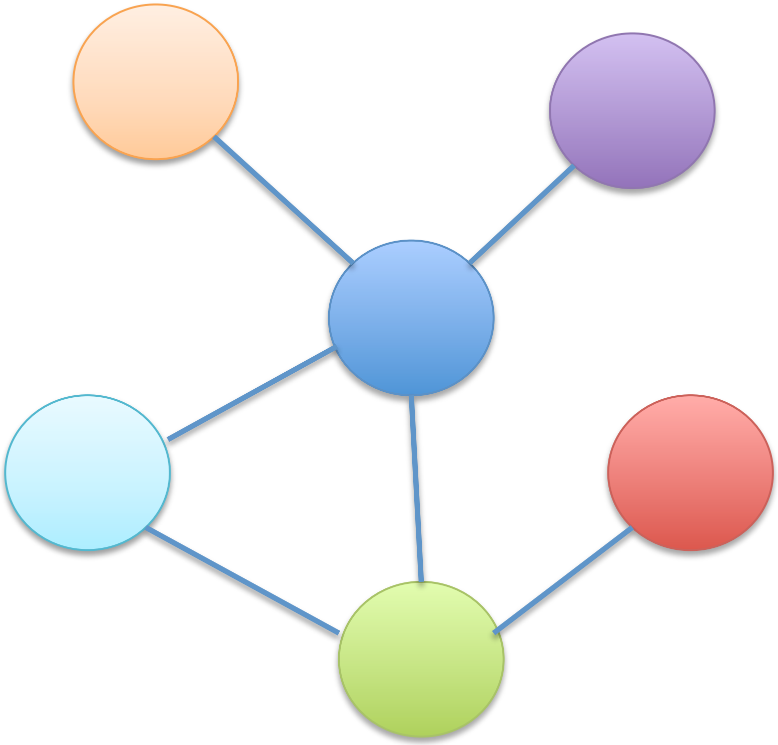
Integrating Tools From Other Systems



Goals of the session

- Show a sample of the tools used to integrate AQMS with other systems.
- Show some examples of how these tools have been used
- Identify areas for development, missing connections? New standards?

AQMS and dbselect, FDSN Web Services - *Stephane Zuzlewski (NCEDC)*
Application**: Accessing data from FDSN web services using ObsPy** - *Jen Andrews (SCSN)*

SIS and Data Centers (IRIS DMC, NCEDC, SCEDC) - *Ellen Yu (SCEDC)*

AQMS and metadata from data centers (IRIS, NCEDC, SIS etc)
Application**: dataless2aqms** - *Aparna Bhaskaran (SCEDC)*

AQMS and PDL, ComCat
PDL notification and indexer listeners, geojson web service - *Jeremy Fee (NEIC)*
Application: **Using geojson to make a Recent EQ map** - *Jon Connolly (PNSN)*
Application: **Getting data from PDL into AQMS** - *Paul Friberg (ISTI)*

AQMS and EEW
Doesn't exist yet - but examine EEW's use of Active MQ, PDL
ActiveMQ - *Steve Guiwitts (USGS Pasadena)*
Shake Alert products in PDL- *Jeremy Fee (NEIC)*

dbselect

- Command line tool to retrieve parametric information from the database. In Northern California, it is used mainly to serve out event information to users but also internally within the AQMS post processing.
- Provides origin, magnitude, arrival, amplitude and coda information in several ASCII formats as well as Hypoinverse.
- Returns moment tensor and fault plane solution in FPFIT, psvelomeca, psmeca, CMT standard and UCB formats.
- Various input parameters can be specified such as time, event Id, magnitude/latitude/longitude/depth intervals, error & quality attributes, ring, polygon, …
- Source code available in the SVN repository.

Web Services (*service.ncedc.org*)

- All the Northern California web services are implemented using the IRIS WSS (Web Services Shell). It facilitates the deployment of new web services and the maintenance of existing ones.
- In order to create a new WS, you just need to:
  - Edit a few configuration files.
  - Implement a handler (e.g. command line utility) responsible for generating the content returned to the client.
- After that, WSS can be deployed via a standard servlet container (e.g. Tomcat).
- Web services can be accessed via a web browser directly or via various types of clients and libraries.

FDSN Web Services

dataselect	• Time series data in MiniSEED format for specified channels and time ranges.
station	• Station metadata in FDSN StationXML format or text.
event	• Event information in QuakeML format or text.

NCEDC Web Services

eventdata

- Pre-assembled time series associated with a specific event.

sacpz

- Poles and zeros information in SAC ASCII format.

resp

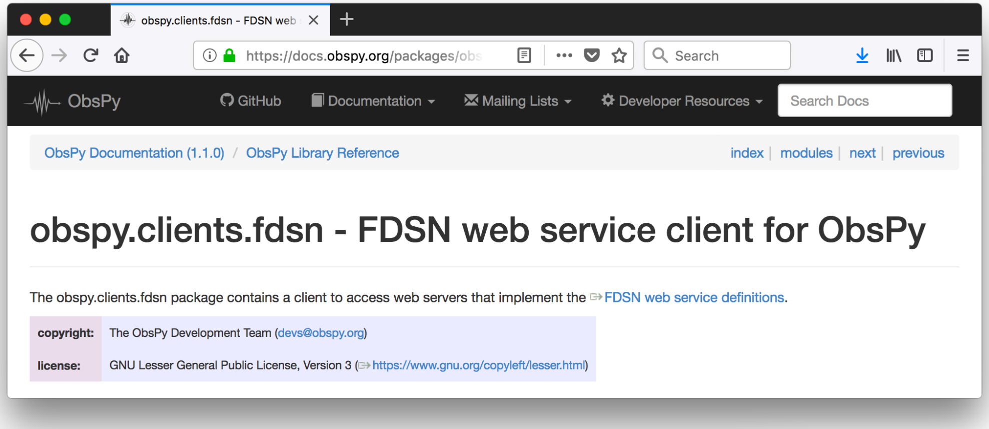
- Channel response information in SEED RESP format.

dataless

- Channel response information in Dataless SEED format.

Obspy: FDSN

- Supports event, waveform and station downloads
- Integrate with basemap for further plotting options, obspy functionality for waveform analysis, e.g:
  - response investigation
  - polarity QC
  - station performance / sensitivity etc.
- ObsPyck (waveform processing GUI) can also connect to servers and use FDSNWS for wavefrom and metadata retrieval

