04, 16:54 (JST).

- Dec 04, 2017 16:54:35 (JST) Announcement
- Dec 04, 2017 16:59:43 (JST) Update

You may have to reload the web page to see the latest information.

- What is "AQUA" System? (in Japanese)
- Max. Amplitude Distribution Maps (in Japanese)

Quick Announcement

- #### Notice of Hi-net
- Mar 01, 2017: The guidance of the updating user account 2017.
 - Jan 07, 2015: We started the continuous waveform data download service for ADEP.
 - Oct 01, 2014: We started the continuous waveform data download service for JAMSTEC(DONET1).

Recent Large Earthquake

Dec 02, 2017 (JST) S OFF URAKAWA M5.5

- Criteria (in Japanese)
- Epicenter on the GSI maps
- Back number

Earthquake Information

Hypocenter Region	S OFF URAKAWA
Origin Time (JST)	Dec 02, 2017 05:48:01.42
Latitude	42.04N
Longitude	142.51E
Depth	66km
Magnitude	5.5

Clickable

Mechanism Solution Information

Plane1 Strike/Dip	28.2°/67.5°
Plane2 Strike/Dip	191.6°/23.3°
P-Axis Azimuth/Take-off	113.2°/67.7°
T-Axis Azimuth/Take-off	309.9°/23.1°

Large Earthquake Info. (M \geq 5)

<http://www.hinet.bosai.go.jp/?LANG=en>

Hypocenter Distribution

NIED National Research Institute for Earth Science and Disaster Prevention

Hi-net β Ver.
High Sensitivity Seismograph Network Japan

Today: 5033 Yesterday: 13387 Total: 138879477 (Toppage access counter since 2003/6/3)

Japanese English (β Ver.) Top Page

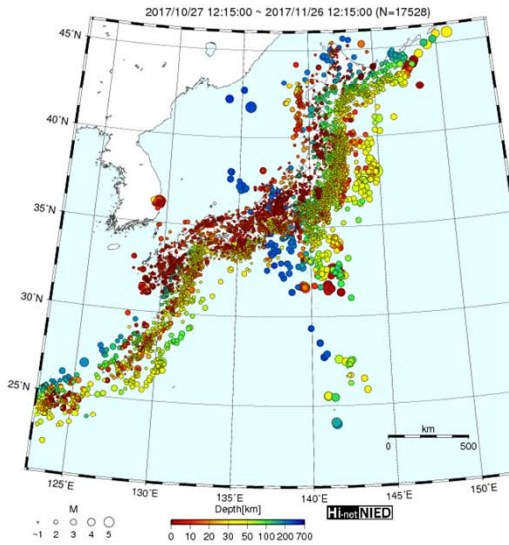
Summary / Results Hypocenter / Waveform Station Information FAQ / Registration For Registered Users

Hi-net Hypocenter Maps

Earthquake locations for the past 30 days. Earthquake locations are from the NIED Hi-net automatic hypocenter determination system (last 2 days) and the JMA unified hypocenter catalog (older than 2 days).

Regional Maps: Japan and Outlying Areas Prefecture Maps:

Japan and Outlying Areas Last 30 days Seismicity in the



Nation-wide

NIED National Research Institute for Earth Science and Disaster Prevention

Hi-net β Ver.
High Sensitivity Seismograph Network Japan

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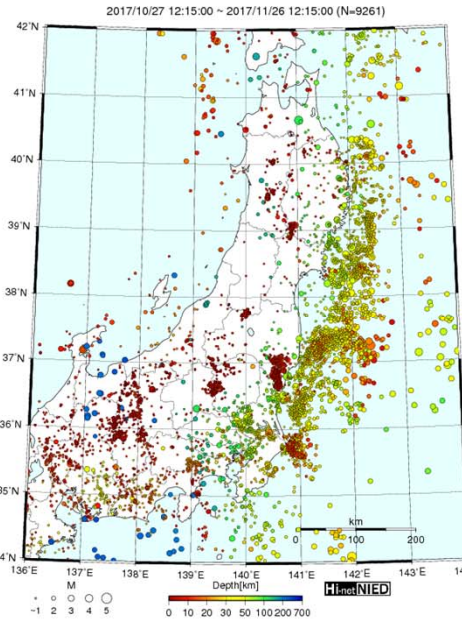
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Regional Maps: Tohoku and Kanto Regions Prefecture Maps:

Tohoku and Kanto Regions Last 30 days Seismicity in the



Regional Scale

NIED National Research Institute for Earth Science and Disaster Prevention

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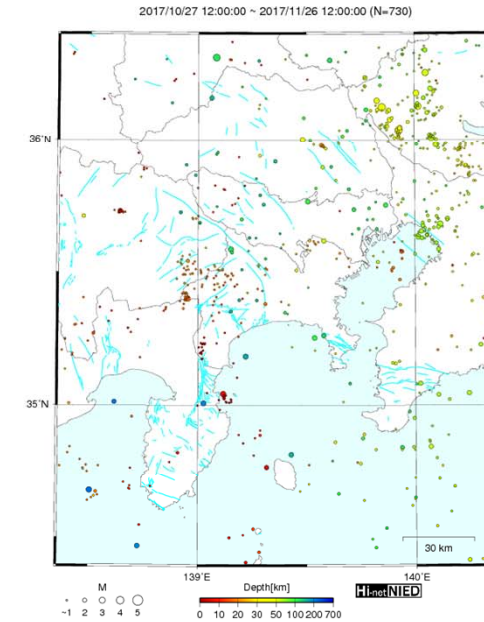
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Regional Maps: Prefecture Maps: Kanagawa Pref. Last 30 days

Kanagawa Pref. Last 30 days Seismicity in the



Prefecture Scale

30 Days / 7 Days / 24 Hours

Waveform Images of Hi-net

About 100-trace Continuous Waveform Images

We draw images of the one-hour continuous seismic waveform recorded at 100 NIED Hi-net stations among about 800 stations. Each trace shows the one-hour waveform at each station from north to south and horizontal axis shows the minute. Left figure denote the distribution of 100 seismic stations. Ten northern red circles correspond to the stations of top 10 traces and next ten blue circles correspond to the next 10 traces.

NIED National Research Institute for Earth Science and Disaster Prevention

Hi-net β Ver.

High Sensitivity Seismograph Network Japan

Today: 15294 Yesterday: 14860 Total: 13884406 (Toppage access counter since 2003/6/3)

Summary / Results | Hypocenter / Waveform | Station Information | FAQ / Registration | For Registered Users

Continuous Waveform Images

Seismograph Network: NIED Hi-net

Search Region: Tokyo

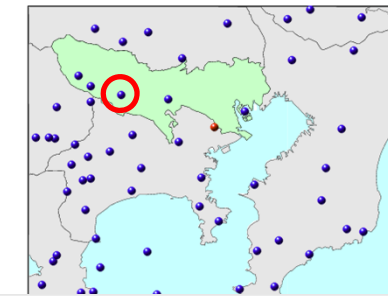
Date and Time (JST): Year 2017 Month Nov Day 13 Hour 03

NIED Hi-net Tokyo >>> 100-trace Continuous Waveform Images

Nov 13, 2017 03h Presence of absence of image creation

Exist Non exist 1hour-preview 24hour-preview

IBARAKI	EDOSAKI	MORIYA
	TSUKUBA-S	
SAITAMA	HIDAKA	HANNO
	IWATSUKI	NAGURI
	TOKOROZAWA	
CHIBA	CHIBA	CHIKURA
	FUTTSU	ICHIHARA
	IWALKITA	KAMOGAWA-S
	KAMOGAWA	KATSURAE
	KATSURAE	NARITA
	SHIMOSA	TATEYAMA-W
YORO		

