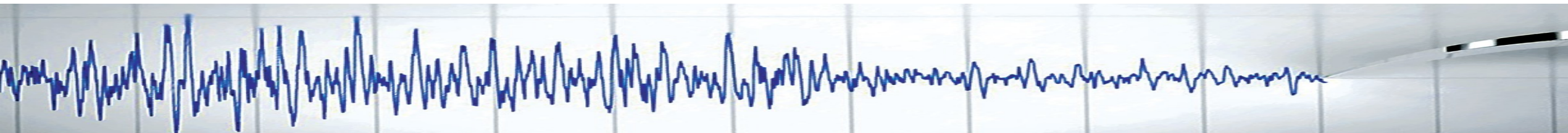




INSTITUTE OF GEODYNAMICS



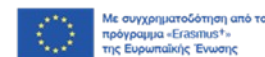
ELLINOGERMANIKI AGOGI



SEISMO-Lab online platform for teachers

ΤΑ ΣΧΟΛΕΙΑ ΜΕΛΕΤΟΥΝ ΤΟΥΣ ΣΕΙΣΜΟΥΣ
28-02-2023

Konstantinos Boukouras
Institute of Geodynamics, NOA



SEISMO-LAB

In this framework the proposed project promotes open education and innovation in schools and their communities, promotes the development of key competences for students who are developing projects and activities serving their communities and presents innovative whole-school approaches which are supporting teachers' professional development through collaboration, networking and good practice exchanges.

Presentation flow

CURRENT PLATFORM STATE

Platform background

- **Network Description**
- **Data acquisition**
- **Data processing**

Platform services

- **Interactive project stations network map**
- **Interactive Seismograms database**
- **Interactive map with automatic solutions data download – *new development***
- **Software download links and training material**
- **FDSNSWS Data Select Builder for data download**
- **Seedlink service**



Examples of how to use the platform services

Future platform development

NETWORK MAP



➤ 57 School Stations, more to be installed.

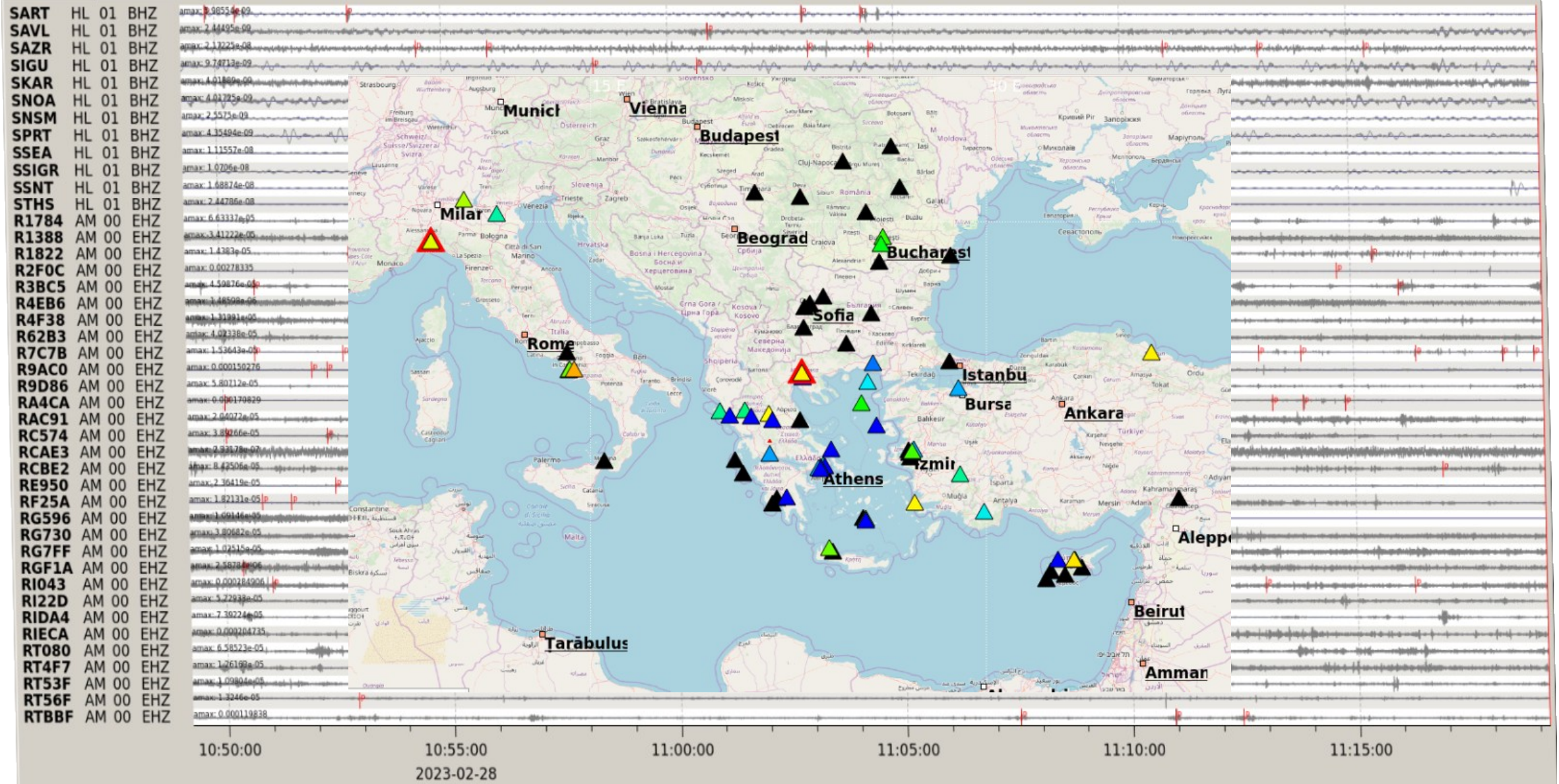
Raspberry Shakes	Raspberry pi with TC1
	

Corell

NETWORK



NETWORK MAP



NETWORK EQUIPMENT

TC1 SEISMOMETER

PC Running jAmaseis software
Data saved locally in hourly sac file format files. Can be converted to miniseed and added to SeisComP3 Directory Structure Archive (SDS).

TC1 SEISMOMETER

RASPBERRY SHAKE

Raspberry PI running SeisComP3 software

Data saved both locally in daily miniseed and transmitted realtime across network to our central acquisition server using the seedlink protocol. Acquisition is made possible using a custom made plugin.

Sends data to our main acquisition server using the Seedlink protocol.

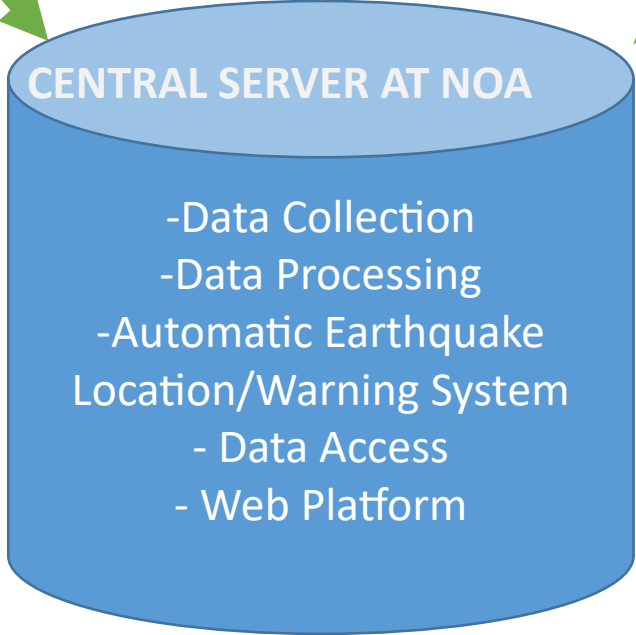


+



Remote School Stations

NETWORK FLOW

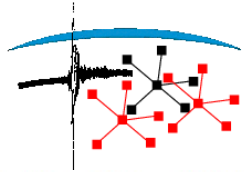


Data send through VPN or Internet using the seedlink protocol



DATA ACQUISITION

Data Acquisition and Processing is done using the Seismological Package **SeisComP3**

