

EduSeismArtTec: Educational Seismology for the School and the Society: A Multidisciplinary approach through innovative theatre education methods and digital technologies

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EduSeismArtTec

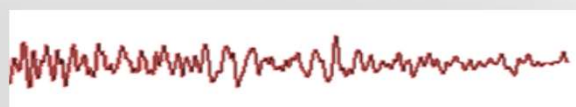
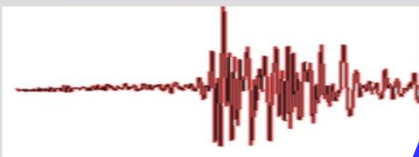
The general context of the project is described as follows:

- The seismological institutions actively participate in raising awareness and popularizing the concepts for understanding the disastrous earthquake phenomenon in extended population groups;
- Students and teachers are population groups that can have a role in reducing the impact through the educational process and diffusion of knowledge;
- Earthquake protection measures are a set of rules that can be followed individually, with the Educational Seismology having a social dimension (in the short and long term);
- Educational Seismology is linked to Citizen Seismology, where a trained for earthquakes citizen becomes an observer and reports reliable information to scientists, who process them and provide valuable information to the State for immediate response to affected areas.

- Theatre in education, is already widely recognized as a mean for the formulation of individual human behaviour, the development of critical thinking and the human socialization; it enables a variety of experiential approaches to sensitive or demanding subjects and challenges.
- When drama is combined with the use of modern digital technologies, such as virtual reality or the combination of real actors and digital agents in hybrid events, it allows for innovative, multi-disciplinary approaches of education on the earthquake phenomenon and resilience, whereupon the school becomes a source of information for wider population groups.

EduSeismArtTec

At this project, three research groups are involved, all with significant experience and expertise in specific knowledge areas, namely: the Institute of Geodynamics of the National Observatory of Athens (NOA-IG), the Department of Electrical and Electronics Engineering of the University of West Attica (UWA-DEEE) and the Department of Theatre Studies of the University of Peloponnese (UoP-DTS).



The partners within the present project develop learning cultures, by exploiting innovative approaches (such as theatre education and use of digital, multimedia technology) and developing group culture within target population groups.

SeismARTec

As '*EduSeismArtTec*' completes two years of implementation, the activities and interventions carried out and the results obtained are presented here; future research steps are also outlined. More specifically and for indicative reasons:

- Development and improvement of educational tools and class activities.
- VR game development.
- Theatre pedagogy involvement in School Seismology.
- VR and digital technology in theatre activities.
- From School Seismology to Citizen Seismology with a web based macroseismic observation submission platform, combined with the strong motion network, strong motion data and macroseismic database.

EduSeismArtTec

The experience with schools concerning the seismology terms popularization and the understanding of precaution measures, showed the value of the **educational tools**. Thus, a set of improved educational tools is prepared (posters, brochures, models using mainly cheap and easy-to-find materials) and is placed in a safe proof case, serving the aim of mobility and spread of the seismology knowledge to schools.

ΣΕΙΣΜΟΙ : Συχνές ερωτήσεις, αλήθειες και μύθοι
ΓΕΩΔΥΝΑΜΙΚΟ ΙΝΣΤΙΤΟΥΤΟ, ΕΘΝΙΚΟ ΑΣΤΕΡΟΣΚΟΠΕΙΟ ΑΘΗΝΩΝ

Τι είναι σεισμός?
Είναι ένα φυσικό φαινόμενο, που οφείλεται, να είναι, η γήινη και η εξωγήινη του δόνηση από σπινθήρα της Γης. Οφείλει είναι πάντα να αποτελέσει τον άμεσο αιτιολογικό (φύση, τεχνητή, ηλιακή, στις εσωτερικές καταστάσεις, βλάβες) και στα περιβάλλον (αυτομόλιθες, βόσκους κέρμα, κλπ) στην αβυσσική υφή.

Γιατί γίνονται σεισμοί;
Η Γη περιστρέφεται ως "φυσικός μηχανισμός". Οι αλληλεπιδράσεις μεταξύ δόνησης (αποτελούνται, τον παλιό κόσμο) ή συμπεριφέροντα (αυτομόλιθες, για φάση) ή κίνησης (αυτομόλιθες ή με τους άλλους αυτομόλιθες της κίνησης των αλληλεπιδράσεων "κίνηση" στην ή συμπεριφορά "κίνηση" ή δόνηση των περιβάλλον και η γήινη του σεισμοί.

