PH5: AN INTRODUCTION

A Look at the PH5 Format and a Hands-On Demonstration to Build Your Own Archive

IRIS
PASSCAL

Agenda

- Introduction to PH5

- Hands-on building a PH5 archive

- Validating and viewing a PH5 archive

- Sending data to and requesting data from the DMC

Introduction

- PH5 - An archival format that uses Hierarchal Data Format, Version 5 (HDF5)

- HDF5 - a flexible and efficient data storage method, operates on a variety of platforms

- Kitchen Exchange Format (.kef) - an easy-to-read text format that allows for the uploading of information into a PH5 archive
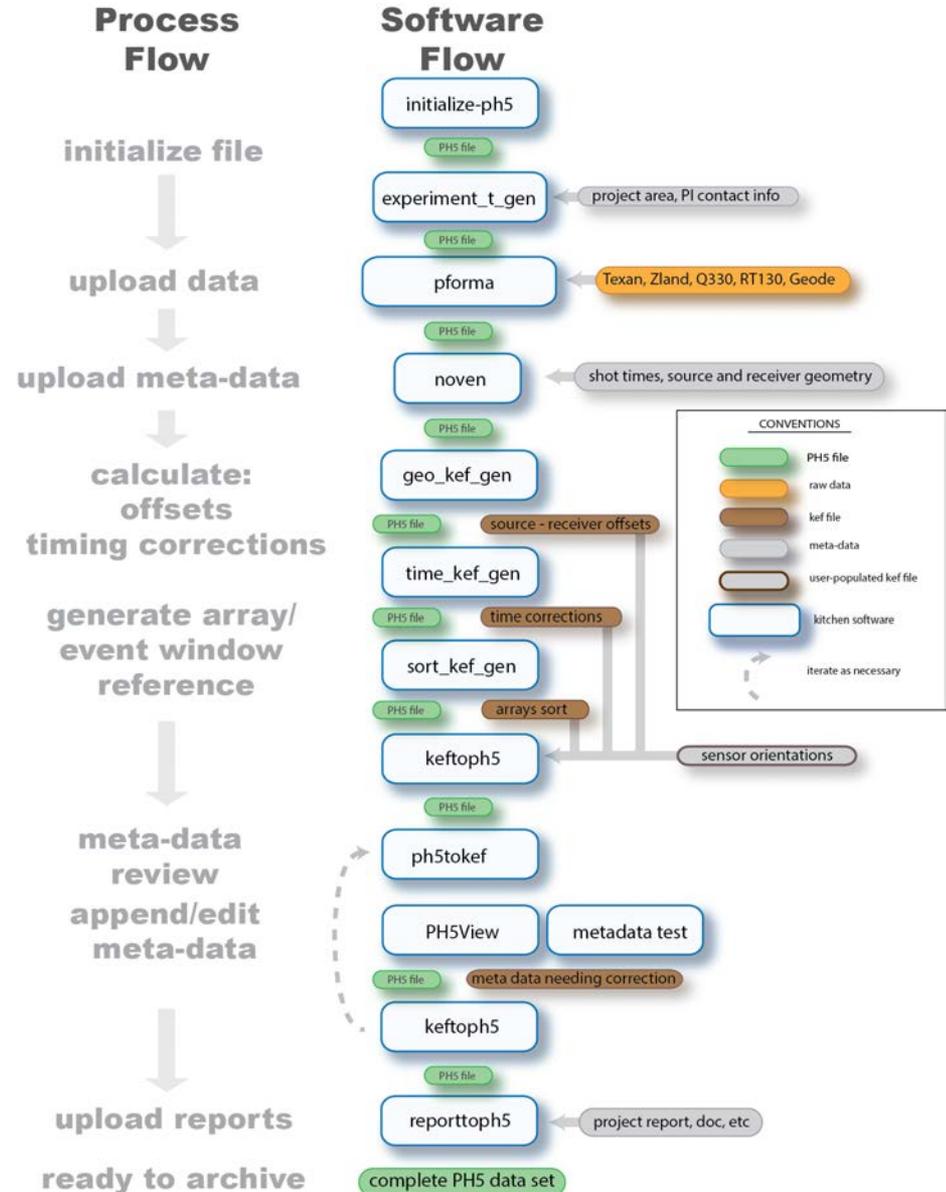
Why HDF5?
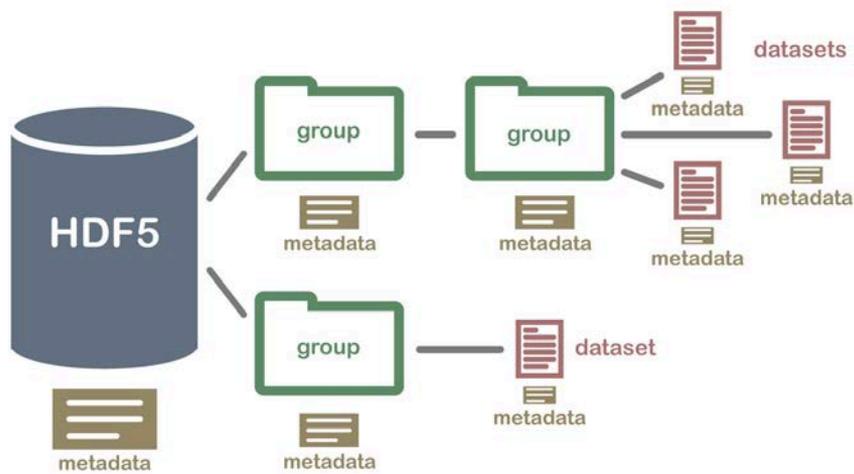
- Portable

- Extensible

- Stores, manipulates, and views data easily

- Unlimited variety

Where do I find PH5?

- How to Download—Go to https://github.com/PIC-IRIS/PH5/wiki, and follow the installation instructions.

- Information on GitHub includes:
  - Wiki
  - Installation instructions
  - Software download

Why PH5?

Controlled Source

- PH5 has advantages (supports multiple input data formats, separate metadata, etc)

- Unlimited time series length, metadata is separate from waveforms

- Can output as SAC, miniSEED, SEG-Y

Why PH5?

Controlled Source

- Allows user to cut SEG-Y gathers as needed; dynamic access to the data

- Stores all data collected, not just static SEG-Y gathers

Why PH5?

Mixed Mode

- Passive data is easy to archive with PH5, and can be combined with controlled source data

- Creates a single archive for experiments with both passive and controlled source targets

- Ex) can output for ambient noise or for an event gather

What's included in a PH5 archive?