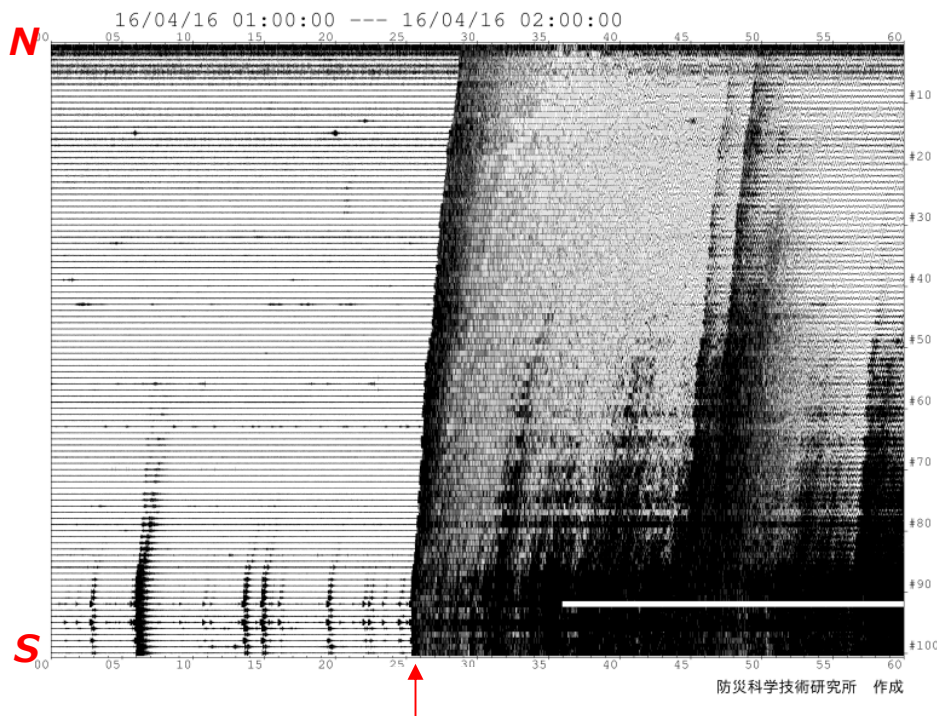
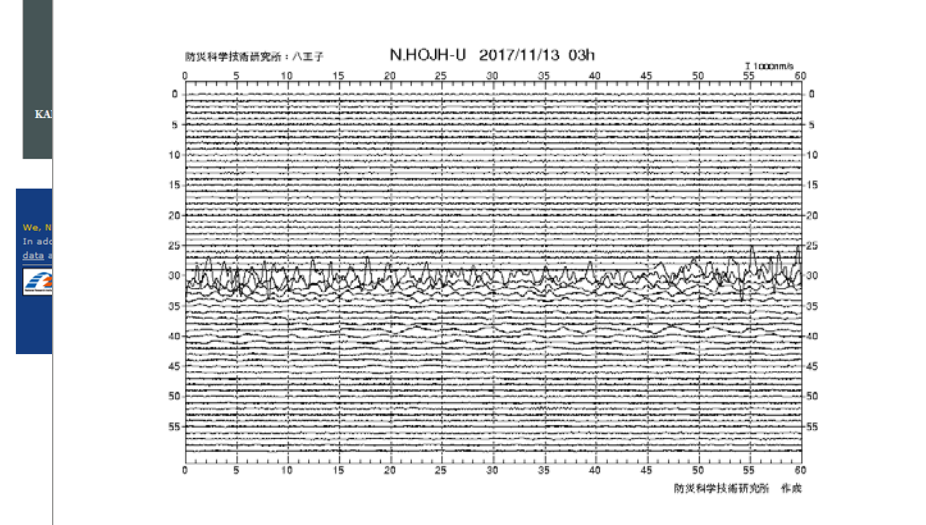


www.hinet.bosai.go.jp/trace/view.php?orgid=01&netid=01&stcd=N.HOJH&tm=2017111303&comp=U&pv=1H&LANG=en

NIED High Sensitivity Seismograph Network Japan (NIED) N.HOJH TOKYO pref. HACHIOJI station | Continuous Waveform Images 1hour preview

Year 2017 Month Nov Day 13 Hour 03 (JST) Comp U Search Postscript 24hour preview Japanese Close

Latest << Before Later >>



2016/04/16 01:25:05 M7.3 at Kumamoto

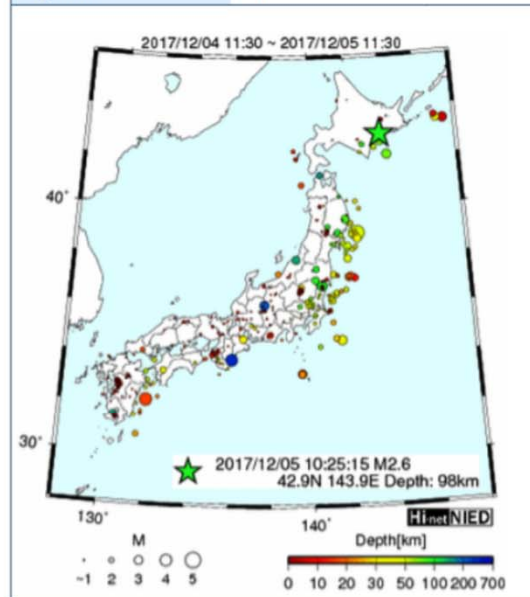
M 7.3 - 30km S of Halabjah, Iraq (USGS/NEIC)