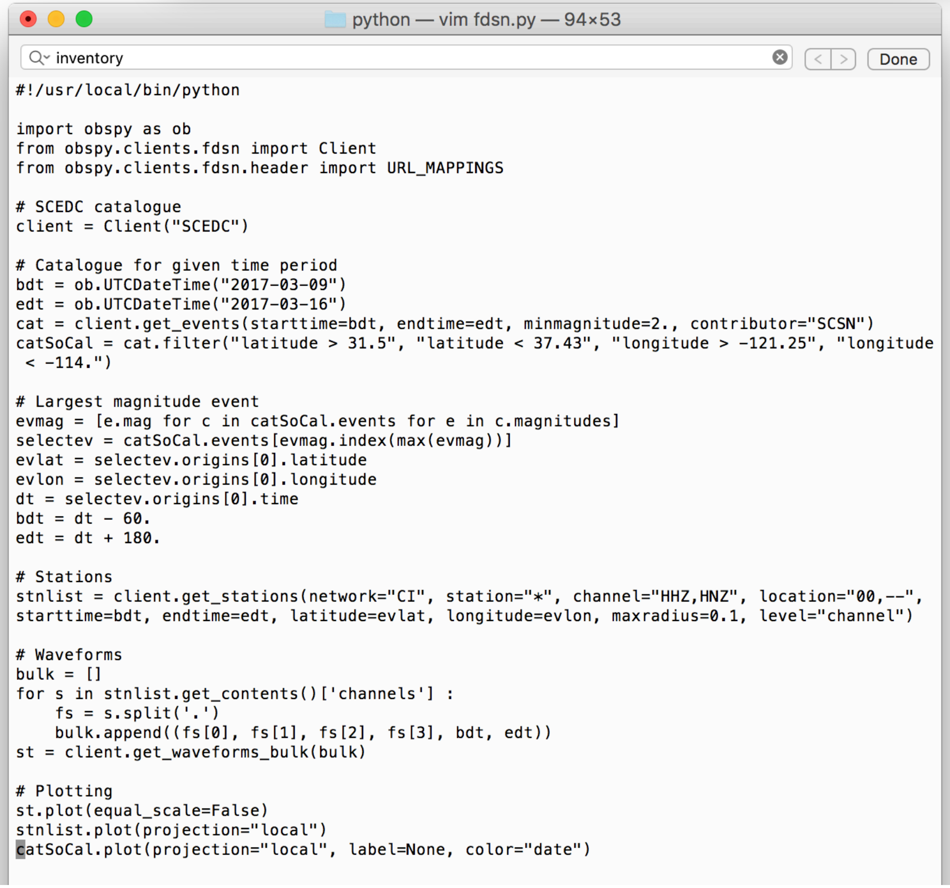

obspy.clients.fdsn - FDSN web
https://docs.obspy.org/packages/obs
Search
ObsPy
GitHub
Documentation
Mailing Lists
Developer Resources
Search Docs
ObsPy Documentation (1.1.0) / ObsPy Library Reference
index | modules | next | previous

obspy.clients.fdsn - FDSN web service client for ObsPy

The obspy.clients.fdsn package contains a client to access web servers that implement the FDSN web service definitions.

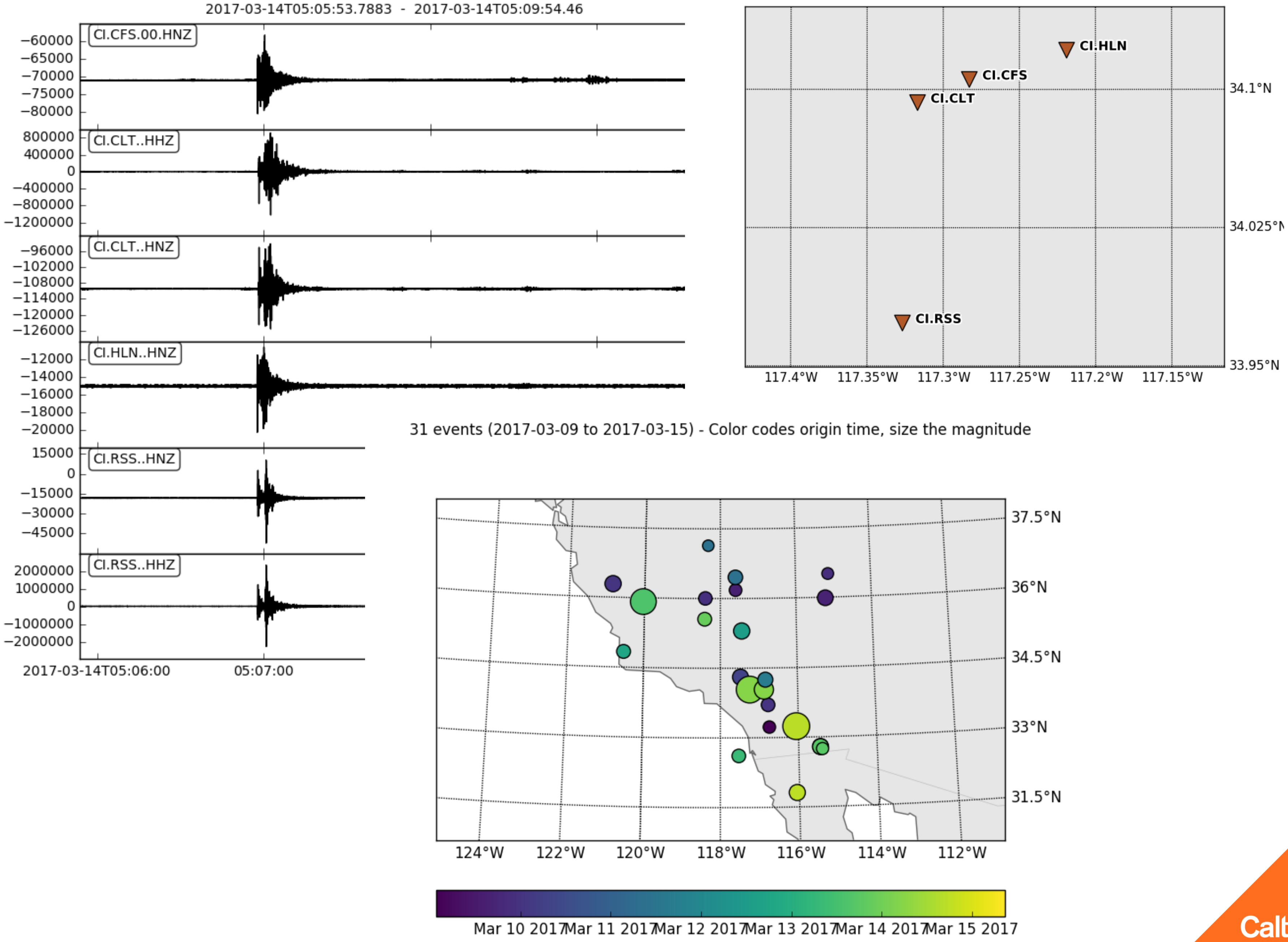
copyright: The ObsPy Development Team (devs@obspy.org)

license: GNU Lesser General Public License, Version 3 (https://www.gnu.org/copyleft/lesser.html)