Metadata

Data
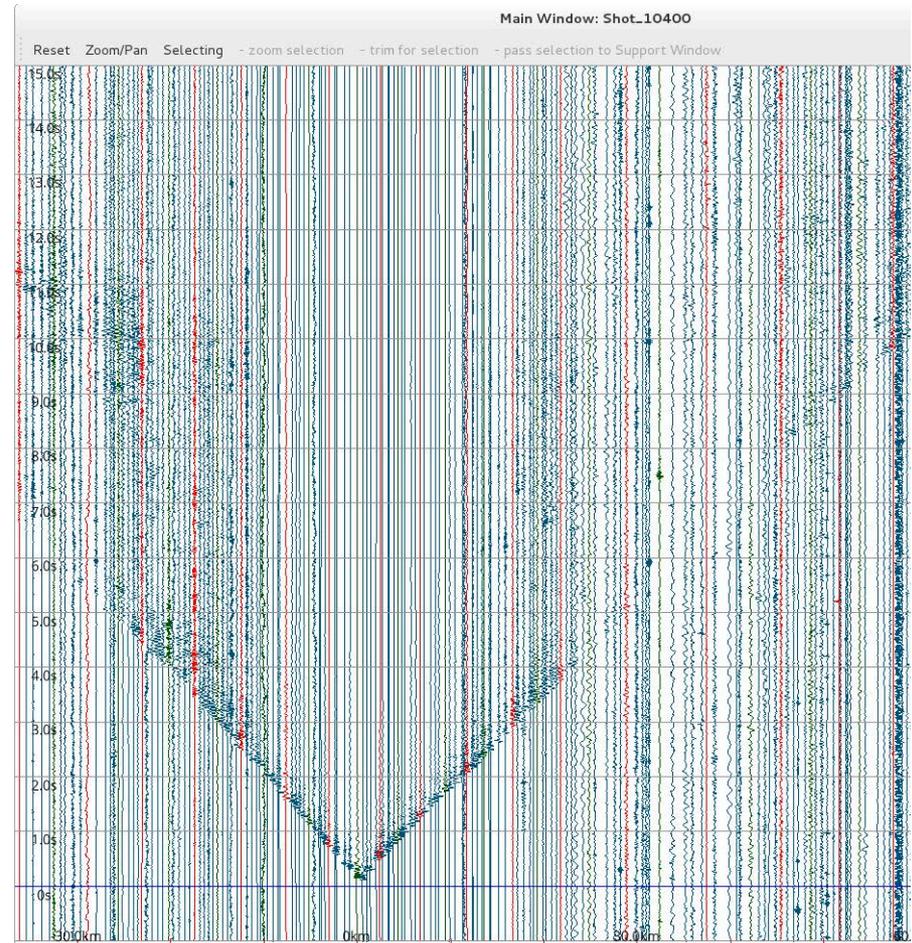
Metadata

- Make good field notes
- Prepare a spreadsheet/ comma separated CSV file for shot and receiver files

station	serial	lat	lon	elevation	Channel	Array	Deploy	Pickup
1001	12997	8.64808	-71.85546	57	1	1	2015:320:00:00.00	2015:321:00:00.00
1002	13919	8.64698	-71.85546	56.81	1	1	2015:320:00:00.00	2015:321:00:00.00
1003	11891	8.64625	-71.85493	56.61	1	1	2015:320:00:00.00	2015:321:00:00.00
1004	13971	8.64549	-71.85435	56.33	1	1	2015:320:00:00.00	2015:321:00:00.00
1005	14094	8.64478	-71.85378	55.86	1	1	2015:320:00:00.00	2015:321:00:00.00
1006	12945	8.64409	-71.85323	55.43	1	1	2015:320:00:00.00	2015:321:00:00.00
1007	12394	8.64329	-71.85276	55.51	1	1	2015:320:00:00.00	2015:321:00:00.00
1008	11590	8.64212	-71.85288	54.84	1	1	2015:320:00:00.00	2015:321:00:00.00
1009	12545	8.64043	-71.85354	55.2	1	1	2015:320:00:00.00	2015:321:00:00.00
1010	12870	8.63791	-71.85376	55.55	1	1	2015:320:00:00.00	2015:321:00:00.00

Shot	lat	lon	elev	time	size	unit	depth
5202	33.80847	-83.55728	225	2015:219:03:20:00.020	273	kg	16
5203	33.69766	-83.49372	194	2015:219:07:20:00.020	182	kg	18
5204	33.45043	-83.39242	172	2015:219:05:50:00.020	727	kg	22
5205	33.31253	-83.29161	177	2015:219:08:51:00.020	182	kg	17
5206	33.11601	-83.12384	147	2015:220:03:00:00.020	182	kg	19
5207	32.83597	-82.89922	102	2015:220:04:10:00.020	182	kg	17
5208	32.69918	-82.92459	75	2015:220:05:10:00.020	182	kg	19
5209	32.47656	-82.80255	59	2015:220:06:18:00.020	364	kg	21
5210	32.35993	-82.71048	55	2015:220:05:05:00.020	182	kg	12
5212	31.84319	-82.42969	68	2015:220:03:05:00.020	182	kg	19

PH5: Compatible data formats

Input

- miniSEED, TRD, ZIP, Fairfield Nodal SEG-D, with more being added!

- PH5 is extensible – can write your own module to ingest different data formats

Output

- miniSEED

- SAC

- SEG-Y

PH5 in the field

- Building a PH5 archive allows for easy viewing of controlled source data in the field

- Example – Using PH5 to view data from individual lines of a controlled source experiment – view each line as it comes in