National Research Institute for Earth Science and Disaster Resilience
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[Japanese](#) [English \(\$\beta\$ Ver. \)](#)
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<http://www.hinet.bosai.go.jp/?LANG=en>

Pages for Registered Users



LOGIN PAGE

[Notice]

- Mar 01, 20: [We started](#)

Purposes:

for evaluation of the efficiency of the MOWLAS data
for improvement of the data service
for maintenance of the seismic networks

Continuous Waveform Data Download

You can download continuous waveform data observed by NIED (Hi-net / F-net / V-net), JMA, universities and other organizations in Japan from this page.
On our website, data after April 1st, 2004 are available.

Old waveform data download

Pages for downloading continuous waveform data of before April 1, 2004 or the long-term data.

Event Waveform Data Download

You can download event triggered (earthquake) waveform data for local earthquakes from this page.

Preliminary Catalog by the Hi-net Automatic System

You can see the earthquake catalog obtained by the NIED Hi-net automatic hypocenter determination system.

JMA Unified Hypocenter Catalogs

You can access earthquake lists, arrival-time data, and focal mechanism catalogs provided by the Japanese Meteorological Agency (JMA). In order to construct these catalogs, JMA analyses not only their data but also data provided by NIED, universities, and other organizations.

Epicentral distribution of deep low-frequency tremor in southwest Japan

Azimuth Information of the Hi-net Borehole Sensors

You can check sensor orientation at the Hi-net stations on this page.

Borehole Sensors Maintenance History

On this page, we list the maintenance histories of borehole sensors.

Response of Observation Equipments

You can view total responses of the NIED Hi-net and F-net system in SEED Header format.

WIN Channels Table File for the NIED Hi-net

This page shows WIN channel information for the NIED Hi-net stations.

Manuals/Tools

You can get several manuals and tools that are useful to operate data we provide on our website.

Waveform Data

Hypocentre Catalogue

Metadata

Documents & Tools

LOGOUT



Before accessing pages shown on right, you have to [register](#)

on the [Hi-net](#), [F-net](#), [V-net](#), [JMA](#), [JMA](#), [JMA](#), [JMA](#) website.

If you have some questions about user registrations, send E-mail to sanction@bosai.go.jp