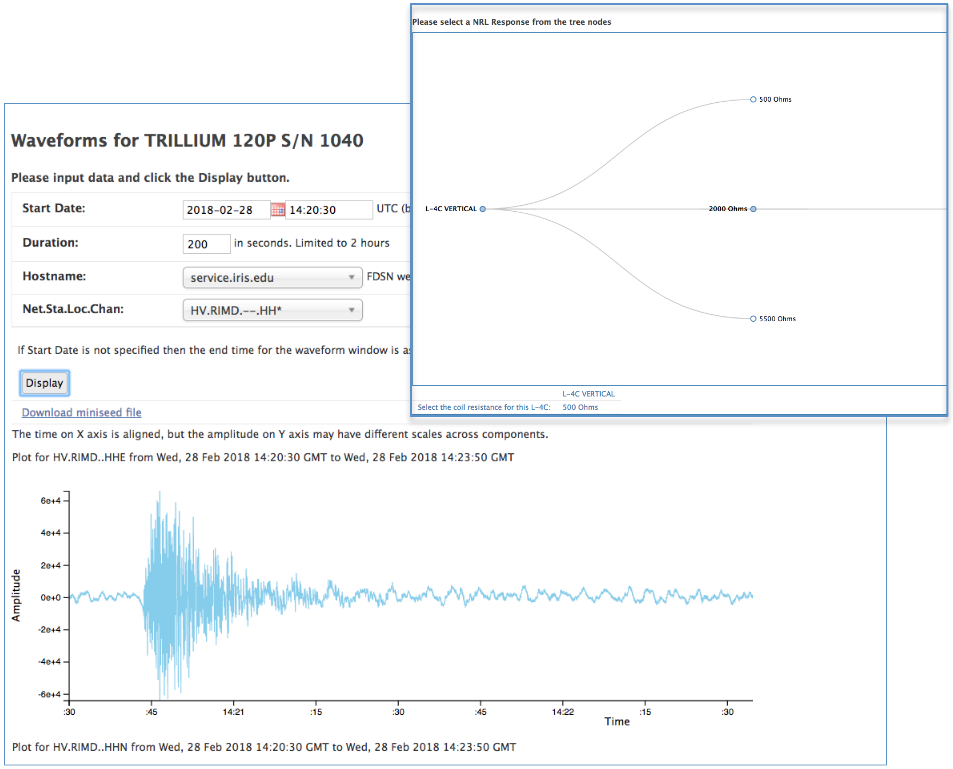
```
#!/usr/local/bin/python

import obspy as ob
from obspy.clients.fdsn import Client
from obspy.clients.fdsn.header import URL_MAPPINGS

# SCEDC catalogue
client = Client("SCEDC")

# Catalogue for given time period
bdt = ob.UTCDateTime("2017-03-09")
edt = ob.UTCDateTime("2017-03-16")
cat = client.get_events(starttime=bdt, endtime=edt, minmagnitude=2., contributor="SCSN")
catSoCal = cat.filter("latitude > 31.5", "latitude < 37.43", "longitude > -121.25", "longitude
 < -114.")

# Largest magnitude event
evmag = [e.mag for c in catSoCal.events for e in c.magnitudes]
selectev = catSoCal.events[evmag.index(max(evmag))]
evlat = selectev.origins[0].latitude
evlon = selectev.origins[0].longitude
dt = selectev.origins[0].time
bdt = dt - 60.
edt = dt + 180.

# Stations
stnlist = client.get_stations(network="CI", station="*", channel="HHZ,HNZ", location="00,--",
starttime=bdt, endtime=edt, latitude=evlat, longitude=evlon, maxradius=0.1, level="channel")

# Waveforms
bulk = []
for s in stnlist.get_contents()['channels'] :
    fs = s.split('.')
    bulk.append((fs[0], fs[1], fs[2], fs[3], bdt, edt))
st = client.get_waveforms_bulk(bulk)

# Plotting
st.plot(equal_scale=False)
stnlist.plot(projection="local")
catSoCal.plot(projection="local", label=None, color="date")
```

Caltech


2017-03-14T05:05:53.7883 - 2017-03-14T05:09:54.46
CI.CFS.00.HNZ
−60000
−65000
−70000
−75000
−80000
CI.CLT..HHZ
800000
400000
0
−400000
−800000
−1200000
CI.CLT..HNZ
−96000
−102000
−108000
−114000
−120000
−126000
CI.HLN..HNZ
−12000
−14000
−16000
−18000
−20000
CI.RSS..HNZ
15000
0
−15000
−30000
−45000
CI.RSS..HHZ
2000000
1000000
0
−1000000
−2000000
2017-03-14T05:06:00
05:07:00
CI.HLN
CI.CFS
CI.CLT
CI.RSS
34.1°N
34.025°N
33.95°N
117.4°W
117.35°W
117.3°W
117.25°W
117.2°W
117.15°W
31 events (2017-03-09 to 2017-03-15) - Color codes origin time, size the magnitude
37.5°N
36°N
34.5°N
33°N
31.5°N
124°W
122°W
120°W
118°W
116°W
114°W
112°W
Mar 10 2017
Mar 11 2017
Mar 12 2017
Mar 13 2017
Mar 14 2017
Mar 15 2017

Integrating with Station Information System

- SIS Integration with IRIS NRL and Data Centers hosting FDSN web services
  (see Philip Crotwell's talk in Dev workshop)
  (see Prabha Acharya's talk in Dev workshop)


Waveforms for TRILLIUM 120P S/N 1040

Please input data and click the Display button.

Start Date: 2018-02-28 14:20:30 UTC (b

Duration: 200 in seconds. Limited to 2 hours

Hostname: service.iris.edu FDSN we

Net.Sta.Loc.Chan: HV.RIMD.--.HH*

If Start Date is not specified then the end time for the waveform window is a

Download miniseed file

The time on X axis is aligned, but the amplitude on Y axis may have different scales across components.

Plot for HV.RIMD..HHE from Wed, 28 Feb 2018 14:20:30 GMT to Wed, 28 Feb 2018 14:23:50 GMT

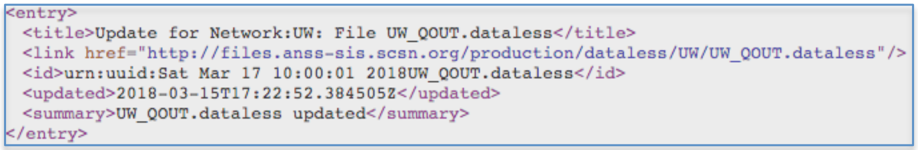
Plot for HV.RIMD..HHN from Wed, 28 Feb 2018 14:20:30 GMT to Wed, 28 Feb 2018 14:23:50 GMT

Please select a NRL Response from the tree nodes

L-4C VERTICAL

Select the coil resistance for this L-4C: 500 Ohms

- AQMS Processing
  SIS hosts dataless SEED files that can be imported into AQMS database. Updates atom feed to communicate what has changed.


```
<entry>
  <title>Update for Network:UW: File UW_QOUT.dataless</title>
  <link href="http://files.anss-sis.scsn.org/production/dataless/UW/UW_QOUT.dataless"/>
  <id>urn:uuid:Sat Mar 17 10:00:01 2018UW_QOUT.dataless</id>
  <updated>2018-03-15T17:22:52.384505Z</updated>
  <summary>UW_QOUT.dataless updated</summary>
</entry>
```

- *Programmatic access to SIS – Requirement gathering to begin mid 2018*

https://files.anss-sis.scsn.org/production/PublishedDataless.xml

dataless2aqms

Station metadata update in AQMS

southern california earthquake data center

SCSN Southern California Seismic Network

USGS science for a changing world

The problem

- Load updates to station metadata in a timely fashion
- Don’t miss any updates
- Perform related tasks atomically. For e.g. loading IR, HT, update loggers and sensors, etc.
- Verify the updates
- Track the loads