- Encourages metadata management/QC in the field

Let's build an archive
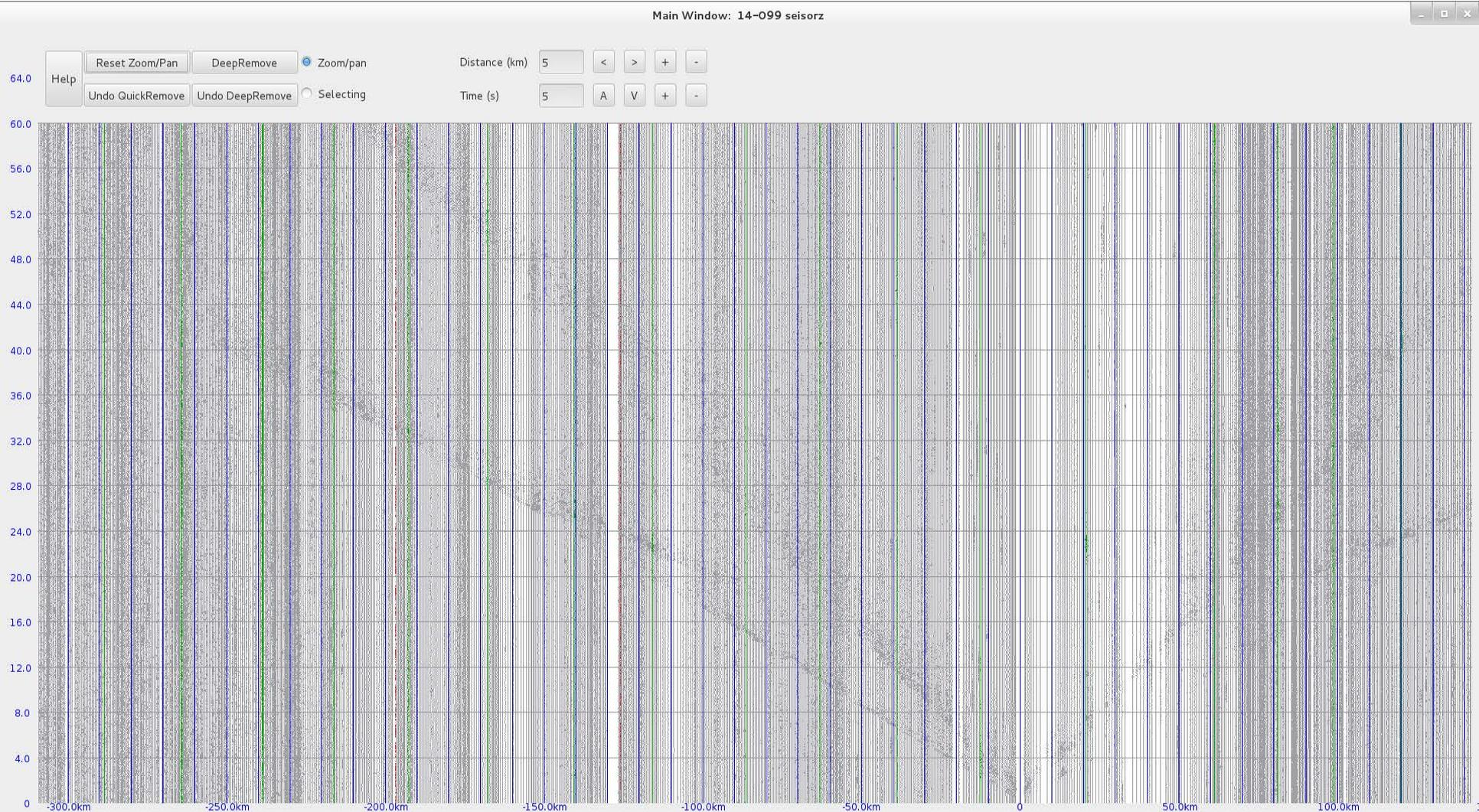
PH5 Requirements

- Install using Anaconda (recommended)
- OR install Python dependencies piecemeal

- Anaconda version 2.7
  - Anaconda: Python platform for data science
  - Link to Anaconda installer and installation instructions included in the PH5 GitHub
- Access PH5 installation instructions on PASSCAL GitHub: https://github.com/PIC-IRIS/PH5/wiki

PH5 Documentation

- Documentation on PASSCAL website: https://www.passcal.nmt.edu/content/data-archiving/documentation/active-source

- Documentation will also be available on the PH5 GitHub

- Nutshell doc: short version of documentation

- Long doc: longer (much, much longer) more detailed version of documentation with screenshots and examples

- Documentation assumes basic user familiarity with Unix

PH5 structure

- PH5 archives consist of a master.ph5 file and a number of miniPH5 files.
- master.ph5 contains metadata and links to the miniPH5 files
- miniPH5 files contain trace data; number of files depends on size of data volume

```
(ph5) [field@texserv2 Sigma]$ ls
master.ph5          miniPH5_00008.ph5   miniPH5_00016.ph5   miniPH5_00024.ph5   miniPH5_00032.ph5
miniPH5_00001.ph5   miniPH5_00009.ph5   miniPH5_00017.ph5   miniPH5_00025.ph5   miniPH5_00033.ph5
miniPH5_00002.ph5   miniPH5_00010.ph5   miniPH5_00018.ph5   miniPH5_00026.ph5   miniPH5_00034.ph5
miniPH5_00003.ph5   miniPH5_00011.ph5   miniPH5_00019.ph5   miniPH5_00027.ph5   miniPH5_00035.ph5
miniPH5_00004.ph5   miniPH5_00012.ph5   miniPH5_00020.ph5   miniPH5_00028.ph5   miniPH5_00036.ph5
miniPH5_00005.ph5   miniPH5_00013.ph5   miniPH5_00021.ph5   miniPH5_00029.ph5
miniPH5_00006.ph5   miniPH5_00014.ph5   miniPH5_00022.ph5   miniPH5_00030.ph5
miniPH5_00007.ph5   miniPH5_00015.ph5   miniPH5_00023.ph5   miniPH5_00031.ph5
```

HANDS-ON DATA

How do you start?

The practice data set

- Array 1 – Fairfield nodes deployed in Socorro, NM in 2016

- Array 2 – Reftek RT125A (Texans) deployed with 4.5Hz geophones in the Tien Shan in 2007 (At DMC: 16-014)

- Array 5 & 6 – Reftek RT130s deployed with Guralp CMG3T sensors in Quebec/Maine in 2014 (At DMC: X8.2012-2017)

- All metadata for Arrays 2, 5, & 6 has been modified to place stations in Socorro, NM

Activate PH5 environment

- PH5 commands are all run from a terminal window

- Since PH5 is installed in an Anaconda environment, need to activate that environment:

- >> **source activate** ph5

- To deactivate PH5 and return to normal environment:

- >> **source deactivate** ph5

Creating an organized directory structure

- Directory structure is suggested by documentation

- Create folders for raw data, metadata, and the PH5 archive

```
(ph5) [field@texserv2 PROJECT-DIR]$ ls
METADATA   PH5   RAW-NODE   RAW-RT130   RAW-TEXAN
```

- All commands in documentation written assuming you use the suggested directory structure

Data ingestion

- What data do you have?

- Raw data formats
  - miniSEED
  - .TRD (RT125a datalogger)
  - .ZIP (RT130 datalogger)
  - .fcnt (Fairfield Nodal SEG-D)

- Recommend sorting raw data by type to make troubleshooting easier

```
(ph5) [field@texserv2 PROJECT-DIR]$ ls
METADATA   PH5   RAW-NODE   RAW-RT130   RAW-TEXAN
```

Create a list of raw files

- Need a list of all raw data files with their full path

- For nodes, default file names are functional but not very descriptive:

  - Original node file names:

  /home/ph5/PH5_WORKSHOP_DATA/NODE/10.fcnt
  /home/ph5/PH5_WORKSHOP_DATA/NODE/12.fcnt

- Before loading data, create soft links with more descriptive file names:

  - New files names (soft links to original data):