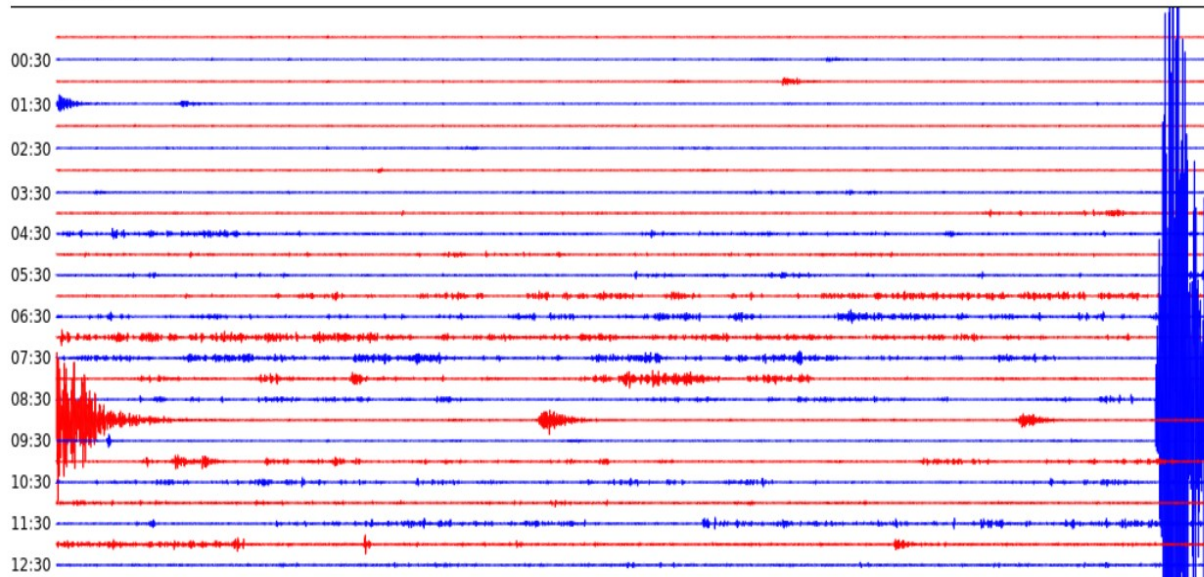


SeisComP3

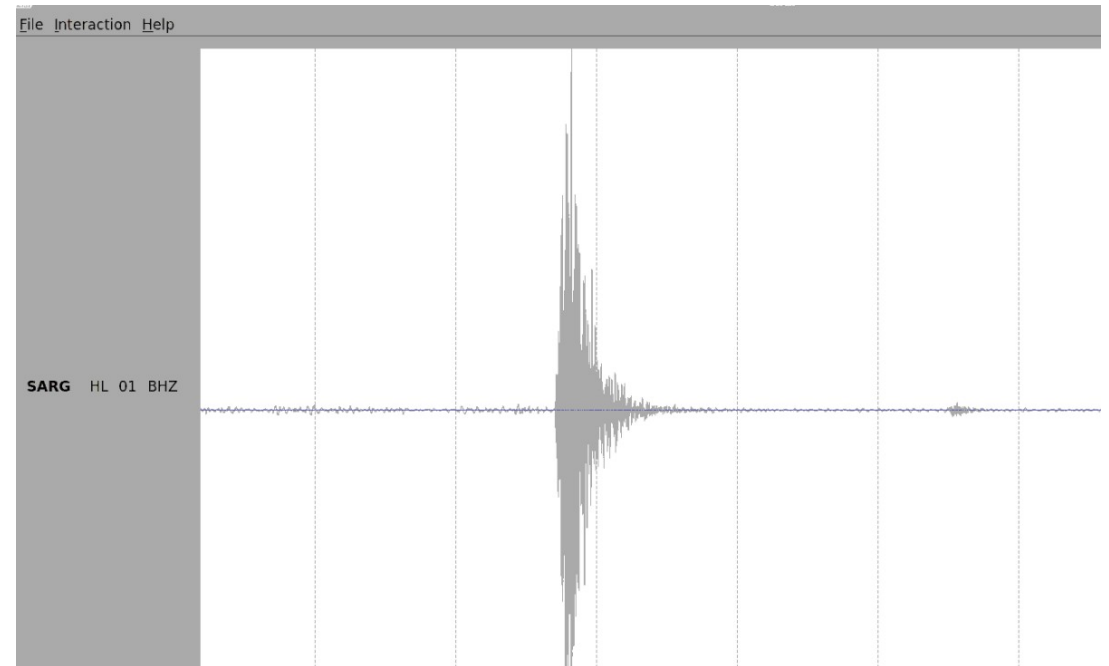
Real Time Plotting of ERASMUS SNAC 'SARG' Station using SeisComp ([Close Window](#))

HL.SARG.01.BHZ
38.18 N 20.48 E

2019-05-21



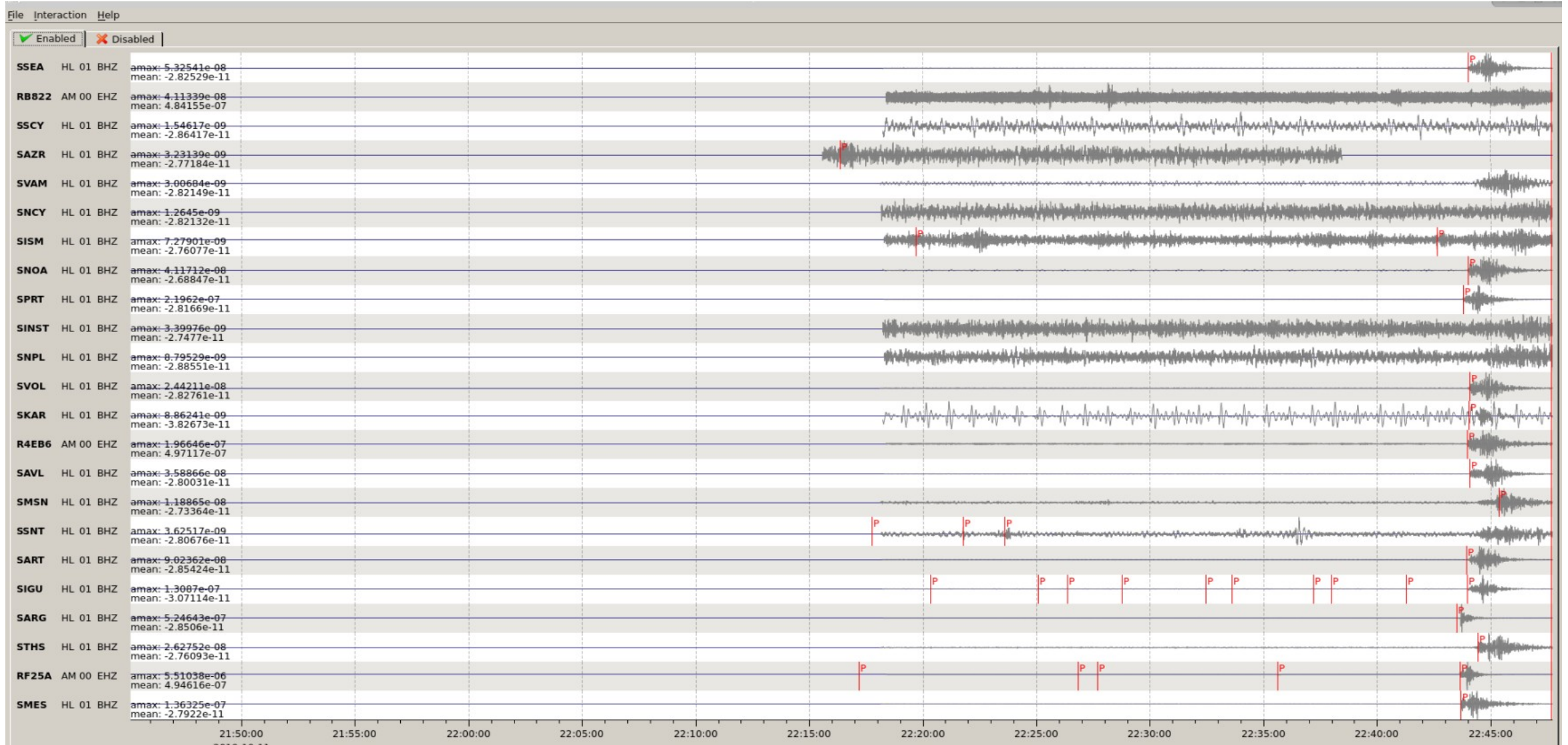
The daily data produced by SeisComP3 can be visualized using SeisComP3 modules