What is the tool? - dataless2aqms.py

- Python script that wraps Popuate_RdSEED, Simple_Resp by Stephane Zuzlewski at Berkeley
- Can ingest network or station dataless (sources : SIS, IRIS, NCEDC, ANZA, any dataless file)
- Runs in manual and automated modes
- Verification tests built in (At SCEDC, dataless loaded into staging db. Synced to production db upon verification. Currently, tests are EEW specific)
- Configurable
- Modular
- Integrated with Request Tracker, SIS, HT schema loader

Workflow

- *python dataless2aqms.py --ini dataless2aqms.ini --sta CI.AGO (or --net NC)*
- Wget or stdin dataless file
- Run (loads to staging db)
  - rdseed to generate RESP file
  - Populate_RdSEED with RESP file as input
  - Simple_Resp
  - SCSN specific tasks like convert MKS to CGS, set AQMS off date, etc
  - Wget Extended Station XML to populate Channelmap_amp/codaparms, sncl_loggers/sensors
  - HT schema loader
  - Make_Blockettes
- Run verification test that compares staging to production
- If verification test passes, sync staging to production

Automated mode (only stations in SIS)

- *python dataless2aqms.py --ini dataless2aqms.ini --detectnload*
- Publish dataless in SIS. Update atom feed.
- Cron job runs dataless2aqms.py --detectnload at 18:30 every day.
    - If timestamp of station in atom feed > channel_data.lddate, station has updated dataless.
    - Logs task in Request Tracker for each station being updated. If new station, log task for Station UI
    - For each station,
        - iterates over all steps from previous slide (2nd bullet point).
        - Verifies load.
            - If verification is successful, continue.
            - If verification fails, update task with the diff.
    - If no station had verification failures, sync staging to production.
        - Resolve tasks.
    - If there are verification failures, don't perform sync. Notify via email.
    - Create network dataless for CI and copy it to well known location.

Future work

- Auto detect and load non SIS stations.
  - Considering IRIS metadata service.
- Ingest multiple dataless files for a station.
- Ingest station xml as well as dataless.

Software details

- Redhat Enterprise Linux v6
- Written in Python 2.7
  - cx_Oracle, feedparser
- Dependencies : rdseed, Populate_RdSEED, Simple_Resp, Make_Blockettes
- Logging : python logging module, conlog
- Version controlled in local git repo. Deployed as SCSN via Puppet.
- Available on AQMS repo in the near future.
- Documentation is on SCSN wiki.

Acknowledgements

Thanks to Stephane Zuzlewski and Ellen Yu

Developer : Aparna Bhaskaran (aparnab@gps.caltech.edu)

Questions?

PDL Listeners, and GeoJSON Event Service

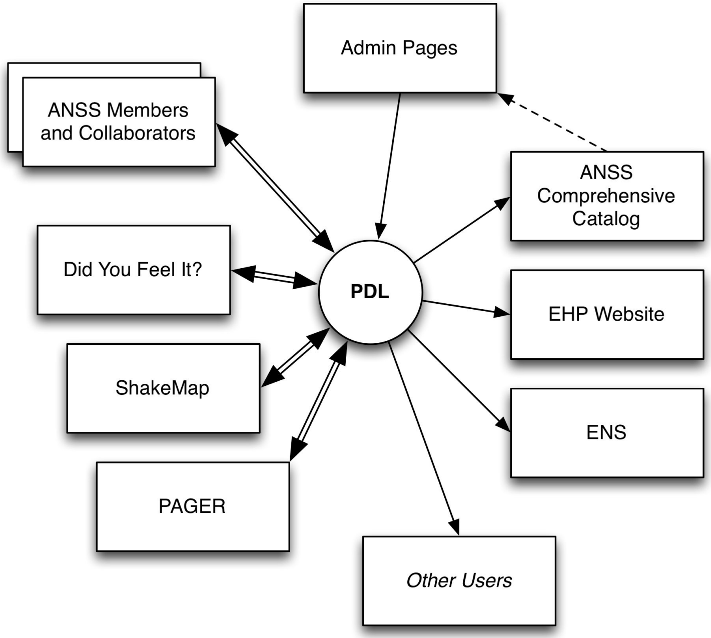
NetOpsIX - Integrating tools from other systems

Jeremy Fee <jmfee@usgs.gov>

U.S. Department of the Interior
U.S. Geological Survey

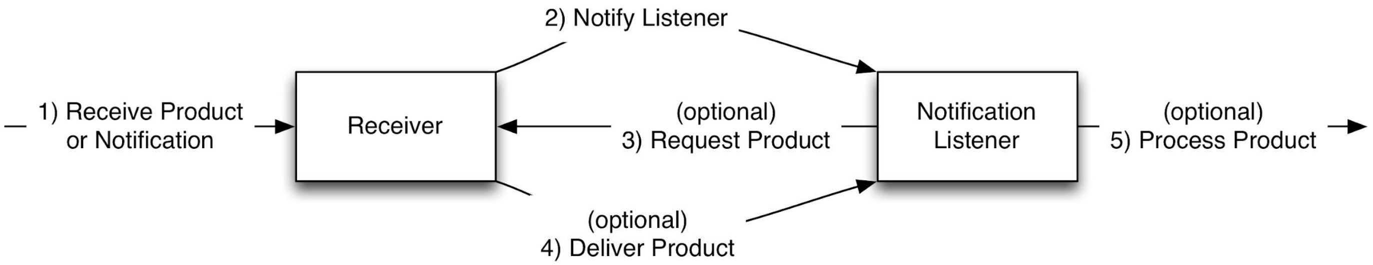
Product Distribution Layer (PDL)

- Integrates systems
  - ShakeMap, ENS, others trigger when origin received; PAGER triggers when ShakeMap received; ...
- Loosely coupled
- Push distribution
- Extensible format



PDL Notification Listener

- Notified about all products
  - Notification includes Product ID (source, type, code, updateTime)
  - One queue and thread per listener
- Configure products to process



2) Notify Listener
1) Receive Product or Notification
Receiver
(optional) 3) Request Product
Notification Listener
(optional) 5) Process Product
(optional) 4) Deliver Product

PDL Indexer

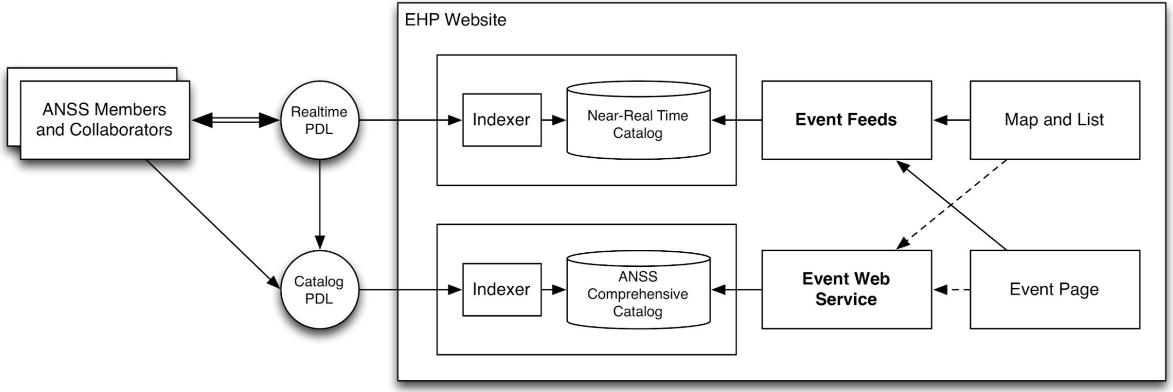
- Indexer is a Notification Listener
- Associates Products into Catalog of Events
  - Using Event ID or Location (16s, 100km)
- Determines Preferredness using Modules
  - Default module uses ANSS Authoritative Regions
- Manual override via products
- Notifies Indexer Listeners when Catalog changes