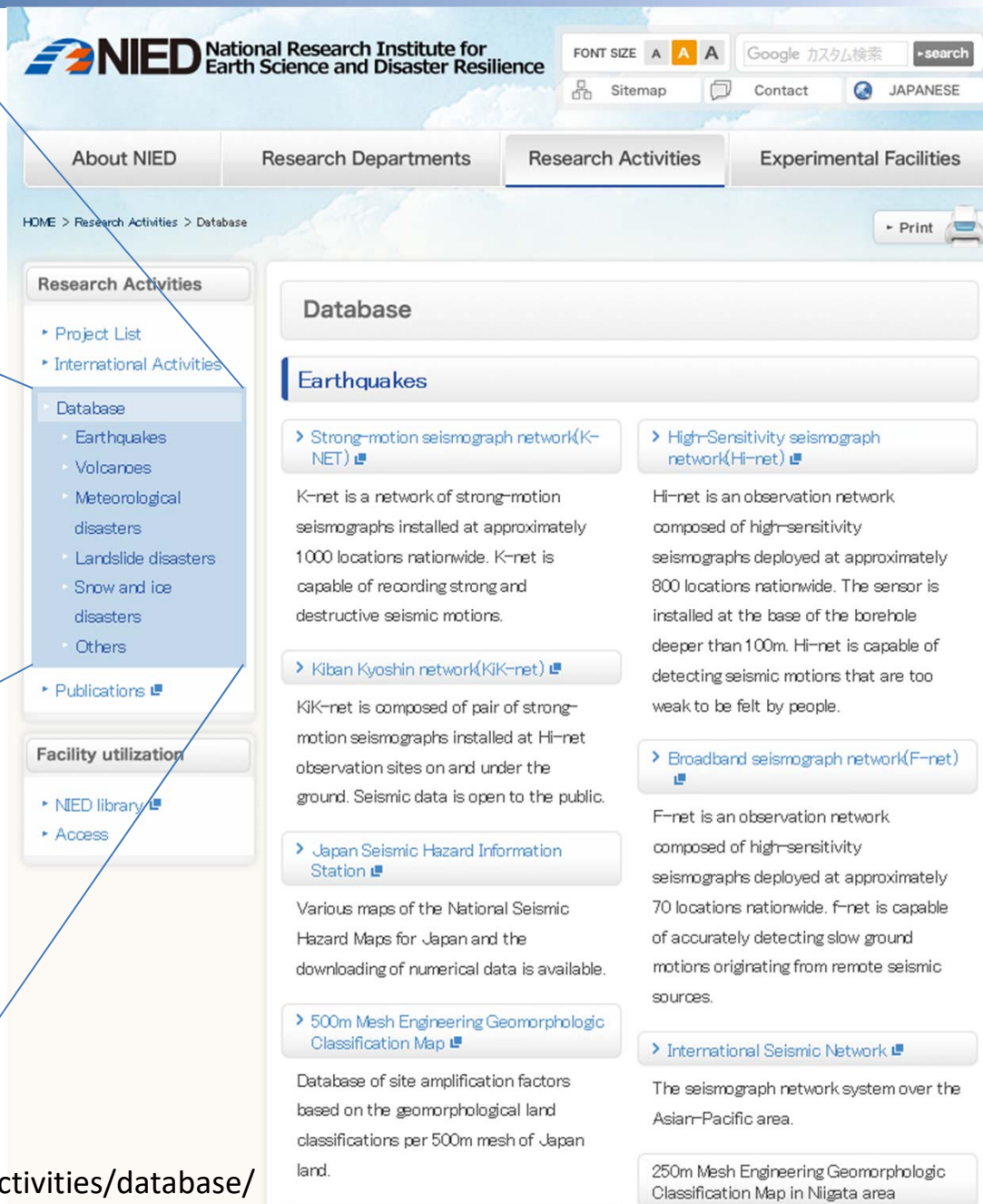
In order to grasp effectiveness of our seismograph networks, and to improve our data service, we ask all users to register.

Nationwide seismograph networks are operated by NIED.

1. Waveform data are **sharing in real-time** with the related institutes/organizations.
 - *JMA announces the EEW to the public using the data.*
 - *Universities use the data for their education and research activities.*
2. Waveform data is opened to the public via the Internet.
 - *Not only waveform data by NIED but also those by other organizations are opened.*
 - *Metadata (e.g., station location, sensor info., geological info.) are also opened.*
3. User registration is required to download the waveform data.
 - *Name, affiliation, E-mail address, and purpose of using data are required for registration.*
 - *User information and data access statistics are used for the improvement of the data service and the maintenance of the seismic networks.*

Database On the NIED Website

- **Database**
- **Earthquakes**
 - Waveform data
 - Earthquake information
 - Japanese seismic hazard maps
- **Volcanoes**
 - Seismic / geodetic data
 - Volcanic Activity
- **Meteorological disasters**
 - The X-band multi-parameter radar (MP-X)
 - The Typhoon data base system(NIED-DTD)
- **Landslide disasters**
 - Landslide map database
 - Landslide disasters database
- **Snow and ice disasters**
 - Snowpack and related meteorological conditions



The screenshot shows the NIED website's database page. The header includes the NIED logo and name, a search bar, font size controls, and navigation links for Sitemap, Contact, and JAPANESE. The main navigation bar has links for About NIED, Research Departments, Research Activities, and Experimental Facilities. The breadcrumb trail is HOME > Research Activities > Database. A left sidebar menu lists Research Activities (Project List, International Activities, Database, Publications) and Facility utilization (NIED library, Access). The Database section is highlighted, showing a list of earthquake-related networks: Strong-motion seismograph network (K-net), High-Sensitivity seismograph network (Hi-net), Kiban Kyoshin network (KIK-net), Japan Seismic Hazard Information Station, 500m Mesh Engineering Geomorphologic Classification Map, and Broadband seismograph network (F-net). Each network has a brief description of its purpose and capabilities.