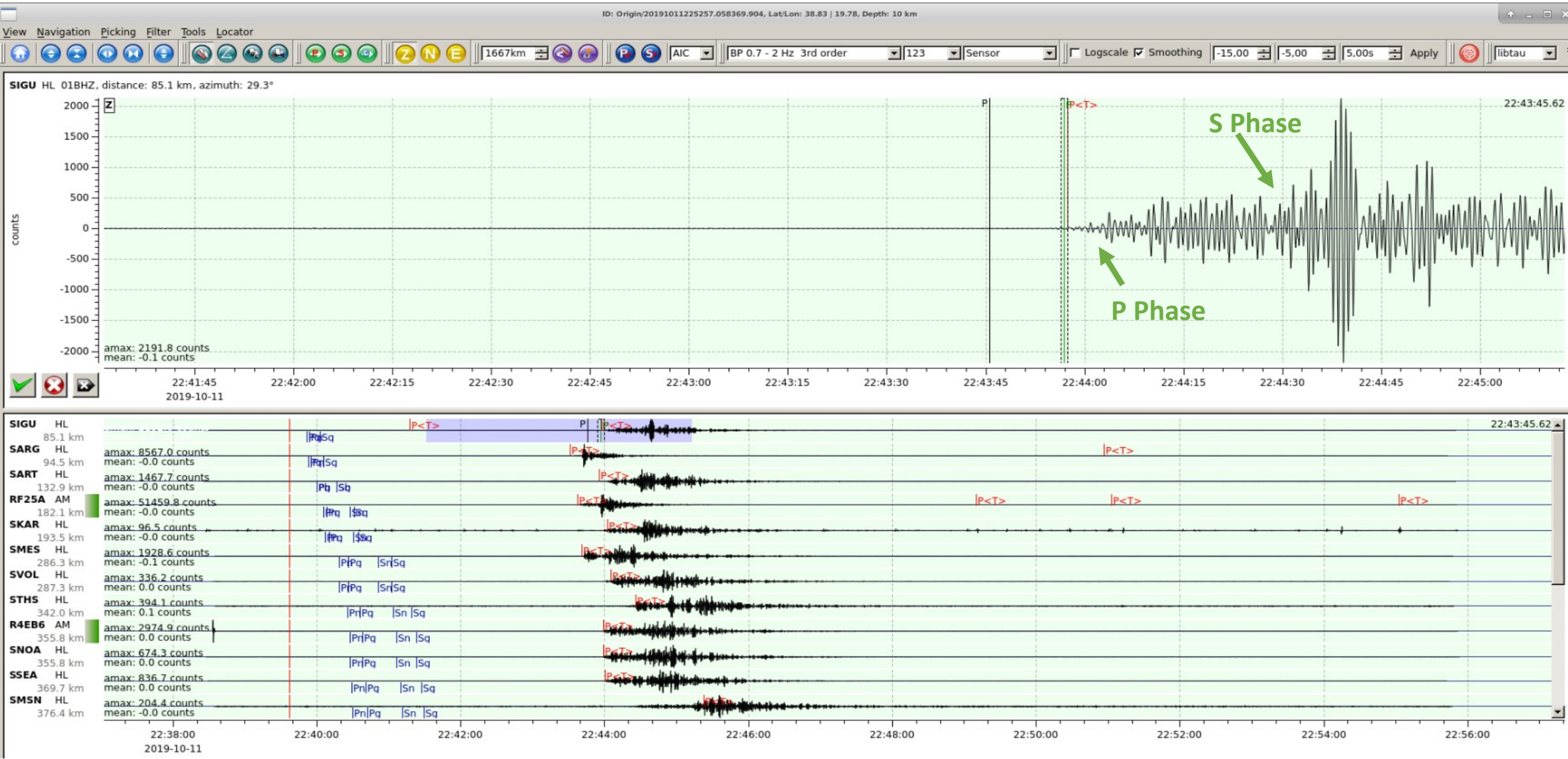
An earthquake recording from a School with a TC-1 seismometer.