  PIC_1_10_1913.0.0.rg16
  PIC_1_12_1916.0.0.rg16

pforma

- GUI application to load data using multiple cores if available
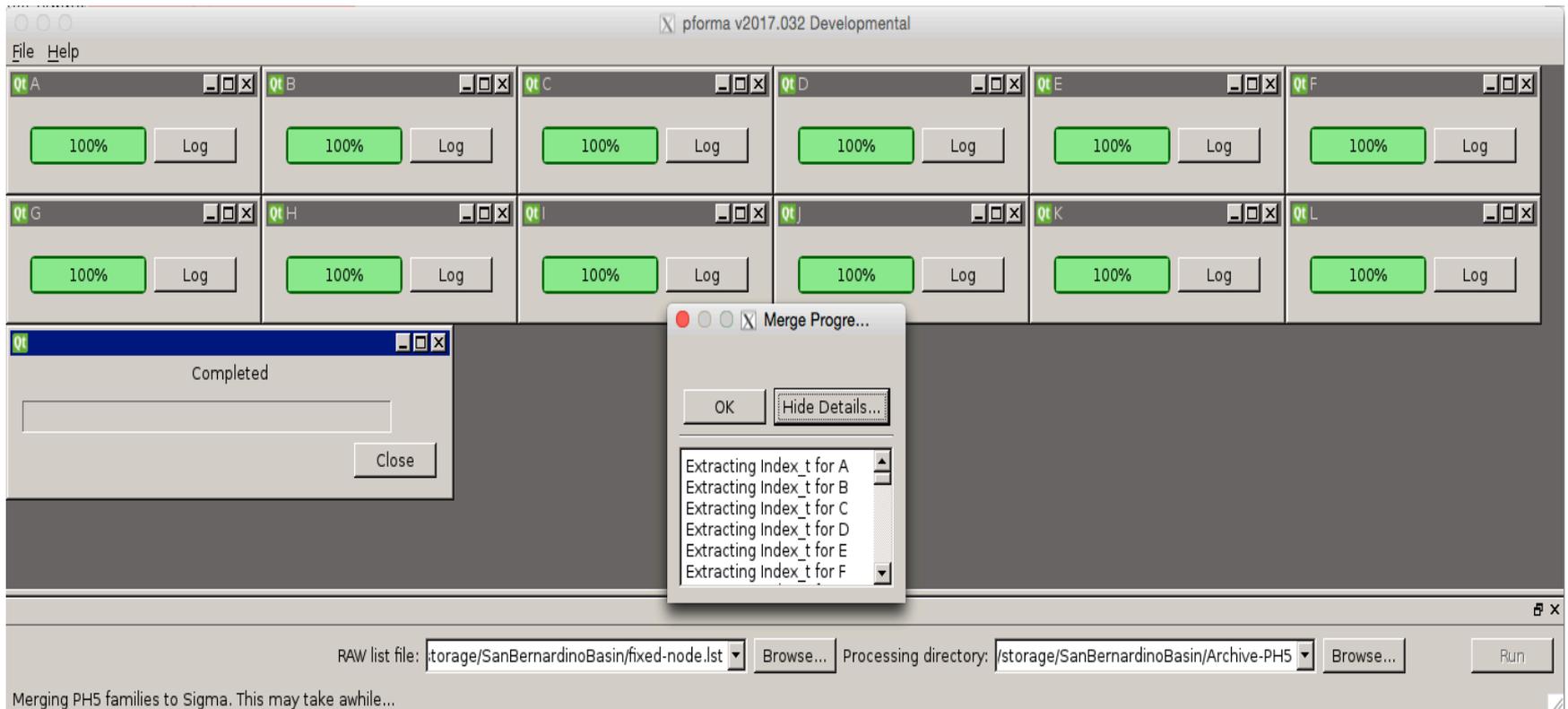
pforma continued

- Requires a list of full path to all raw data files and a processing directory to write PH5

- Creates a subdirectory in main processing directory for each subset of data it processes (ex, A, B, C, D, etc)

- After loading all data, merges subdirectories into a Sigma directory

- Several additional parameters are required for nodes: UTM zone, # of SEGD traces to combine

Hands-on: Nutshell steps 1-3

- Activate the PH5 environment
  - **source activate** ph5

- 1. Create an organized directory structure

- 2. Create list of raw files
  - Create raw file lists for each instrument type. Then combine final versions of all three lists into a single raw file list

- 3. Run pforma
  - Nodes - UTM Zone: 13, Number of SEG-D Traces to Combine: 1

Metadata in PH5

- Metadata is loaded into PH5 via kitchen exchange format (kef) files

- Main kef files for metadata:
  - receiver kefs
  - shot/event kefs
  - experiment summary kef

- Other derived kef files:
  - source-to-receiver offset kef
  - timing correction kef for Texans

Experiment summary kef

- Created using GUI program experiment_t_gen

- Contains experiment information including:
  - DMC assigned assembled ID and FDSN network code
  - Experiment long and short names
  - PI names and institutions
  - Experiment summary
  - Coordinates for bounding box

Experiment geometry – receivers & shots

- Receiver & shot metadata loaded from csv files

- Generate kefs using GUI program **noven**
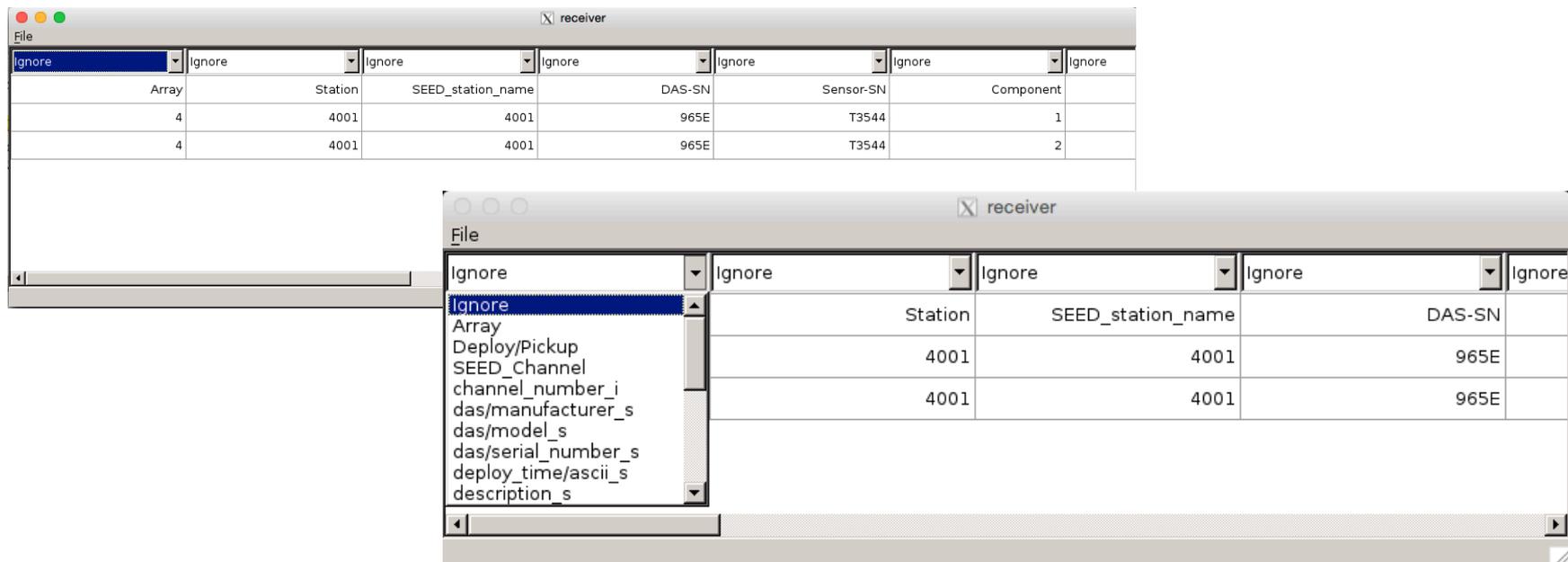
Receiver and shot kefs

Receiver kef

- All receiver info including DAS & sensor type
- Array number is required
- Each array can only contain 1 sample rate
- Different instrumentation/ time periods should be in different arrays
- Uses DAS serial numbers to link data to metadata

Shot/event kef

- Contains all shot information including location and shot time
- Shot line is required; PH5 supports multiple shot lines
- Shot/event size, units, and depth are optional