PDL Indexer Listeners

- Notified by Indexer after Catalog changes
  - Indexer Action (multiple actions possible in response to one product)
    - EVENT_ADDED - first time event was seen
      - EVENT_SPLIT - one existing event is now two or more
    - EVENT_UPDATED - information added/removed from event
    - EVENT_DELETED - event deleted
      - EVENT_MERGED - two or more existing events are now one
    - EVENT_ARCHIVED - archive policies are removing information
    - PRODUCT_(ADDED|UPDATED|DELETED|ARCHIVED) - unassociated products
  - Preferred event information (from preferred origin)
  - Product that was indexed (may or may not be preferred)

Event Web Service and Feeds

- Access to Comprehensive Catalog
- Data for Map/List and Event Page



EHP Website

ANSS Members and Collaborators

Realtime PDL

Catalog PDL

Indexer

Near-Real Time Catalog

Indexer

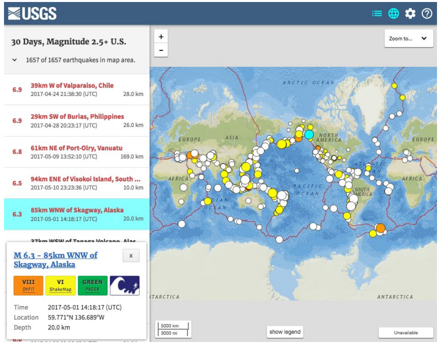
ANSS Comprehensive Catalog

Event Feeds

Event Web Service

Map and List

Event Page



30 Days, Magnitude 2.5+ U.S.

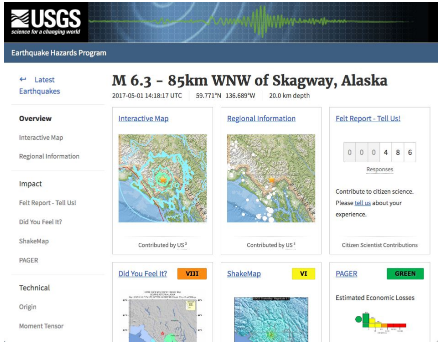
1657 of 1657 earthquakes in map area.

6.9	39km W of Valparaiso, Chile 2017-04-24 21:38:30 (UTC)	28.0 km
6.9	29km SW of Burias, Philippines 2017-04-28 20:23:17 (UTC)	26.0 km
6.8	61km NE of Port-Olry, Vanuatu 2017-05-09 13:52:10 (UTC)	169.0 km
6.5	94km ENE of Visokoi Island, South ... 2017-05-10 23:23:36 (UTC)	10.0 km
6.3	85km WNW of Skagway, Alaska 2017-05-01 14:18:17 (UTC)	20.0 km

M 6.3 - 85km WNW of Skagway, Alaska

VIII DYFI? | VI ShakeMap | GREEN PAGER

Time 2017-05-01 14:18:17 (UTC)
Location 59.771°N 136.689°W
Depth 20.0 km



Earthquake Hazards Program

← Latest Earthquakes

M 6.3 - 85km WNW of Skagway, Alaska

2017-05-01 14:18:17 UTC | 59.771°N 136.689°W | 20.0 km depth

Overview
Interactive Map
Regional Information

Impact
Felt Report - Tell Us!
Did You Feel It?
ShakeMap
PAGER

Technical
Origin
Moment Tensor

Interactive Map — Contributed by US

Regional Information — Contributed by US

Felt Report - Tell Us! — 0 0 0 4 8 6 Responses. Contribute to citizen science. Please tell us about your experience. — Citizen Scientist Contributions

Did You Feel It? VIII

ShakeMap VI

PAGER GREEN — Estimated Economic Losses

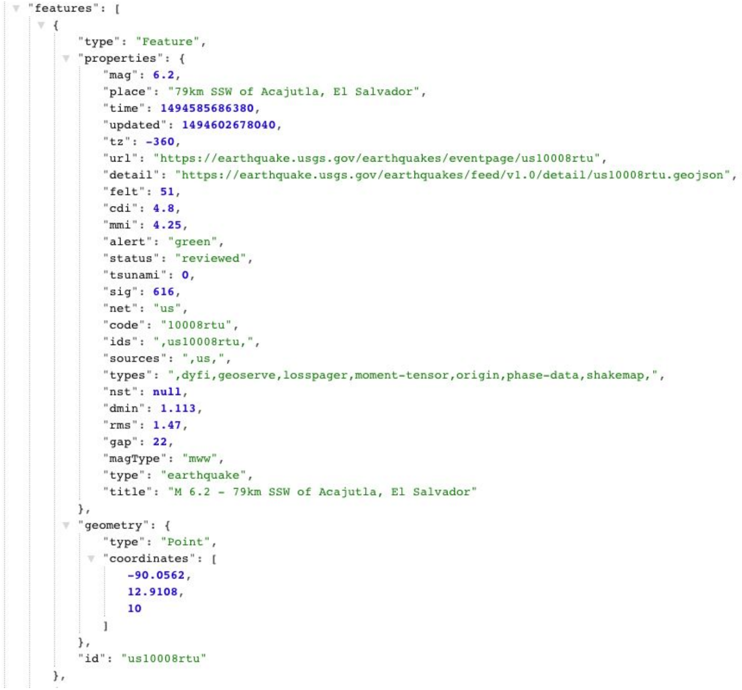
Event Web Service

- FDSN Event Web Service v1.1 compatible (mostly)
  - Quakeml summary generated based on product properties
  - Quakeml detail returns *phase-data* quakeml for requested Event ID
  - catalog/contributor mapping may not match intent
- GeoJSON output formats are most complete
  - Similar to underlying PDL Indexer schema
  - Pre-dates FDSN compatibility