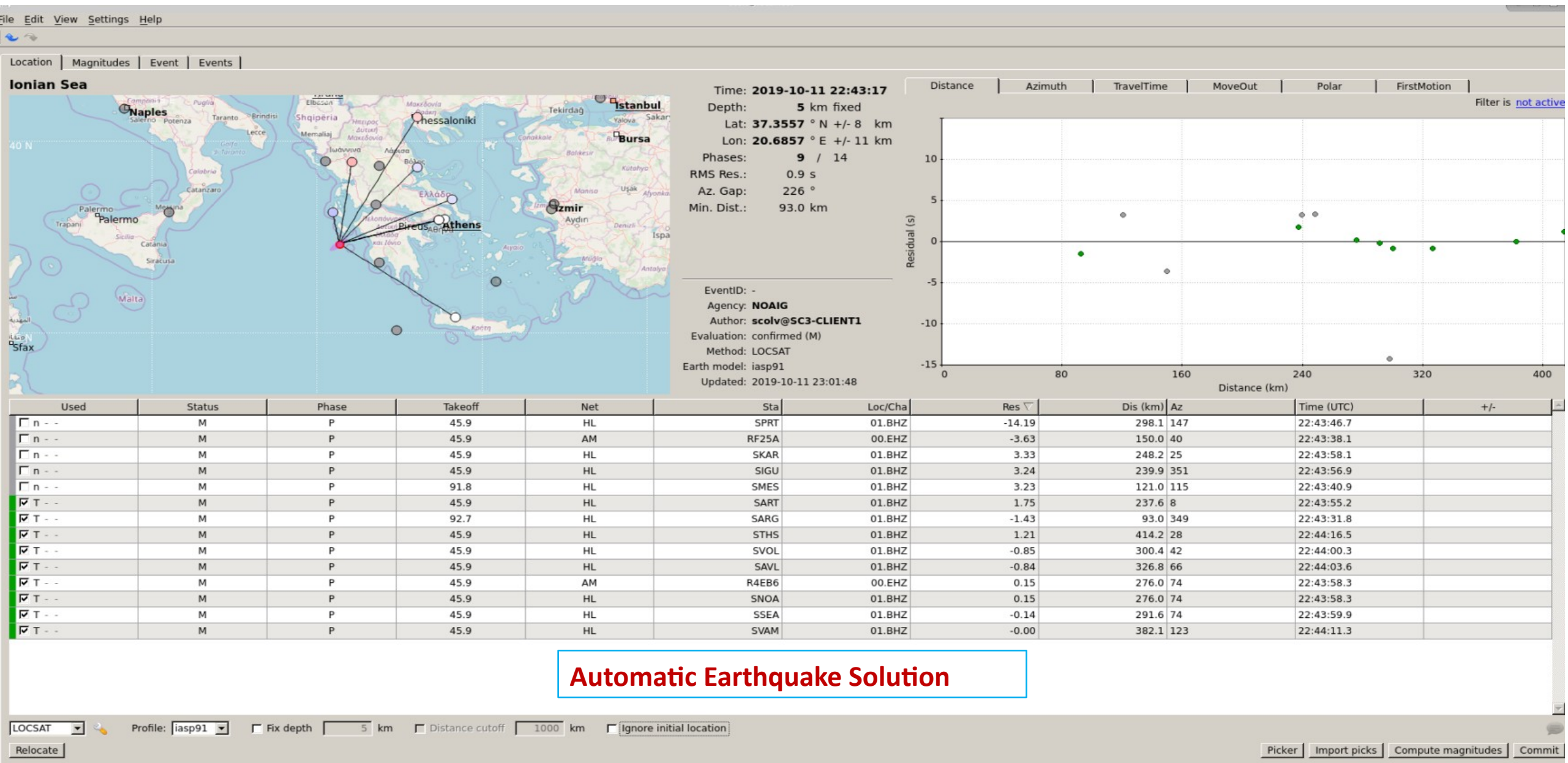
DATA ACQUISITION



DATA PROCESSING

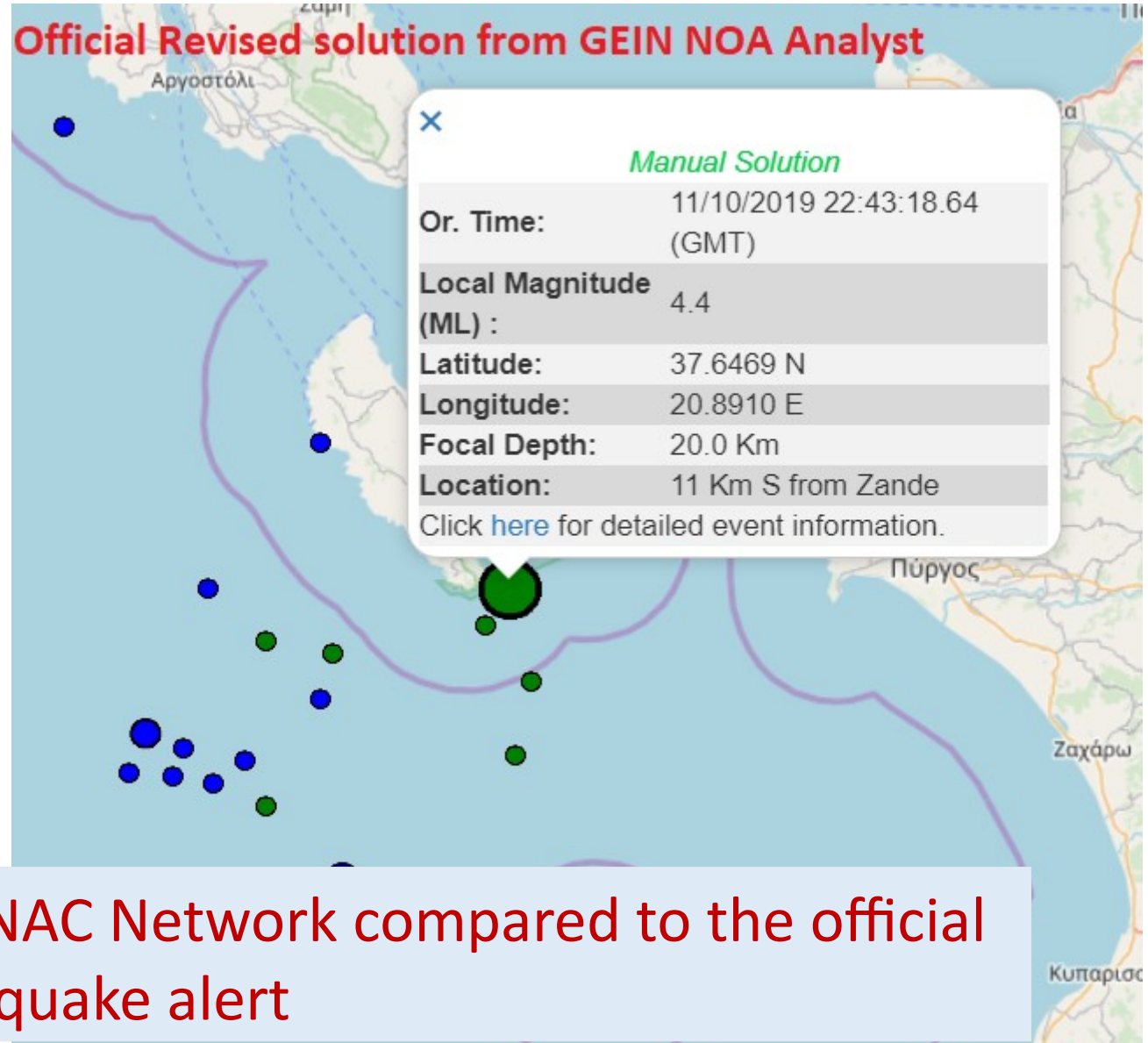
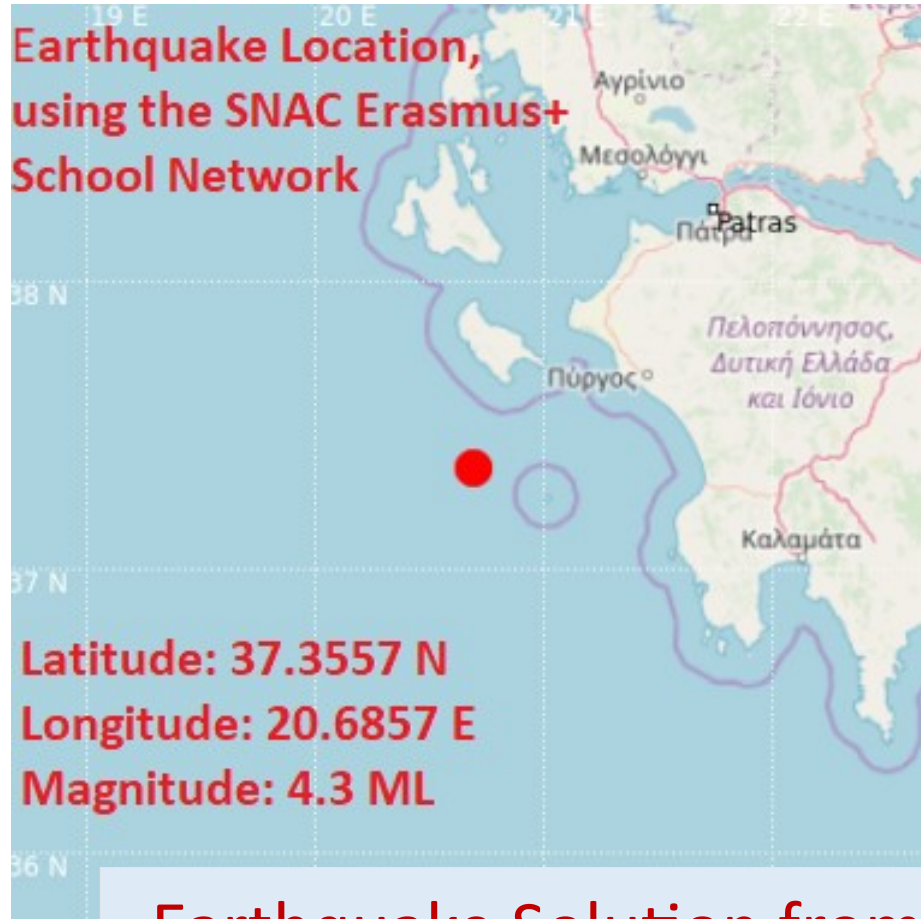


DATA PROCESSING



Automatic Earthquake Solution

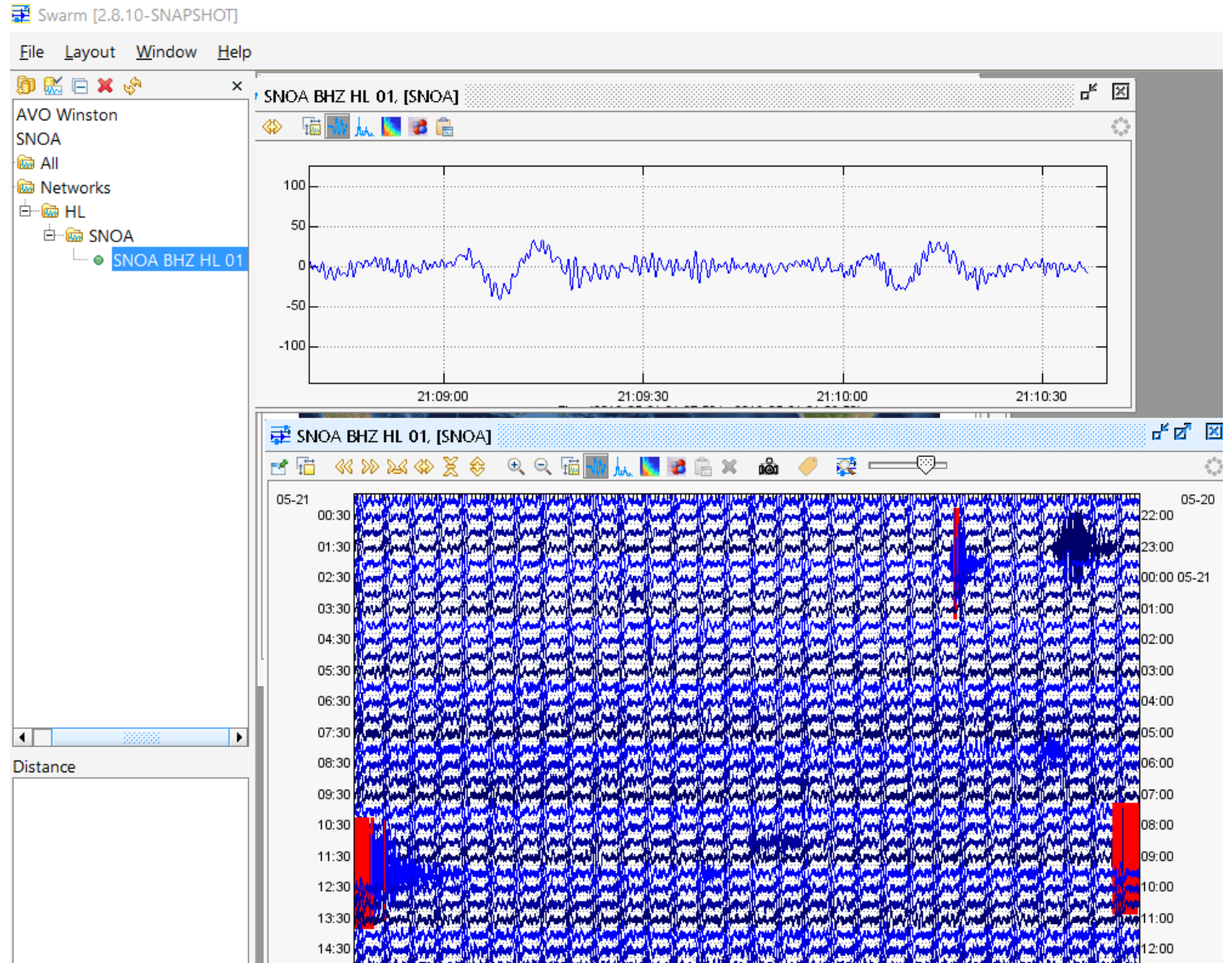
DATA PROCESSING



Earthquake Solution from the SNAC Network compared to the official earthquake alert

DATA PROCESSING

- The software for users that can also acquire real time data from online stations is **Swarm**, that offers many useful capabilities.
- The software and a lot of training material for SWARM is available at snac.gein.noa.gr



WEB PLATFORM <https://seismolab.gein.noa.gr>



- [Home](#)
- [Project Network](#)
- [Automatic Alerts](#) ▾
- [Seismograms Database](#)
- [Online Stations Status](#)
- [SOFTWARE](#) ▾
- [Data Download](#) ▾