Checking experiment geometry

- **noven** can output Google Earth kml files

- Use to check experiment geometry

- If necessary, correct any errors and rebuild kef files
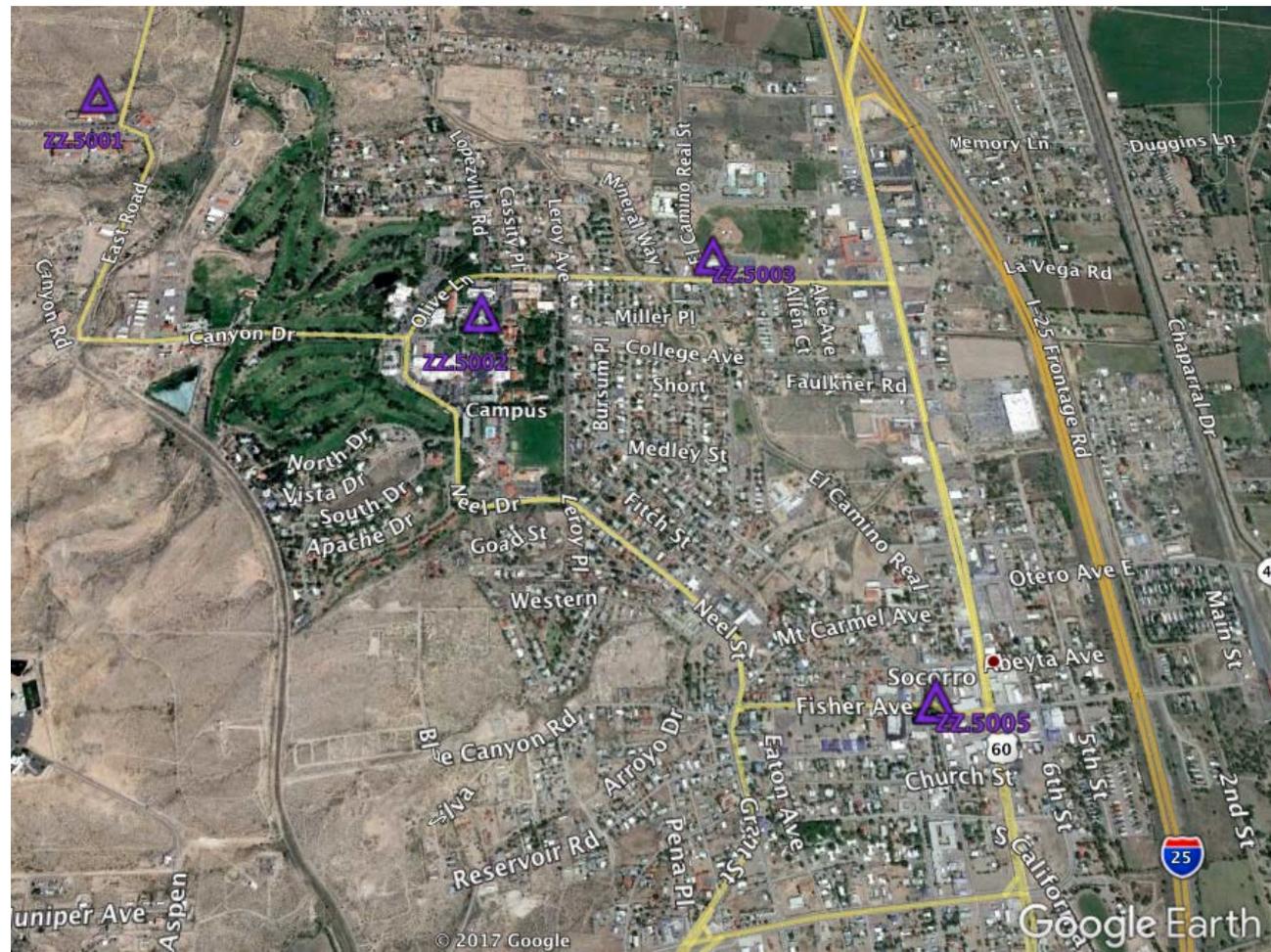
Load kef files into PH5

- All kef files are loaded into the master.ph5 file in the merged (Sigma) directory via the **keftoph5** command

- To load the kef file for array 2, from the Sigma directory run:
    - **keftoph5** –n master.ph5 –k ../../METADATA/array_2.kef

- **keftoph5** creates a log in the Sigma directory

Hands-on: Nutshell steps 4-7

- 4. Create experiment summary with experiment_t_gen
  - Northwest corner: Lat (Y) 35, Lon (X) -107.5
  - Southeast corner: Lat (Y) 33.5, Lon (X) -106.5
  - net_code: ZZ; experiment_id: 17-042

- 5. Use **noven** to create kef files for receivers & shots

- 6. Check experiment geometry with Google Earth

- 7. Load experiment, receiver & shot kefs

Response information

- Responses are loaded from RESP files

- RESP files can be found at the IRIS DMC Nominal Response Library (NRL: http://ds.iris.edu/NRL/)

- Use **resp_load** command to generate csv and load response information

Derived tables

- Other information such as source-to-receiver offset is calculated from the PH5

- Derived tables includes source-to-receiver offset, Texan timing corrections, etc

Hands-on: Nutshell steps 8-12

- 8. Update response table for multiple instrument types

- 9. Create and load response information

- 10. Create and load source-to-receiver offset table

- 11. Create and load Texan timing-drift corrections table

- 12. Create and load sort table to optimize searches

Validating PH5

The PH5 software suite contains a few tools to help check the validity of your metadata and data.

- ph5_validate
- ph5view
- ph5tostationxml

ph5_validate

- Runs a basic set of checks on PH5 archive
- Checks to see if PH5 is ready for DMC

>> *ph5_validate –n master.ph5*

Outputs a text file containing warnings, errors and can automatically fix some issues for you!

ph5tostationxml

Best tool for outputting metadata and response data in a variety of formats including:

- Stationxml
- Stationtxt
- KML
- SAC poles and zeroes

- RESP output is being added

Running ph5tostationxml

For more info use the –h flag!