https://earthquake.usgs.gov/fdsnws/event/1/

GeoJSON Summary

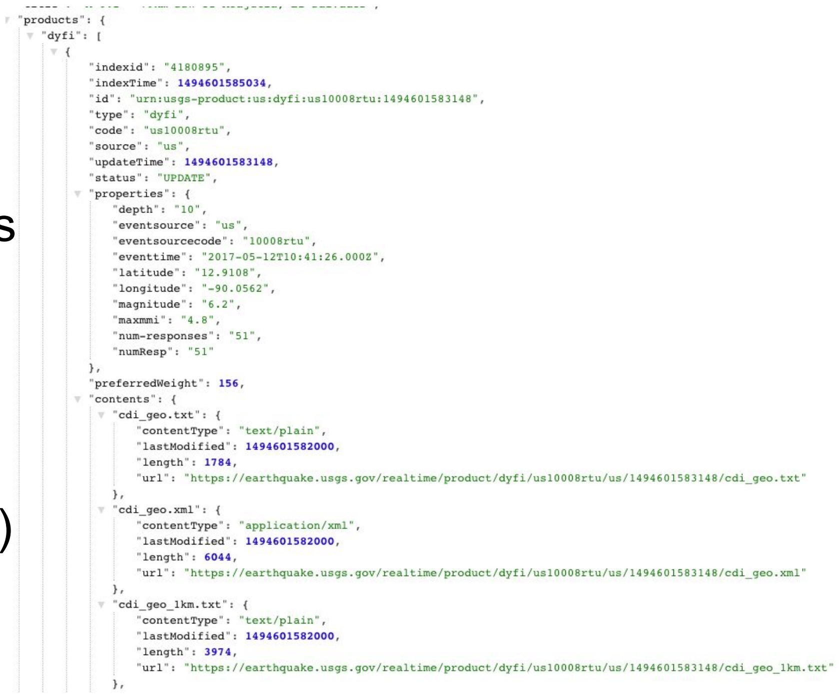
- GeoJSON FeatureCollection
  - Summary of multiple events
- Notable API Parameters
  - *catalog* - search/return event information from a specific catalog (vs preferred)
  - *contributor* - any information contributed
  - *producttype* - specific type contributed, can be combined with *contributor*
  - *updatedafter* - any product updated



```
▼ "features": [
  ▼ {
      "type": "Feature",
    ▼ "properties": {
        "mag": 6.2,
        "place": "79km SSW of Acajutla, El Salvador",
        "time": 1494585686380,
        "updated": 1494602678040,
        "tz": -360,
        "url": "https://earthquake.usgs.gov/earthquakes/eventpage/us10008rtu",
        "detail": "https://earthquake.usgs.gov/earthquakes/feed/v1.0/detail/us10008rtu.geojson",
        "felt": 51,
        "cdi": 4.8,
        "mmi": 4.25,
        "alert": "green",
        "status": "reviewed",
        "tsunami": 0,
        "sig": 616,
        "net": "us",
        "code": "10008rtu",
        "ids": ",us10008rtu,",
        "sources": ",us,",
        "types": ",dyfi,geoserve,losspager,moment-tensor,origin,phase-data,shakemap,",
        "nst": null,
        "dmin": 1.113,
        "rms": 1.47,
        "gap": 22,
        "magType": "mww",
        "type": "earthquake",
        "title": "M 6.2 - 79km SSW of Acajutla, El Salvador"
      },
    ▼ "geometry": {
        "type": "Point",
      ▼ "coordinates": [
          -90.0562,
          12.9108,
          10
        ]
      },
      "id": "us10008rtu"
    },
```

GeoJSON Detail

- GeoJSON Feature
  - Detail for one event
  - Additional *products* property includes product information
- Notable API Parameters
  - *includedeleted* - return information when event deleted (normally HTTP 409)
  - *includesuperseded* - return all versions of all products



```
"products": {
  "dyfi": [
    {
      "indexid": "4180895",
      "indexTime": 1494601585034,
      "id": "urn:usgs-product:us:dyfi:us10008rtu:1494601583148",
      "type": "dyfi",
      "code": "us10008rtu",
      "source": "us",
      "updateTime": 1494601583148,
      "status": "UPDATE",
      "properties": {
        "depth": "10",
        "eventsource": "us",
        "eventsourcecode": "10008rtu",
        "eventtime": "2017-05-12T10:41:26.000Z",
        "latitude": "12.9108",
        "longitude": "-90.0562",
        "magnitude": "6.2",
        "maxmmi": "4.8",
        "num-responses": "51",
        "numResp": "51"
      },
      "preferredWeight": 156,
      "contents": {
        "cdi_geo.txt": {
          "contentType": "text/plain",
          "lastModified": 1494601582000,
          "length": 1784,
          "url": "https://earthquake.usgs.gov/realtime/product/dyfi/us10008rtu/us/1494601583148/cdi_geo.txt"
        },
        "cdi_geo.xml": {
          "contentType": "application/xml",
          "lastModified": 1494601582000,
          "length": 6044,
          "url": "https://earthquake.usgs.gov/realtime/product/dyfi/us10008rtu/us/1494601583148/cdi_geo.xml"
        },
        "cdi_geo_1km.txt": {
          "contentType": "text/plain",
          "lastModified": 1494601582000,
          "length": 3974,
          "url": "https://earthquake.usgs.gov/realtime/product/dyfi/us10008rtu/us/1494601583148/cdi_geo_1km.txt"
        },
```

More Information

- PDL
  - https://usgs.github.io/pdl
  - https://github.com/usgs/pdl
- Event Web Service and Feeds
  - https://earthquake.usgs.gov/fdsnws/event/1/
  - https://earthquake.usgs.gov/earthquakes/feed/
  - https://github.com/usgs/earthquake-event-ws
  - https://github.com/usgs/libcomcat

EEW PDL/Comcat Integration

NetOpsIX - Integrating tools from other systems

Jeremy Fee <jmfee@usgs.gov>

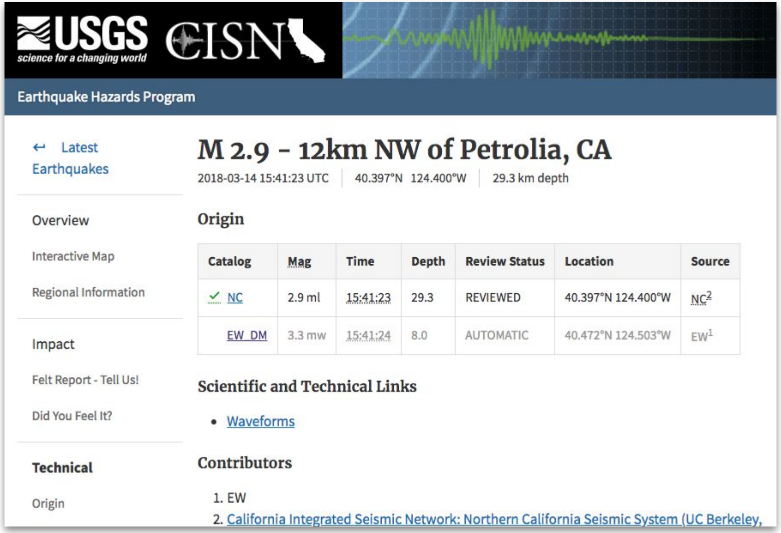
U.S. Department of the Interior
U.S. Geological Survey

Why Integrate?