Welcome to the SEISMO-LAB PLATFORM

Creating School Seismology Labs For the Development of Students' Competences

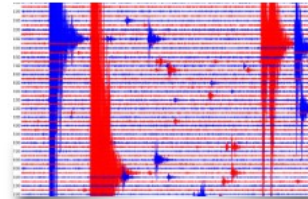
EU-ERASMUS project webpage



SEISMO-LAB Project Network



SEISMO-LAB Automatic Earthquake Solutions



SEISMO-LAB Seismograms Database



SEISMO-LAB Download Station Data



WEB PLATFORM Interactive map

Project Network



WEB PLATFORM Interactive seismograms database

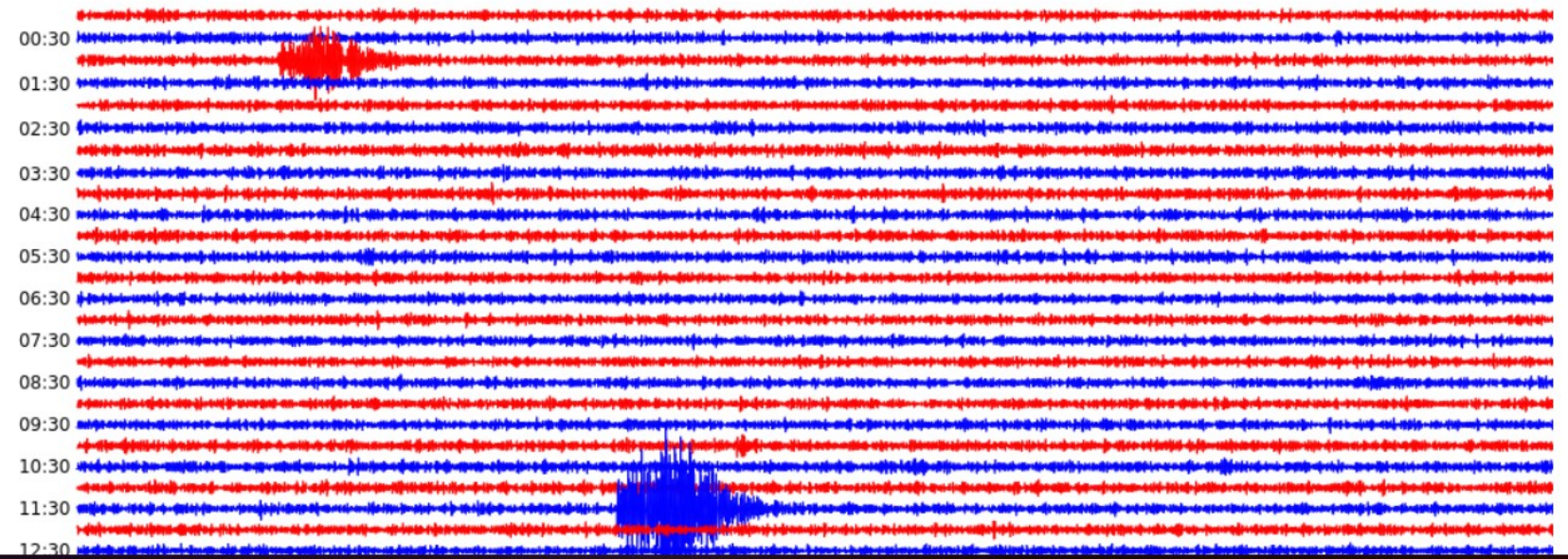
SEISMOGRAMS DATABASE

Select Station - Date (Day/Month/Year) to view recording: - / /

Seismogram Plotting of station SNOA for 01/01/2019

HL.SNOA.01.BHZ
37.97 N 23.72 E

2018-12-31 - 2019-01-01



WEB PLATFORM Online Stations Status

ONLINE STATIONS STATUS

SNAC ERASMUS Online Stations Status

Last Update: (Day,Time -UTC-): 141, 21:38:4

Click on each station status to see its real time plotting.

Name	Network	Status	Time of last recording (Day,Hour)	Time delay (Day, Hour)
SARG	HL	Station is OK	141, 21:37:56	0, 0:0:8
SAZR	HL	Station is OK	141, 21:37:54	0, 0:0:10
SKAR	HL	Station is OK	141, 21:38:01	0, 0:0:3
SNOA	HL	Station is OK	141, 21:37:56	0, 0:0:8
SPRT	HL	Station is OK	141, 21:37:56	0, 0:0:8
SSEA	HL	Station is OK	141, 21:37:59	0, 0:0:5
SSNT	HL	Station is OK	141, 21:38:02	0, 0:0:2
SVAM	HL	Station is OK	141, 21:38:04	0, 0:0:0
SVOL	HL	Station is OK	141, 21:37:59	0, 0:0:5
R4EB6	AM	Station is OK	141, 21:38:02	0, 0:0:2
DR22	AM	Station is off line	68, 06:00:00	72, 15:28:56

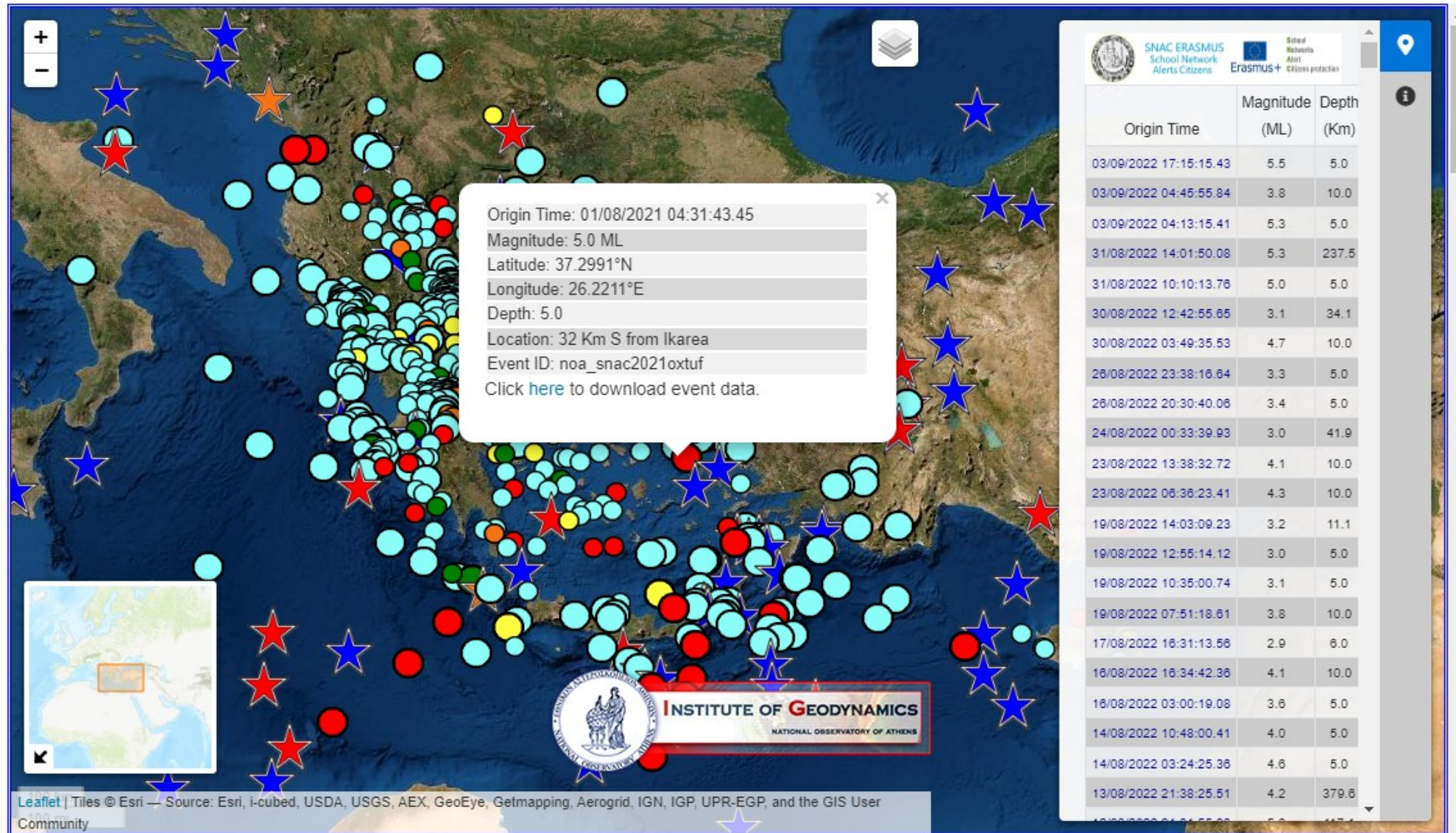
NEW WEB PLATFORM Automatic Earthquake Solutions



NEW WEB PLATFORM Automatic Earthquake Solutions

SNAC AUTOMATIC ALERTS SYSTEM – ALL DAYS

A .zip file containing SAC format data with all available stations participating in the automatic alert can be downloaded