>> *ph5tostationxml –n master –p .*
–level=response –o experiment.xml

>> *ph5tostationxml –n master –p .*
-o experiment.kml –f KML

ph5view

- ph5view allows you to create shot and receiver gathers of your data.
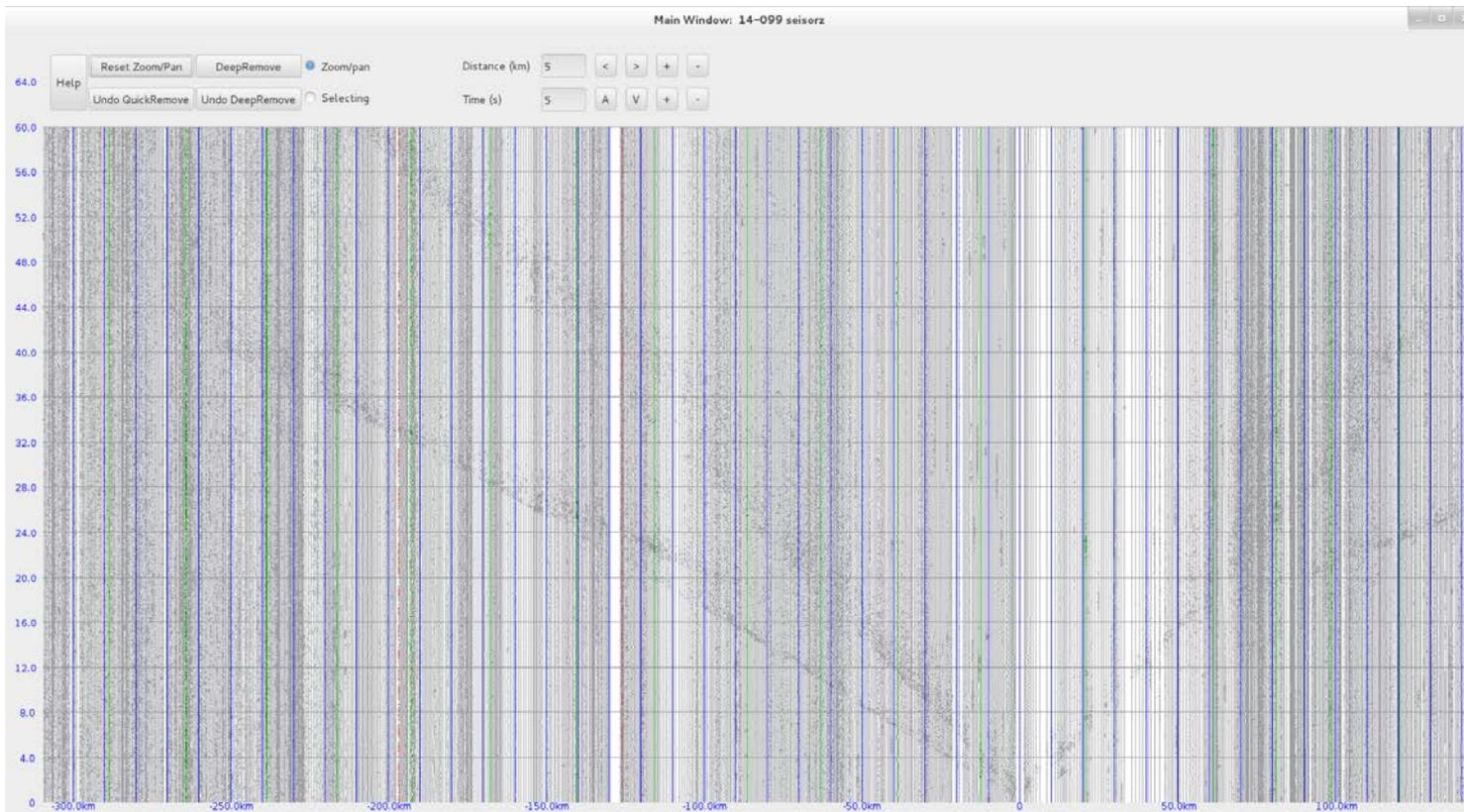
Hands-on: Nutshell step 13-14

- 13. Validate your PH5 archive - **ph5_validate**

- 13. Output your metadata - **ph5tostationxml**

- 14. View data and generate shot gathers - **ph5view**

Troubleshooting PH5

Using the already mentioned tools there are a few issues you may encounter.

- Station or event metadata being incorrect
- Data for a station missing
- Incorrect responses loaded

Fixing Metadata

A strength of PH5 is being able to quickly and easily fix metadata issues.

The general workflow to fix metadata uses:

- *ph5tokef* – pull the current kef file from the PH5
- Correct the problem in the kef file
- *delete_table* – remove the incorrect metadata
- *keftoph5* – load the corrected kef file

Example

After looking at the KML we see station 1355 array 2 coordinates are wrong.

>> *ph5tokef –n master –A 2 > array2.kef*

After updating and saving the kef file:

>> *delete_table –n master –A 2*

>> *keftoph5 –n master –k array2.kef*

Missing Data

Problem: ph5_validate says there is no data for station 1001 das <das_serial>. After looking at our list we created for pforma we see we just forgot that raw file.

We can now use 125atoph5 to load the data

>> 125atoph5 –n master -p <<path_to_ph5>> -r I0711RAW200.TRD

Writing Out Data

PH5 currently supports miniSEED, SAC, and SEG-Y

- ph5toevt for event based SEG-Y output

- ph5torec for receiver gather SEG-Y output

- ph5toms is used for miniSEED and SAC out

Output Examples

The –h flag is very helpful. These programs provide a variety of options for helping extract only the data you want/need.

>> ph5toms –n master –o mseed/ -f MSEED -s <<start_time>> –l 86400

>> ph5toevt –n master –shot_line 1 -e 9001 –l 60 –A 1 –o segy/

Hands-on: Nutshell steps 15-16

- 15. Output SEG-Y gathers
    - ph5toevt EXAMPLE COMMAND

- 16. Output SAC and/or miniSEED
    - ph5toms EXAMPLE COMMAND

Sending PH5 archives to the DMC

- For PASSCAL experiments, contact PASSCAL Data Group at data_group@passcal.nmt.edu to submit data

- For non-PASSCAL experiments, contact IRIS DMC Data Group at engine_room@iris.washington.edu to coordinate submitting data to the DMC

- Large experiments (>100GB) are normally mailed to the DMC on a disk or uploaded using BBCP. Smaller experiments may be uploaded using FTP.

- Once PH5 is deemed archive ready, data are accessed through PH5 Web Services https://service.iris.edu/ph5ws/

PH5 archives at the DMC
Requesting SEGY data using the web form

- http://ds.iris.edu/mda/

Assembled Data Sets (544) :: Click column title to sort :: Jump to permanent networks or virtual networks or temporary networks

Report No. ▲▼	Name ▲▼	Nickname ▲▼	Format ▲▼	Type ▲▼	Start ▲▼	End ▲▼	Data ▲▼	Reports ▲▼
17-028	SinoProbe: Northeast China Transect	SinoProbe	PH5 (SEGY)	PASSCAL	2011	2011	N	N
17-027	Imaging of an Active Fault in Central Wyoming: The O...	OwlCreek	SEGY	PASSCAL	2014	2014	Y	📁
17-026	High Resolution Imaging of the Dallas-Derby Dome int...	DallasDome	SEGY	PASSCAL	2012	2012	Y	📁
17-025	Dallas Dome High Resolution Seismic Line	Dallas	SEGY	PASSCAL	2015	2015	Y	📁
17-024	Thousand Palms Oasis	ThousandPalms	SEGY	PASSCAL	2015	2015	Y	📁
17-023	Seismic Reflection Profile Across an Active Fault Sc...	BoysenReservoir	SEGY	PASSCAL	2016	2016	Y	📁
17-022 ®	Geothermal Seismic Exploration and Monitoring Via Am...	RaPiER	SEGY	PASSCAL	2017	2018	Y	📁
17-021 ®	Central Oregon Dense 3C Node Transect	Cascadia 2017	PH5 (SEGY)	PASSCAL	2017	2017	N	N
17-020	Trinity River Lowden Ranch Array 2015	Lowden Array	PH5 (SEGY)	Other	2015	2015	N	N
17-019 ®	Mount St. Helens 3C Node Array	MSH 2017	PH5 (SEGY)	PASSCAL	2017	2017	N	N
17-018	High Altitude Student Platform Stratospheric Acousti...	HASP	SEGY	PASSCAL	2015	2015	N	N