- Integrate with existing information
  - Users who visit the web site immediately after event
  - Start collecting Did You Feel It? felt reports sooner
  - Automatically superseded by RSN information
  - Provide more information following an alert
- NEIC/RSN can receive EEW origin via PDL
- EEW can use PDL to identify RSN Event ID

Current Integration

- PDL Sender by Gary Gann
  - Quakeml from Core-Info Point Source
  - Converted to *origin* products
  - Rate limits using mag/location changes
- Sending to staging PDL
  - Staging Event Page (Technical)
  - Staging API



M 2.9 - 12km NW of Petrolia, CA

2018-03-14 15:41:23 UTC | 40.397°N 124.400°W | 29.3 km depth

Origin

Catalog	Mag	Time	Depth	Review Status	Location	Source
✓ NC	2.9 ml	15:41:23	29.3	REVIEWED	40.397°N 124.400°W	NC[2]
EW_DM	3.3 mw	15:41:24	8.0	AUTOMATIC	40.472°N 124.503°W	EW[1]

Scientific and Technical Links

- Waveforms

Contributors

1. EW
2. California Integrated Seismic Network: Northern California Seismic System (UC Berkeley,

https://dev-earthquake.cr.usgs.gov/earthquakes/eventpage/nc72983731
https://dev-earthquake.cr.usgs.gov/fdsnws/event/1/query?format=geojson&catalog=ew_dm

Ongoing

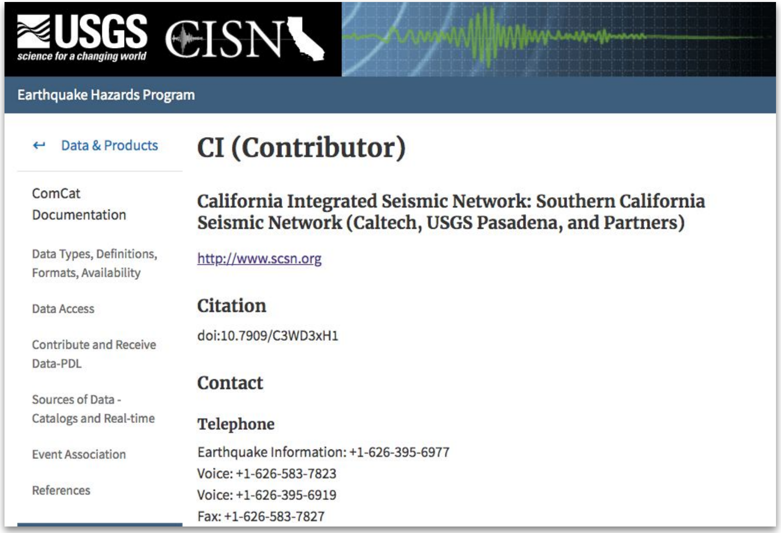
- Rate Limiting
  - Send first
  - Send when point source changes magnitude by 0.2, or distance by X km
  - Eventually same criteria as CAP Alerts
- Multiple Event IDs
  - Possibly related to failover
  - May use multiple EEW catalogs

Integration Possibilities

- Planned
  - Contributor Page
  - Deleted Event Commentary
- Proposed
  - Event Page Integration
  - Alerts on Home Page
  - Background Page
  - Additional Product Information

Planned - Contributor Page

- Attribution information for ComCat, Event Page
  - Full name for *EW* network
  - Optional logo



USGS science for a changing world
CISN
Earthquake Hazards Program
↩ Data & Products
ComCat Documentation
Data Types, Definitions, Formats, Availability
Data Access
Contribute and Receive Data-PDL
Sources of Data - Catalogs and Real-time
Event Association
References

CI (Contributor)

California Integrated Seismic Network: Southern California Seismic Network (Caltech, USGS Pasadena, and Partners)

http://www.scsn.org

Citation

doi:10.7909/C3WD3xH1

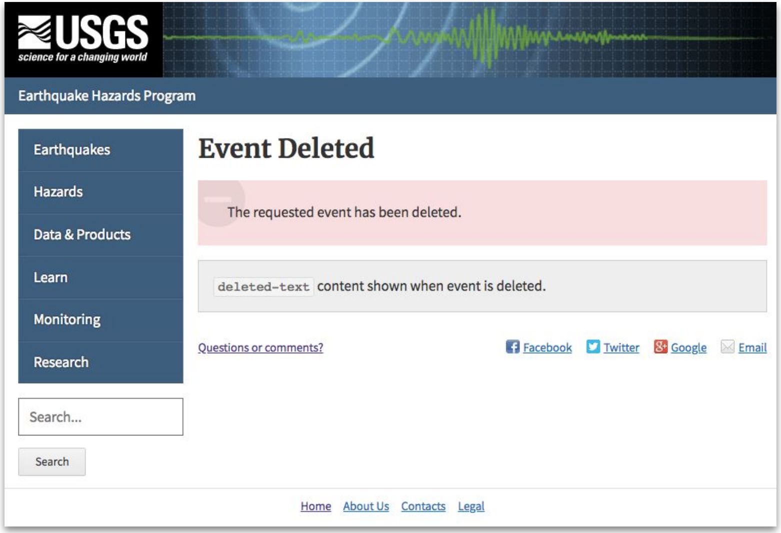
Contact

Telephone

Earthquake Information: +1-626-395-6977
Voice: +1-626-583-7823
Voice: +1-626-395-6919
Fax: +1-626-583-7827

Planned - Deleted Event Commentary

- New *delete-text* product, shown if event is deleted
- Replace existing Errata
- Proposed - use by EEW after false alert



Event Deleted

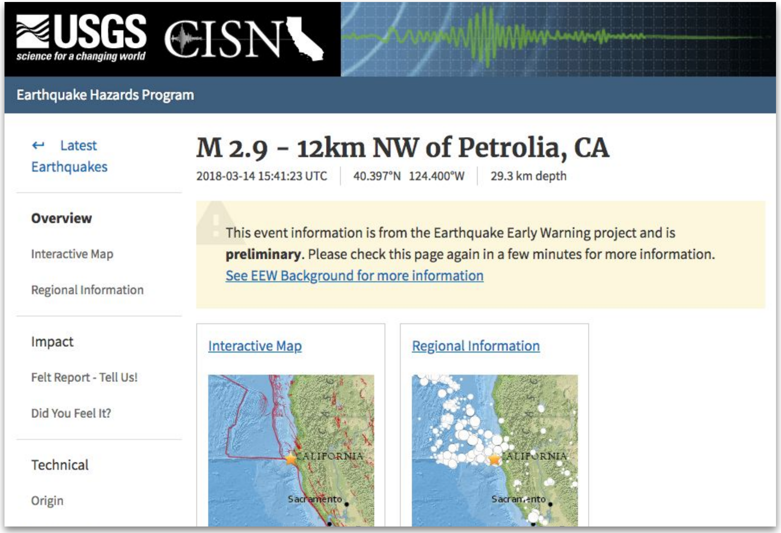
The requested event has been deleted.