NEW WEB PLATFORM Automatic Earthquake Solutions

SNAC Automatic Events

#	Event ID	Origin Time	Magnitude (ML)	Latitude	Longitude	Depth (Km)	Location	Details
1	noa_snac2022rhaxo	03/09/2022 17:15:15.43	5.5	33.0791	17.1853	5.0	592 Km SW from Pílos	Event data
2	noa_snac2022rgces	03/09/2022 04:45:55.84	3.8	39.6451	22.1287	10.0	28 Km W from Larisa	Event data
3	noa_snac2022rgbco	03/09/2022 04:13:15.41	5.3	35.5228	26.9854	5.0	22 Km W from Karpathos	Event data
4	noa_snac2022rbhzp	31/08/2022 14:01:50.08	5.3	38.0584	29.7166	237.5	223 Km NE from Rodhos	Event data
5	noa_snac2022rbaiq	31/08/2022 10:10:13.76	5.0	37.5377	26.6220	5.0	21 Km N from Patmos	Event data
6	noa_snac2022qzjwo	30/08/2022 12:42:55.65	3.1	36.6291	24.2711	34.1	17 Km SW from Milos	Event data
7	noa_snac2022qysha	30/08/2022 03:49:35.53	4.7	38.5281	20.4307	10.0	14 Km NW from Fiskardo	Event data
8	noa_snac2022qsxlj	26/08/2022 23:38:16.64	3.3	39.5810	22.2371	5.0	18 Km W from Larisa	Event data
9	noa_snac2022qsrfv	26/08/2022 20:30:40.06	3.4	38.2913	22.6381	5.0	24 Km ESE from Galaxidi	Event data
10	noa_snac2022qnmsw	24/08/2022 00:33:39.93	3.0	37.5404	23.0460	41.9	19 Km E from Navplion	Event data
11	noa_snac2022qmrcx	23/08/2022 13:38:32.72	4.1	39.9801	19.7843	10.0	39 Km N from Corfu	Event data
12	noa_snac2022qmder	23/08/2022 06:36:23.41	4.3	39.6323	22.2722	10.0	16 Km WNW from Larisa	Event data
13	noa_snac2022qfjwo	19/08/2022 14:03:09.23	3.2	39.9267	21.6301	11.1	24 Km SE from Grevena	Event data
14	noa_snac2022qfhqi	19/08/2022 12:55:14.12	3.0	39.3807	19.9398	5.0	28 Km NW from Paxoi	Event data
15	noa_snac2022qfdaa	19/08/2022 10:35:00.74	3.1	39.4229	19.9795	5.0	27 Km SSE from Corfu	Event data
16	noa_snac2022qexpp	19/08/2022 07:51:18.61	3.8	39.6293	22.2515	10.0	17 Km W from Larisa	Event data
17	noa_snac2022qbxsx	17/08/2022 16:31:13.56	2.9	39.3167	20.6766	6.0	18 Km ENE from Parga	Event data
18	noa_snac2022qacio	16/08/2022 16:24:42.26	4.1	39.4004	20.5481	10.0	18 Km NNE from Parga	Event data

A .zip file containing SAC format data with all available stations participating in the automatic alert can be downloaded

WEB PLATFORM SOFTWARE DOWNLOAD

Rich material for SWARM, configured for the SNAC network.
Software download and training material.



SNAC ERASMUS
School Network
Alerts Citizens



School
Networks
Alert
Citizens protection

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Welcome to the School Network Alerts Citizens (SNAC)

EU-ERASMUS project webpage



School
Networks
Alert
Citizens protection

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SOFTWARE](#)
(includes Training Material
and SNAC metadata, last
update 15/07/2020)

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Guide by SNAC](#)

[Greek SNAC/SWARM
Video Tutorial](#)

[English SWARM Video
Tutorial](#)

[Raspberry Shake
Installation Instructions](#)

[Download Official
SWARM Guide](#)

[Java Runtime
Environment \(JRE\) 8
Required for Swarm](#)

WEB PLATFORM Seedlink service

The platform snac.gein.noa.gr offers a free public seedlink service at port 18000 with the real-time school data. The service can be accessed with software like SWARM or SeisGram2K and the data can be visualized real-time.

The image shows two windows from the SWARM software. The left window is titled 'Edit Data Source' and shows the configuration for a 'SeedLink Server'. The 'Data Source Name' is 'HL'. The 'IP Address or Host Name' is 'snac.gein.noa.gr' and the 'Port' is '18000'. The right window is titled 'SSEA BHZ HL 01, [HL]' and displays a real-time seismic waveform plot. The plot shows amplitude over time from 07-10 13:00 to 07-11 12:00. The x-axis is labeled 'Time (UTC) + Minutes' and ranges from 1 to 30. The y-axis shows time in hours and minutes. The plot shows a dense, noisy signal with a clear periodic pattern, likely representing seismic data from a school.

Adding a Seedlink Data Source in SWARM in order to connect to the seedlink service of SNAC

WEB PLATFORM Data Portal - FDSN Web Services Support

- This specification defines RESTful web service interfaces for accessing common FDSN data types. This specification serves as a baseline level of compatibility allowing data request tools to work with any FDSN data center implementing these services. The following service interfaces are specified:
- **[fdsnws-station](#)** – For access to station metadata in [FDSN StationXML](#) format
- **[fdsnws-dataselect](#)** – For access to time series data in miniSEED format
- **[fdsnws-event](#)** – For access to event parameters in [QuakeML](#) format
- **[fdsnws-availability](#)** – For access to time series data availability

DATA DOWNLOAD

In this section Data Download is available from all the network stations.

The download is available using the following builder:

SeisComP3 FDSNWS DataSelect - URL Builder

Time constraints	
Start Time	<input type="text"/>
End Time	<input type="text"/>
Channel constraints	
Network	<input type="text" value="AB,C?"/>
Station	<input type="text" value="ABC,D*"/>
Location	<input type="text" value="00"/>
Channel	<input type="text" value="BH?"/>
Service specific constraints	
Quality	<input type="text" value="B"/>
Minimum Length (s)	<input type="text" value="0.0"/>
Longest Only	<input type="checkbox"/>
Authentication	<input type="checkbox"/>
Output control	
Format	<input type="text" value="miniseed"/>
No Data 404	<input checked="" type="checkbox"/>
URL	
http://10.0.0.235:8080/fdsnws/dataselect/1/query?nodata=404	

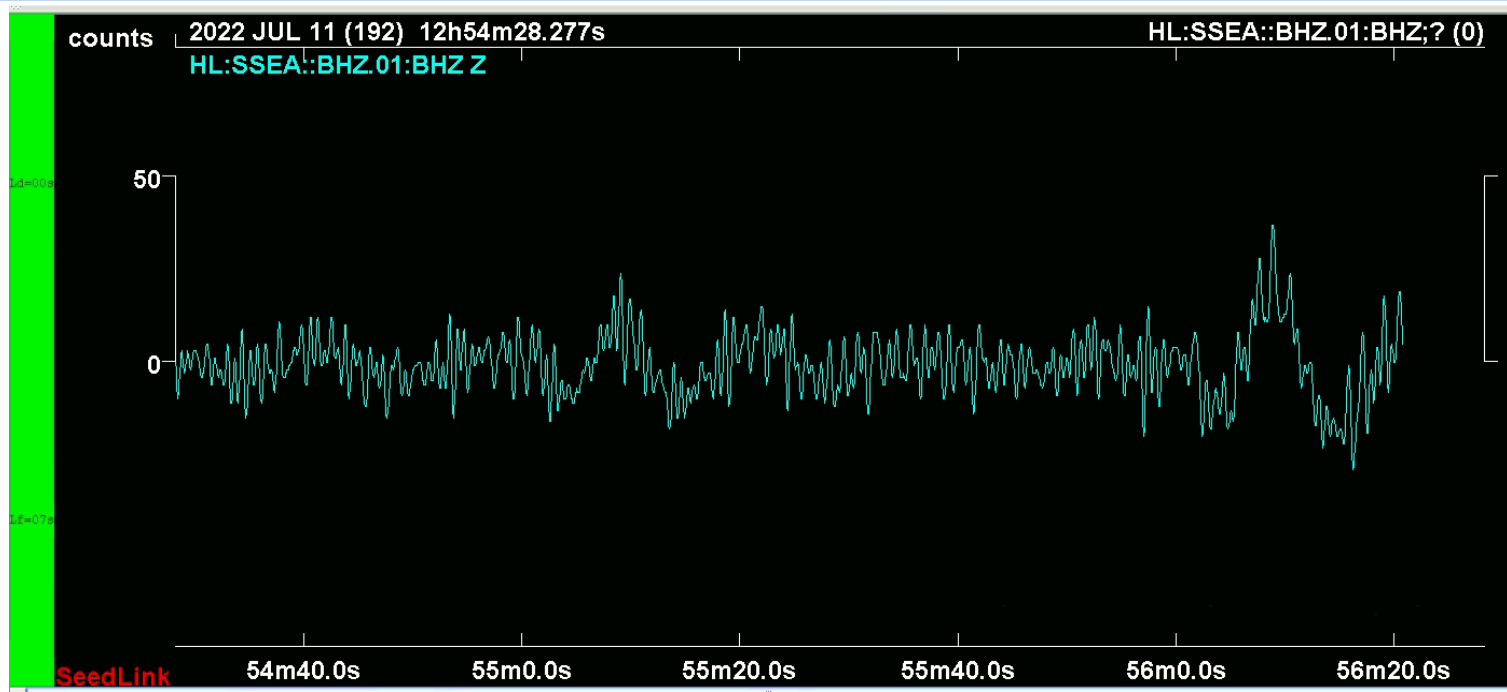
Example 1: SeisGram2K

SeisGram2K Seismogram Viewer is an easy-to-use, platform-independent, Java software package for interactive visualization and analysis of earthquake seismograms. SeisGram2K runs and reads data files locally and over the Internet. It can be downloaded from here:

<http://alomax.free.fr/seisgram/SeisGram2K.html>

After downloading it, the following command can be used in order to visualize real-time data from the SNAC platform:

```
java -cp ./SeisGram2K70.jar net.alomax.seisgram2k.SeisGram2K -seedlink "snac.gein.noa.gr:18000#HL_SSEA:???#120" -seedlink.groupchannels NO -title "REALTIME PLOTS USING SEISGRAM2K" -display.font=02,BOLD -display.maxvisible=36
```



Example 2: DATA DOWNLOAD using FDSN

We visit the URL: <http://snac.gein.noa.gr:8080/fdsnws/dataselect/1/builder>

SeisComP3 FDSNWS DataSelect - URL Builder

Time constraints

Start Time
End Time

Channel constraints

Network
Station
Location
Channel

Service specific constraints

Quality
Minimum Length (s)
Longest Only
Authentication

Output control

Format
No Data 404

URL

<http://snac.gein.noa.gr:8080/fdsnws/dataselect/1/query?starttime=2022-07-01T00%3A00%3A00&endtime=2022-07-01T01%3A00%3A00&station=SNOA&nodata=404>

1. We select which data time period we want to download. We select small time periods, based on the event we want to download.

2. We enter the name of the station.

3. We click the following link in order to download the data. The data are saved in miniseed format.

Example 3: Event info DOWNLOAD using FDSN

We visit the URL: <http://snac.gein.noa.gr:8080/fdsnws/dataselect/1/builder>

SeisComP3 FDSNWS Event - URL Builder

Time constraints

Start Time
End Time

Geographic constraints

None
 Bounding Box
 Circle

Service specific constraints

Minimum Depth (km)
Maximum Depth (km)
Minimum Magnitude
Maximum Magnitude
Magnitude Type
All Origins
All Magnitudes
Arrivals
Exclude Picks
Focal Mechanism
All Focal Mechanisms
MT Station Contributions
Include Comments
Event ID
Limit
Offset
Order By
Catalog
Contributor
Update After

Output control

Format
Formatted
No Data 404

URL

1. We select which time period we want to search for events

2. We (optionally) select a minimum magnitude

3. We click the following link in order to download the data. The data are saved in miniseed format. Then they can be opened and processed with software like SWARM.

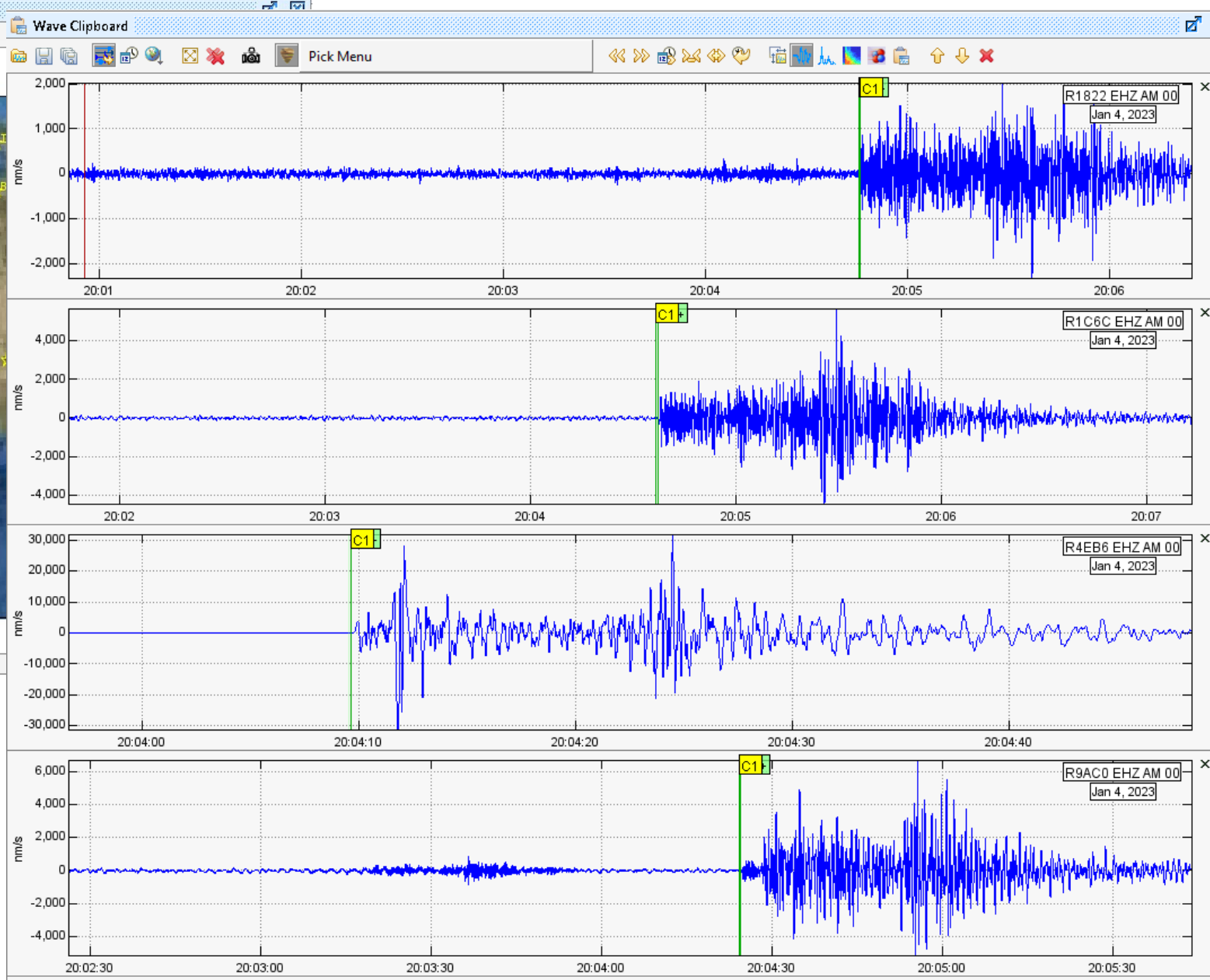
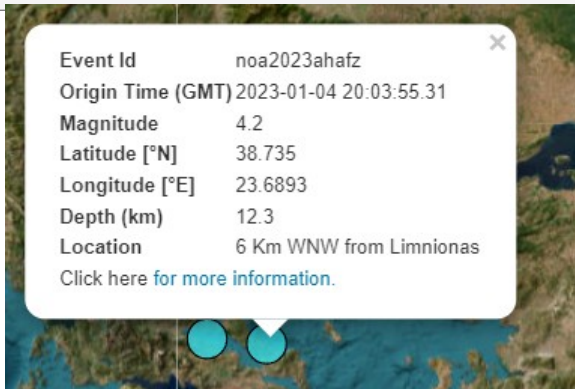
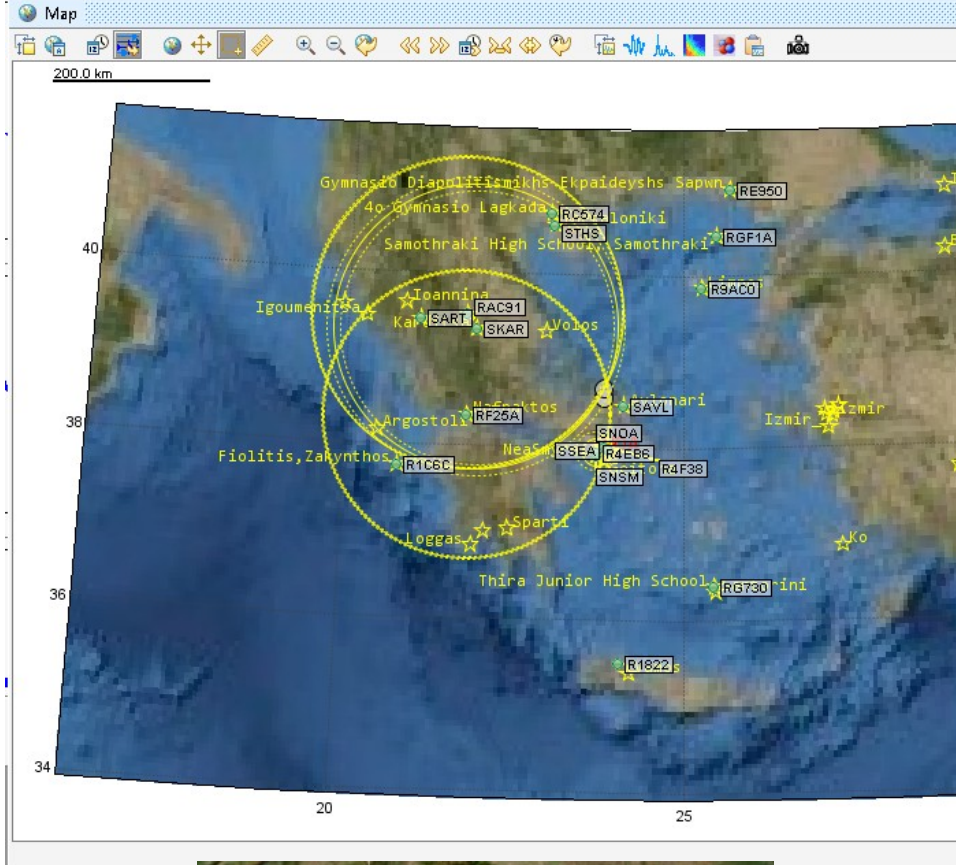
Example 3: Event info DOWNLOAD using FDSN