HOME > Research Activities > Database

Research Activities

- ▶ Project List
- ▶ International Activities
- ▶ Database
 - ▶ Earthquakes
 - ▶ Volcanoes
 - ▶ Meteorological disasters
 - ▶ Landslide disasters
 - ▶ Snow and ice disasters
 - ▶ Others
- ▶ Publications

Facility utilization

- ▶ NIED library
- ▶ Access

Database

Earthquakes

- ▶ Strong-motion seismograph network(K-NET)
- ▶ High-Sensitivity seismograph network(Hi-net)
- ▶ Kiban Kyoshin network(KIK-net)
- ▶ Japan Seismic Hazard Information Station
- ▶ 500m Mesh Engineering Geomorphologic Classification Map
- ▶ Broadband seismograph network(F-net)
- ▶ International Seismic Network

K-net is a network of strong-motion seismographs installed at approximately 1000 locations nationwide. K-net is capable of recording strong and destructive seismic motions.

Hi-net is an observation network composed of high-sensitivity seismographs deployed at approximately 800 locations nationwide. The sensor is installed at the base of the borehole deeper than 100m. Hi-net is capable of detecting seismic motions that are too weak to be felt by people.

KIK-net is composed of pair of strong-motion seismographs installed at Hi-net observation sites on and under the ground. Seismic data is open to the public.

Various maps of the National Seismic Hazard Maps for Japan and the downloading of numerical data is available.

Database of site amplification factors based on the geomorphological land classifications per 500m mesh of Japan land.

F-net is an observation network composed of high-sensitivity seismographs deployed at approximately 70 locations nationwide. f-net is capable of accurately detecting slow ground motions originating from remote seismic sources.

The seismograph network system over the Asian-Pacific area.

250m Mesh Engineering Geomorphologic Classification Map in Niigata area

Operation of observation stations/facilities of NIED are supported by the national budgets mainly.

To explain **the necessity of the databases** for progress of science & technology is very important

database

DOI

Main Purpose:

Visualize cited performance of the NIED's research data

Assumed Advantages:

- Easy to cite the data in publications
- Easy to catch how many publications used the data

MP Radar

MP (Multi-Parameter) Radar enables accurate rainfall estimation by transmitting and receiving polarized radiowaves. The developed technology was transferred to the MLIT's radar network (XRRAIN).



X-band MP radar (Ebina City)

Snow and Weather Observation Network

The observation network monitors valuable meteorological data including detailed snow information in mountainous areas, which cannot be observed by other organizations. These data are used for snow disaster prevention and snow removal.



Interior view of an observation station

S-net DONET

S-net and DONET are the ocean bottom earthquake and tsunami observation networks composed of seismometer and water-pressure gauge. S-net is installed along the Japan Trench from off the coast of Hokkaido to Chiba. DONET is deployed in the area off Kumano-nada in Nankai Trough and Kii channel. NIED boasts the world's largest-scale of ocean bottom observation networks of more than 200 observatories. They are expected to contribute to the early detection of earthquake and tsunami.



S-net observation unit DONET observation unit

F-net

F-net seismograph can record seismic motions in a wide frequency range, from rapid to very slow oscillations. Using such a seismograph, we can analyze source mechanisms and source processes of large earthquakes all over the world.



F-net

V-net

V-net is a volcano observation network which can monitor volcanic activities such as volcanic earthquakes, crustal movement, and volcanic eruptions.