`deleted-text` content shown when event is deleted.

https://earthquake.usgs.gov/earthquakes/errata.php

Proposed - Warning at Top of Page

- Shown at top of page when EEW is preferred



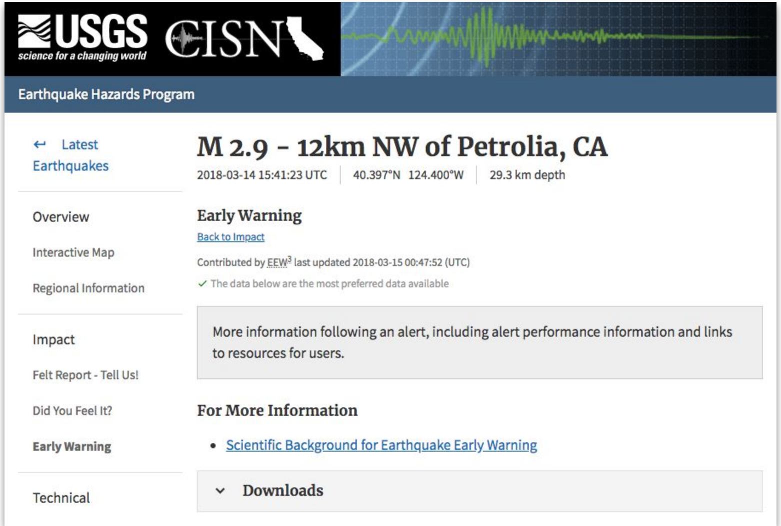
M 2.9 - 12km NW of Petrolia, CA

2018-03-14 15:41:23 UTC | 40.397°N 124.400°W | 29.3 km depth

This event information is from the Earthquake Early Warning project and is **preliminary**. Please check this page again in a few minutes for more information. See EEW Background for more information

Proposed - Section on Event Page

- Show more details following confirmed or missed EEW Alert



M 2.9 - 12km NW of Petrolia, CA

2018-03-14 15:41:23 UTC | 40.397°N 124.400°W | 29.3 km depth

Early Warning

Back to Impact

Contributed by EEW[3] last updated 2018-03-15 00:47:52 (UTC)

✓ The data below are the most preferred data available

More information following an alert, including alert performance information and links to resources for users.

For More Information

- Scientific Background for Earthquake Early Warning

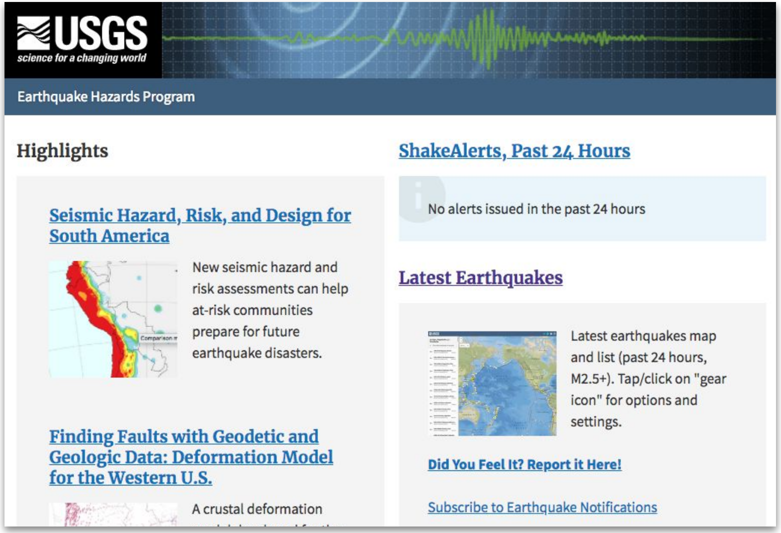
⌄ Downloads

Proposed - Link to Event Page

- Can link directly to EEW Section
- Event Page could be primary place to post follow up information
  - Stored in ComCat with other event information
- Depends on ability to include links

Proposed - Alerts on Home Page

- Link to corresponding Event Page
  - True or false alerts
- Similar to Significant Earthquakes



Earthquake Hazards Program

Highlights

Seismic Hazard, Risk, and Design for South America

New seismic hazard and risk assessments can help at-risk communities prepare for future earthquake disasters.

Finding Faults with Geodetic and Geologic Data: Deformation Model for the Western U.S.

A crustal deformation

ShakeAlerts, Past 24 Hours

No alerts issued in the past 24 hours

Latest Earthquakes

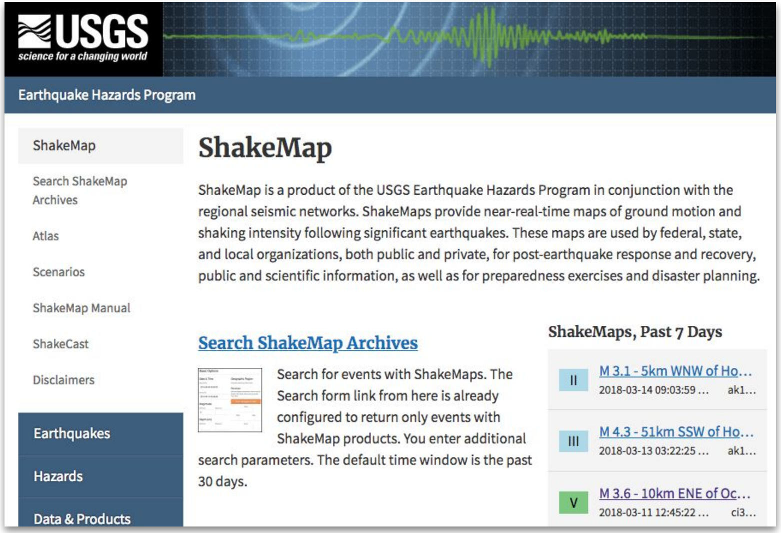
Latest earthquakes map and list (past 24 hours, M2.5+). Tap/click on "gear icon" for options and settings.

Did You Feel It? Report it Here!

Subscribe to Earthquake Notifications

Proposed - Background Page

- Show recent alerts
- Similar to other USGS products



Earthquake Hazards Program

ShakeMap

ShakeMap is a product of the USGS Earthquake Hazards Program in conjunction with the regional seismic networks. ShakeMaps provide near-real-time maps of ground motion and shaking intensity following significant earthquakes. These maps are used by federal, state, and local organizations, both public and private, for post-earthquake response and recovery, public and scientific information, as well as for preparedness exercises and disaster planning.

Search ShakeMap Archives

Search for events with ShakeMaps. The Search form link from here is already configured to return only events with ShakeMap products. You enter additional search parameters. The default time window is the past 30 days.

ShakeMaps, Past 7 Days

II	M 3.1 - 5km WNW of Ho… 2018-03-14 09:03:59 …	ak1…
III	M 4.3 - 51km SSW of Ho… 2018-03-13 03:22:25 …	ak1…
V	M 3.6 - 10km ENE of Oc… 2018-03-11 12:45:22 …	ci3…

Proposed - Additional Product Info

- Attach Core-Info XML to *origin* product
  - Could be downloaded by users
  - Display more detailed information, e.g. point and line source
- Send CAP Alert as *cap* product
  - Would automatically be included in ATOM feeds
  - Would be searchable via API

Thanks for listening!

References

- Jennifer Andrews *jrand@gps.caltech.edu*
- Aparna Bhaskaran *aparnab@gps.caltech.edu*
- Jon Connolly *joncon@uw.edu*
- Jeremy Fee *jmfee@usgs.gov*
- Paul Friberg *paulf@isti.com*
- Steve Guiwits *sguiwits@usgs.gov*
- Ellen Yu *eyu@gps.caltech.edu*
- Stephane Zuzlewski *stephane@seismo.berkeley.edu*