Search output of query: <http://snac.gein.noa.gr:8080/fdsnws/event/1/query?starttime=2022-01-01T00%3A00%3A00&endtime=2022-07-11T00%3A00%3A00&minmagnitude=4&format=text&nodata=404>

#EventID	Time	Latitude	Longitude	Depth/km	Author	Catalog	Contributor	ContributorID	MagType	Magnitude	MagAuthor	EventLocationName
noa_snac2022lyqbx	2022-06-19T23:24:14.52448	34.131310	28.425251	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022lyqbx	MLv	5.395082649	Erasmus-SNAC	Eastern Mediterranean Sea	
noa_snac2022kevhm	2022-05-25T21:54:42.101285	34.740211	21.419142	178.824295	Erasmus-SNAC	NOA-regional	noa_snac2022kevhm	MLv	4.687895257	Erasmus-SNAC	Central Mediterranean Sea	
noa_snac2022kcxrg	2022-05-24T20:50:48.585265	38.910065	21.353981	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022kcxrg	MLv	4.158907844	Erasmus-SNAC	Greece	
noa_snac2022ilkrq	2022-05-01T01:33:35.010498	39.484089	24.288616	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022ilkrq	MLv	4.272294417	Erasmus-SNAC	Aegean Sea	
noa_snac2022iisii	2022-04-29T14:01:13.944201	34.956581	24.738024	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022iisii	MLv	4.655465	Erasmus-SNAC	Crete, Greece	
noa_snac2022iedft	2022-04-27T01:51:53.742991	35.869965	22.589520	74.44220734	Erasmus-SNAC	NOA-regional	noa_snac2022iedft	MLv	4.987268808	Erasmus-SNAC	Central Mediterranean Sea	
noa_snac2022hyvvu	2022-04-24T04:27:57.058547	42.789600	18.031302	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022hyvvu	MLv	5.221746063	Erasmus-SNAC	NW Balkan Region	
noa_snac2022hyvjw	2022-04-24T04:14:03.177263	35.028435	27.511391	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022hyvjw	MLv	4.620248467	Erasmus-SNAC	Dodecanese Islands, Greece	
noa_snac2022hwltk	2022-04-22T21:08:04.698137	42.372879	18.916702	71.79576874	Erasmus-SNAC	NOA-regional	noa_snac2022hwltk	MLv	5.786494094	Erasmus-SNAC	NW Balkan Region	
noa_snac2022hrfxn	2022-04-20T00:29:05.216721	40.073673	24.456137	5.0	Erasmus-SNAC	NOA-regional	noa_snac2022hrfxn	MLv	4.008488349	Erasmus-SNAC	Aegean Sea	
noa_snac2022hleop	2022-04-16T17:00:39.605982	35.912132	22.524771	28.74285698	Erasmus-SNAC	NOA-regional	noa_snac2022hleop	MLv	4.612925821	Erasmus-SNAC	Central Mediterranean Sea	
noa_snac2022hiell	2022-04-15T01:34:27.446634	37.224903	14.537395	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022hiell	MLv	5.054293609	Erasmus-SNAC	Sicily, Italy	
noa_snac2022gzceu	2022-04-10T02:12:31.64293	38.298908	23.594515	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022gzceu	MLv	4.134175505	Erasmus-SNAC	Greece	
noa_snac2022gyzst	2022-04-10T00:57:51.37091	43.840508	19.393553	143.8608093	Erasmus-SNAC	NOA-regional	noa_snac2022gyzst	MLv	4.762648857	Erasmus-SNAC	NW Balkan Region	
noa_snac2022gygjd	2022-04-09T15:10:49.427061	37.625687	21.028183	5.0	Erasmus-SNAC	NOA-regional	noa_snac2022gygjd	MLv	4.005347784	Erasmus-SNAC	Southern Greece	
noa_snac2022gohyz	2022-04-04T04:39:41.801379	36.157063	21.682795	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022gohyz	MLv	4.196840534	Erasmus-SNAC	Southern Greece	
noa_snac2022gddeb	2022-03-29T01:47:43.938274	38.824760	9.696500	339.4117737	Erasmus-SNAC	NOA-regional	noa_snac2022gddeb	MLv	5.403239301	Erasmus-SNAC	Western Mediterranean Sea	
noa_snac2022foysp	2022-03-21T07:39:41.77652	36.428596	21.120935	5.0	Erasmus-SNAC	NOA-regional	noa_snac2022foysp	MLv	4.154066015	Erasmus-SNAC	Southern Greece	
noa_snac2022diasn	2022-02-17T01:48:48.380106	38.985050	20.487213	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022diasn	MLv	4.612298143	Erasmus-SNAC	Greece	
noa_snac2022bmovl	2022-01-22T02:32:56.834188	39.573044	24.245958	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022bmovl	MLv	4.255977406	Erasmus-SNAC	Aegean Sea	
noa_snac2022bddia	2022-01-16T22:32:00.88557	40.030083	24.455383	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022bddia	MLv	4.357517688	Erasmus-SNAC	Aegean Sea	
noa_snac2022bcjil	2022-01-16T12:26:20.554001	39.951504	24.405622	5.040858746	Erasmus-SNAC	NOA-regional	noa_snac2022bcjil	MLv	4.527581494	Erasmus-SNAC	Aegean Sea	
noa_snac2022bcibq	2022-01-16T11:48:06.709259	39.959774	24.385469	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022bcibq	MLv	5.507527211	Erasmus-SNAC	Aegean Sea	
noa_snac2022atqgk	2022-01-11T17:44:14.356745	40.681366	21.641956	5.0	Erasmus-SNAC	NOA-regional	noa_snac2022atqgk	MLv	4.100677001	Erasmus-SNAC	Greece	
noa_snac2022atlia	2022-01-11T15:14:35.235258	40.766502	21.369293	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022atlia	MLv	4.446632139	Erasmus-SNAC	Greece	
noa_snac2022asjkr	2022-01-11T01:07:57.838723	35.265797	31.162132	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022asjkr	MLv	6.293067795	Erasmus-SNAC	Cyprus Region	
noa_snac2022asiww	2022-01-11T00:52:55.770096	40.883297	21.513386	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022asiww	MLv	4.071722695	Erasmus-SNAC	Greece	
noa_snac2022aqkxr	2022-01-09T23:38:30.492536	40.882201	21.672853	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022aqkxr	MLv	4.06170966	Erasmus-SNAC	Greece	
noa_snac2022aqhlm	2022-01-09T21:53:24.710662	40.771881	21.608858	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022aqhlm	MLv	4.349792073	Erasmus-SNAC	Greece	
noa_snac2022aqhdh	2022-01-09T21:43:49.087687	40.736568	21.563753	1.066244364	Erasmus-SNAC	NOA-regional	noa_snac2022aqhdh	MLv	5.614064912	Erasmus-SNAC	Greece	
noa_snac2022ahosh	2022-01-05T03:21:33.417713	36.645561	29.814751	10.0	Erasmus-SNAC	NOA-regional	noa_snac2022ahosh	MLv	4.939813238	Erasmus-SNAC	Turkey	

Using the above info we can use FDSN datasetselect, like in Example1, to download station data for specific events !

Example 4: Event Detection using SWARM

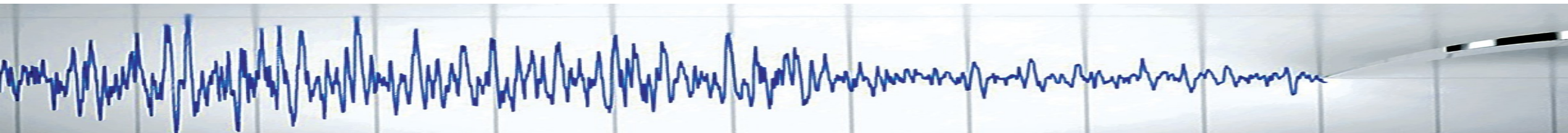




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THANK YOU FOR YOUR ATTENTION !!



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SEISMO-LAB

In this framework the proposed project promotes open education and innovation in schools and their communities, promotes the development of key competences for students who are developing projects and activities serving their communities and presents innovative whole-school approaches which are supporting teachers' professional development through collaboration, networking and good practice exchanges.