PH5 archives at the DMC
Requesting SEGY data using the web form

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PH5 Data Request Form

TAIGER-pilot 17-009

Form   Map   Help

The form below is for requesting subsets of the experiment data. If you would like to request ALL of the data in SAC format please click the following link: I want to request the full data set in SAC format

TAIGER-pilot

David Okaya-Francis Wu
University of Southern California
The full-scale TAIGER active source profiling e:
preparation, the Taiwan and US scientists will

Show/Hide Events   Export as CSV

*Click the array number to add it to the form. Cli·
the form*

The fields below will be used to track your request and are all required. Hover over input fields below for help.	
Name:	
Institution:	
Your E-MAIL:	
LABEL:	

Array: 001
Sample Rate: 250
Deploy Time: 2006:291:11:00:00
Pickup Time: 2006:291:23:00:00
Show/Hide Stations   Export as CSV

The fields below specify your request. An asterisk (*) indicates required field.

Use the column to the right to select the data you would like to request. It will automatically be placed into the form when you click on what you want in the tables to the right.

Data Type:	about Standard SEG-Y	Standard SEG-Y
Component:		ALL
Decimation (useful for high sample rate data):		NONE
Reduction Velocity (Km/sec):		

PH5 archives at the DMC
Requesting SEGY data using the web form

The fields below specify your request. An asterisk (*) indicates required field.

Use the column to the right to select the data you would like to request. It will automatically be placed into the form when you click on what you want in the tables to the right.

Data Type:	about Standard SEG-Y	Standard SEG-Y
Component:		ALL
Decimation (useful for high sample rate data):		NONE
Reduction Velocity (Km/sec):		

☑ Apply Time Correction to Texan Data

Request by:

Event order: ● By Event IDs ○ By Time Range	Receiver order: ○ By Event ID Range	Traces: ○ Das Serial Number

*Event IDs (comma separated list): 9001,
*Array IDs (comma separated list): 001,
*Length (secs): ___ Offset (s): ___

Submit Data Request

TAIGER-pilot

David Okaya-Francis Wu
University of Southern California
The full-scale TAIGER active source profiling experiment is scheduled for November 20
preparation, the Taiwan and US scientists will drill and detonate o

Show/Hide Events   Export as CSV

ID	Time	Latitude	Longitude	Elevation(m)	Mag	dep
9001	2006:291:17:01:00.000	23.79164	120.92957	1.0	500.0	70.0

Click the array number to add it to the form. Clicking rows in the station table will add th the form

Array: 001
Sample Rate: 250
Deploy Time: 2006:291:11:00:00
Pickup Time: 2006:291:23:00:00
Show/Hide Stations   Export as CSV

ID	DAS	Latitude	Longitude	Elevation(m)	Component
32	11136	23.83588	120.28516	0.01	1
34	11210	23.8354	120.28711	0.01	1
36	11195	23.83484	120.28922	0.01	1
38	11196	23.83439	120.29099	0.01	1
40	11197	23.83401	120.29288	0.01	1
68	11198	23.8349	120.32071	0.01	1
70	11199	23.83437	120.32259	0.01	1

PH5 archives at the DMC
Requesting MSEED and SAC using Web Service:

https://service.iris.edu/

IRIS DMC Web Services

Service Implementations

PH5WS

Service Interface	Version	Summary	Return options
station	v.1	metadata for time series data stored in PH5 format	• FDSN StationXML • Text
dataselect	v.1	active and passive source time series for data stored in PH5 format	• miniSEED • SAC
event	v.1	active source event metadata for time series data stored in PH5 format	• QuakeML • Text

PH5 archives at the DMC
Requesting MSEED and SAC using Web Services:

URL Builder: dataselect v.1

Service interface	URL Builder	Help	Revisions

Use this form to build a URL to the **dataselect** web service. Notice that as you edit the form, the link is automatically updated.

❓ Usage

Standard Options:

Request Type:	FDSN ▾
Format:	SAC (zip) ▾

FDSN Network Code and/or PH5 Report Number?

Network:	☑	ZI
Report Number:	☐	15-016
Station:		MSL25
Location:		--
Channel:	☑	DPZ
Component:	☐	1
Start Time:	☑	2016-12-12T00:00:00	🛗
End Time:	☑	2016-12-12T05:00:00	🛗
Decimation:		2
Reduction Velocity:		10	km/second

Click the link:
https://service.iris.edu/ph5ws/dataselect/1/query?reqtype=FDSN&format=SAC&net=ZI&sta=MSL25&starttime=2016-12-12T00:00:00&
endtime=2016-12-12T05:00:00&nodata=404

PH5 archives at the DMC
Requesting MSEED and SAC using Web Services:

PH5 archives at the DMC
Requesting MSEED and SAC using Web Services:

```xml
− <FDSNStationXML schemaVersion="1.0">
    <Source>PIC-PH5</Source>
    <Sender>IRIS-PASSCAL-DMC-PH5</Sender>
    <Module>PH5 WEB SERVICE: metadata | version: 1</Module>
  − <ModuleURI>
      http://service.iris.edu/ph5ws/station/1/query?net=ZI&starttime=2016-12-01T00:00:00&endtime=2017-01-31T00:00:00&level=channel&
    </ModuleURI>
    <Created>2017-12-04T15:42:34.183401</Created>
  − <Network alternateCode="16-022" code="ZI" endDate="2017-01-12T00:29:43" startDate="2016-09-15T00:35:28">
    − <Description>
        Investigation of the crustal structure of the Matador Arch
      </Description>
      <TotalNumberStations>64</TotalNumberStations>
    − <Station code="1" endDate="2017-01-11T21:43:50" startDate="2016-12-10T16:48:45" iris:PH5Array="001">
        <Latitude unit="DEGREES">33.9482295039</Latitude>
        <Longitude unit="DEGREES">-102.757130325</Longitude>
        <Elevation unit="METERS">1138.0</Elevation>
      − <Site>
          <Name>Converted from UTM Zone 13</Name>
        </Site>
        <CreationDate>2016-12-10T16:48:45</CreationDate>
        <TerminationDate>2017-01-11T21:43:50</TerminationDate>
        <TotalNumberChannels>3</TotalNumberChannels>
        <SelectedNumberChannels>3</SelectedNumberChannels>
      − <Channel code="DPE" endDate="2017-01-11T21:43:50" locationCode="" startDate="2016-12-10T16:48:45" iris:PH5ReceiverId=
          <Latitude unit="DEGREES">33.9482295039</Latitude>
          <Longitude unit="DEGREES">-102.757130325</Longitude>
          <Elevation unit="METERS">1138.0</Elevation>
          <Depth unit="METERS">0.0</Depth>
          <Azimuth unit="DEGREES">90.0</Azimuth>
          <Dip unit="DEGREES">0.0</Dip>
          <SampleRate>250.0</SampleRate>
          <StorageFormat>PH5</StorageFormat>
        − <Sensor>
            <Type>Geo Space GS-30CT</Type>
            <Description>Geo Space GS-30CT/FairfieldNodal ZLAND 3C</Description>
            <Manufacturer>Geo Space</Manufacturer>
            <Vendor/>
            <Model>GS-30CT</Model>
            <SerialNumber/>
            <InstallationDate>2016-12-10T16:48:45</InstallationDate>
            <RemovalDate>2017-01-11T21:43:50</RemovalDate>
          </Sensor>
        − <DataLogger>
            <Type>FairfieldNodal ZLAND 3C</Type>
            <Description/>
            <Manufacturer>FairfieldNodal</Manufacturer>
```