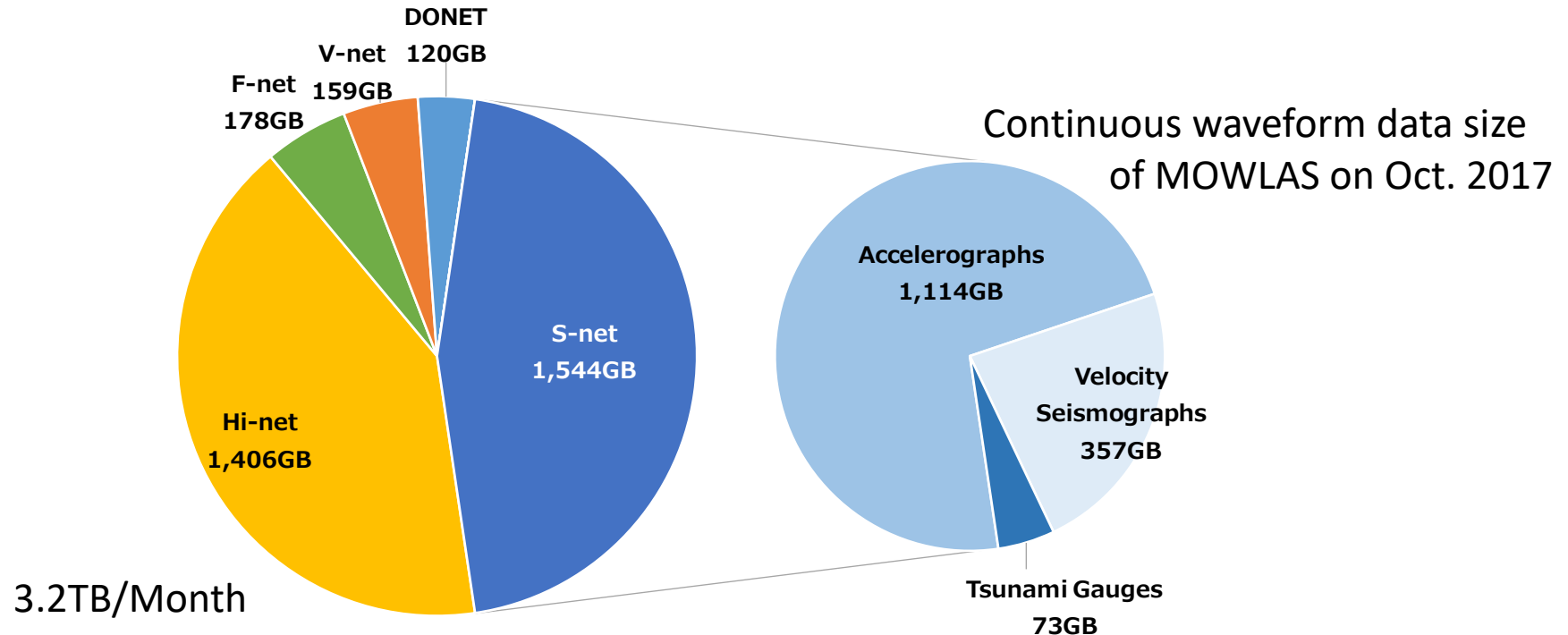


V-net



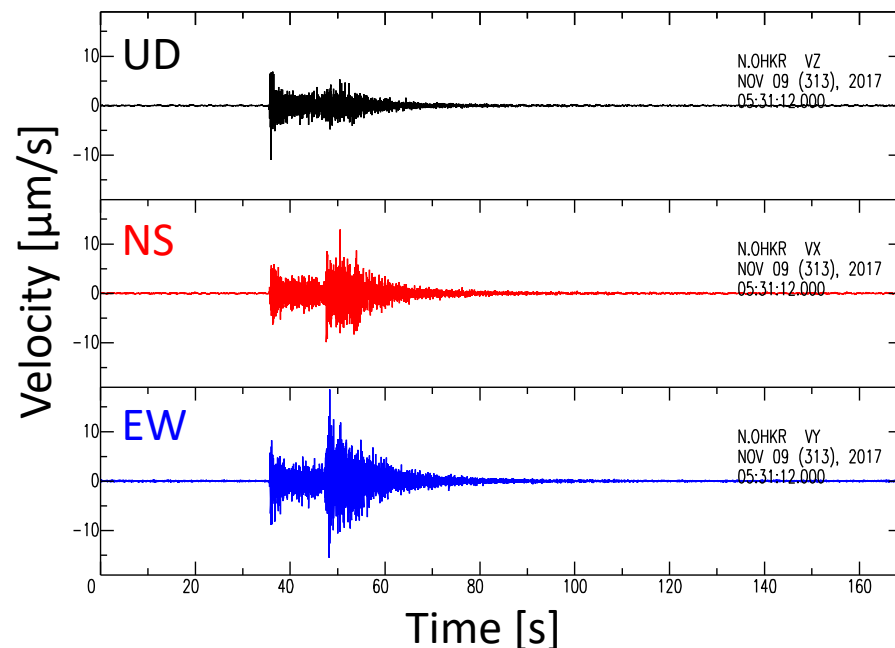
Data Unit

- **Networks are working: Increasing every second.**
- **Each network is composed by 50 ~ 1000 stations.**
 - Each station has its own observation parameters and repair histories individually.
- **Some networks have several kinds of sensors.**
 - e.g., S-net has 150 stations with three accelerographs, a velocity seismograph and two tsunami gauges.