PH5 archives at the DMC
Requesting MSEED and SAC using Web Services:

URL Builder: event v.1

| Service interface | URL Builder | Help | Revisions |

Use this form to build a URL to the **event** web service. Notice that as you edit the form, the link is automatically updated.

❓ Usage

Catalog: `Z5`

Shotline: `001`

Shot-id: `5011`

Format: `ShotText (| delimited) ▾`

Start Time: ☑ `2007-07-16T00:00:00` 🗓

End Time: ☑ `2007-07-19T00:00:00` 🗓

Location:

All: 🔵

Lat/Lon Box: ⚪

Lat/Lon Radius: ⚪

Click the link:

http://service.iris.edu/ph5ws/event/1/query?catalog=Z5&format=shottext&starttime=2007-07-16T00:00:00&endtime=2007-07-19T00:00:00&nodata=404

PH5 archives at the DMC
Requesting MSEED and SAC using Web Services:

```
#Network|ReportNum|ShotLine|Shot|ShotTime|Latitude|Longitude|Elevation|ShotSize|ShotUnits
Z5|16-014|001|24|2007-07-18T11:01:00.000000Z|40.50538333|75.94993333|3532.0|0.0|
Z5|16-014|001|25|2007-07-18T11:03:00.000000Z|40.52176667|75.9621|3520.0|0.0|
Z5|16-014|001|26|2007-07-18T12:03:00.000000Z|40.5333|75.9627|3507.0|0.0
Z5|16-014|001|27|2007-07-18T12:11:00.000000Z|40.54256667|75.9625|3507.0|0.0|
Z5|16-014|001|20|2007-07-18T02:31:00.000000Z|40.50391667|75.924|3552.0|0.0|
Z5|16-014|001|21|2007-07-18T02:33:00.000000Z|40.49941667|75.91386667|3572.0|0.0|
Z5|16-014|001|22|2007-07-18T10:03:00.000000Z|40.5135|75.95648333|3535.0|0.0|
Z5|16-014|001|23|2007-07-18T10:06:00.000000Z|40.50533333|75.93533333|3537.0|0.0|
Z5|16-014|001|28|2007-07-18T12:53:00.000000Z|40.56073333|75.95438333|3495.0|0.0|
Z5|16-014|001|29|2007-07-18T12:57:00.000000Z|40.55208333|75.95861667|3500.0|0.0|
Z5|16-014|001|4|2007-07-17T05:43:00.000000Z|40.38163333|75.8187|3790.0|0.0|
Z5|16-014|001|8|2007-07-17T07:53:00.000000Z|40.39975|75.80148333|3749.0|0.0|
Z5|16-014|001|2|2007-07-17T02:20:00.000000Z|40.44848333|75.81605|3704.0|0.0|
Z5|16-014|001|6|2007-07-17T06:38:00.000000Z|40.39378333|75.8094|3785.0|0.0|
Z5|16-014|001|11|2007-07-17T09:36:00.000000Z|40.43033333|75.80655|3709.0|0.0|
Z5|16-014|001|10|2007-07-17T09:13:00.000000Z|40.41911667|75.80353333|3728.0|0.0|
Z5|16-014|001|13|2007-07-17T11:58:00.000000Z|40.46651667|75.83063333|3674.0|0.0|
Z5|16-014|001|12|2007-07-17T11:41:00.000000Z|40.43796667|75.81083333|3703.0|0.0|
Z5|16-014|001|15|2007-07-17T12:51:00.000000Z|40.47286667|75.85651667|3651.0|0.0|
Z5|16-014|001|14|2007-07-17T12:48:00.000000Z|40.46906667|75.84393333|3664.0|0.0|
Z5|16-014|001|17|2007-07-17T13:47:00.000000Z|40.48373333|75.87978333|3599.0|0.0|
Z5|16-014|001|16|2007-07-17T13:38:00.000000Z|40.4776|75.8676|3637.0|0.0|
Z5|16-014|001|19|2007-07-18T01:43:00.000000Z|40.49416667|75.90298333|3586.0|0.0|
Z5|16-014|001|18|2007-07-18T01:36:00.000000Z|40.48881667|75.8909|3591.0|0.0|
Z5|16-014|001|1|2007-07-16T10:20:00.000000Z|40.45856667|75.81975|3704.0|0.0|
Z5|16-014|001|5|2007-07-17T06:31:00.000000Z|40.3691|75.81776667|3834.0|0.0|
Z5|16-014|001|9|2007-07-17T08:11:00.000000Z|40.40833333|75.79825|3745.0|0.0|
```

PH5 archives at the DMC
Requesting MSEED and SAC using Web Services:

```
- <q:quakeml>
  - <eventParameters publicID="smi:local/4a415560-d6f4-49d9-b845-9497fc4882e4">
    - <event publicID="smi:local/Z5.001.24" iris:Shot_id="24" iris:Network="Z5" iris:ShotLine="001" iris:ReportNum="16-014">
        <type>controlled explosion</type>
      - <origin publicID="smi:local/24c761b8-803c-4357-98ef-e84479567513">
        - <time>
            <value>2007-07-18T11:01:00.000000Z</value>
          </time>
        - <latitude>
            <value>40.50538333</value>
          </latitude>
        - <longitude>
            <value>75.94993333</value>
          </longitude>
          <iris:Elevation>3532.0</iris:Elevation>
        </origin>
      - <magnitude publicID="smi:local/31dc26f4-bd65-41b4-bf2a-c133d87ea9b1">
        - <mag>
            <value>0.0</value>
          </mag>
          <type/>
        </magnitude>
      </event>
    - <event publicID="smi:local/Z5.001.25" iris:Shot_id="25" iris:Network="Z5" iris:ShotLine="001" iris:ReportNum="16-014">
        <type>controlled explosion</type>
      - <origin publicID="smi:local/a1af7bce-5241-4df0-8fb4-5205fefeeca0">
        - <time>
            <value>2007-07-18T11:03:00.000000Z</value>
          </time>
        - <latitude>
            <value>40.52176667</value>
          </latitude>
        - <longitude>
            <value>75.9621</value>
          </longitude>
          <iris:Elevation>3520.0</iris:Elevation>
        </origin>
      - <magnitude publicID="smi:local/a9dab0a7-38a3-4243-a12f-de7a79bfbc12">
```

THANK YOU