Data Quality

- Troubles on the earthquake observation
 - **Data lost** by power trouble, communication line trouble or system down
 - **Noisy data**
 - Electrical noise (e.g., Lightning)
 - Ground noise (e.g., Strong wind, Road construction)
 - **Data with small amplitude / wrong data**
 - Output voltage reduction by degradation of a sensor

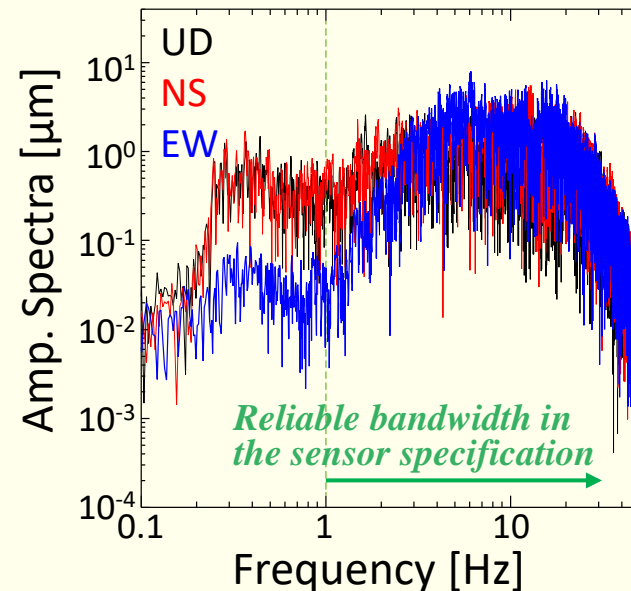
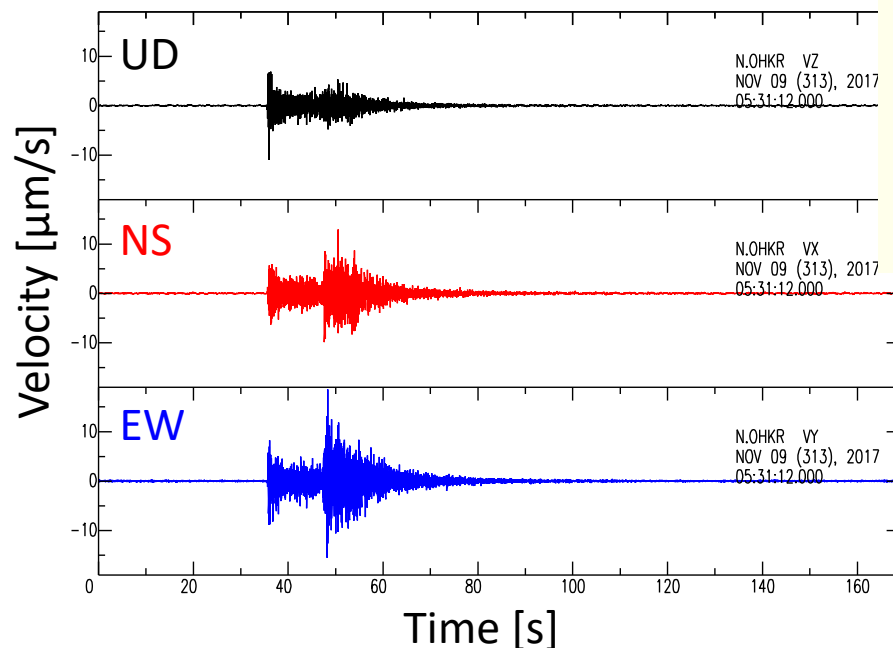


Available for picking the arrival time of the earthquake motion.

Inappropriate for analysis using three-component seismograms.

Data Quality

- Troubles on the earthquake observation
 - **Data lost** by power trouble, communication system down
 - **Noisy data**
 - Electrical noise (e.g., Lightning)
 - Ground noise (e.g., Strong wind)
 - **Data with small amplitude**
 - Output voltage reduction by cable



Available for picking the arrival time of the earthquake motion.

Inappropriate for analysis using three-component seismograms.

Summary

1. Earthquake observation data (waveform data) are **sharing in real-time** with the related institutes and/or organizations. The data are used for monitoring earthquake activity, earthquake research, and educational activities
2. Waveform data is **opened to the public** via the Internet. User registration is required to download the waveform data.
3. In order to track papers/reports cited the data of NIED's networks, NIED will introduce **the data DOIs** to the NIED's database.

Thank you for your attention!