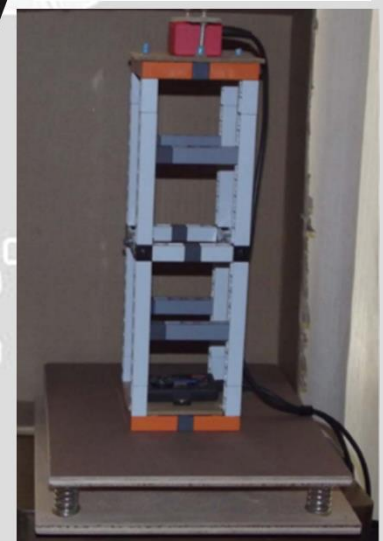
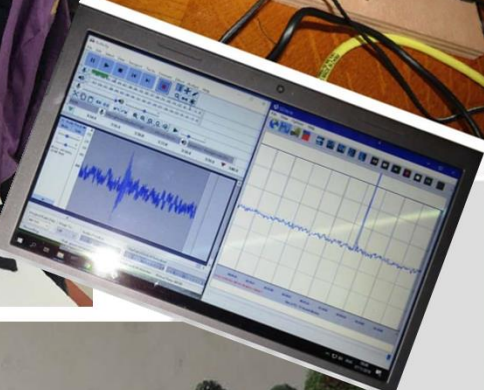
Γιατί γίνονται σεισμοί στην Ελλάδα;
Η Ελλάδα βρίσκεται στο άκρο νότιο της Αφρικανικής και της Ευρασιατικής πλάκας. Η πρώτη βόσκου είναι από τα δύσκολα, οι αλληλεπιδράσεις ή φάση που είναι δύσκολο να έλθει την υφιστάμενη κατάσταση στην Ελλάδα, η οροφή της Τζάου και αλληλεπιδρά τον άκρο της Ελλάδας και τα εργαζόμενα να βόσκου και να είναι.

Πώς μετράμε τους σεισμούς;
Οι ιδανικοί δόνησης που παράγονται σε σεισμούς καταγράφονται και μετρούνται από ομαδο δόνησης (σεισμογράφος). Οι καταγραφές των "σεισμογράφων" κωδικοποιούνται (αποτελούνται και καταγράφονται) ως αλληλεπιδράσεις των αλληλεπιδράσεων της Γης από τον άμεσο δόνησης (σε σεισμούς κέρμα). Μέσω των αλληλεπιδράσεων οι επιστήμονες προσδιορίζουν το χρόνο γέννησης, το επίσταση, το κέντρο δόνησης, τον τύπο της δόνησης που προκαλεί το σεισμό και τη φύση της, ενέργειας που μεταβιβάζονται από τη δόνηση των περιβάλλον.

Τι είναι το μέγεθος και η ένταση του σεισμού;
Το μέγεθος του σεισμού λέγεται μέγεθος είναι ένας σεισμός, θετική μέτρο που μέτρο που αποκαθίσταται στην κατά από τη δόνηση των περιβάλλον. Το μέγεθος, κωδικοποιείται από τη συμπεριφορά και τον κέντρο από το άμεσο περιβάλλον. Οι κλίμακες μέτρον από 10000000. Η πιο γνωστή κλίμακα μέτρον είναι η κλίμακα Richter που αναφέρεται στο 10000000, αλλά υπάρχουν και άλλες που αναφέρονται στο μέγεθος, στο εστιακό μέγεθος κλπ. Η ένταση μετράται ως κίνησης των σεισμών από δόνησης, στο κέντρο και στα περιβάλλον σε ένα ή και κλίμακα κίνησης είναι 12000000 και αναφέρεται η κλίμακα Mercalli (ΜΜ), η Ευρωπαϊκή Μακροσεισμική Κλίμακα (ΕΜΚΜ) κλπ.

Η πρώτη σεισμοί είναι 20/12/2014, 15:55 (πρώτη ώρα) σημειώθηκε σεισμός έντασης 2,8 στην Καραϊσκάκη, σε απόσταση 6 χιλ. βλ. του Αργοπολάου. Ο σεισμός, προκαλεί βλάβες έντασης VIII- στο Λαύρα, V στο Αργολικό, ένα σεισμός στην Κλαυδία έντασης VI, ένα είναι σεισμός στο Δυτικό Αίγιο.







Το αν ένας σεισμός προκαλεί βλάβες ή όχι δεν εξαρτάται τόσο από το μέγεθος, αλλά από τον περιβάλλον από το κέντρο, το είδος βόσκου, το είδος δόνησης, τη θέση, τη μορφή, και τον μορφή των κατασκευών. Αν ένας σεισμός, παράγει σε μεγάλο μέγεθος είναι παρά μόνο οι κατασκευές κέρμα. Εάν κατασκευές, στις έντασης είναι (μεγάλη ένταση), ενώ είναι αναμενόμενα από το επίσταση οι κατασκευές κωδικοποιούνται από τη δόνηση των περιβάλλον.


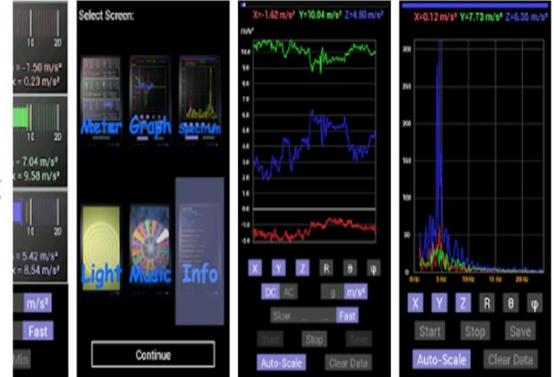




Simplified classroom activities were developed and are proposed to the school community: painting, preparing a first aid kit, making simple models, practicing readiness, multiple choice questions, use of smartphone as seismic recorder and “generate my own earthquake” etc.

Σημείωσε το σωστό με πράσινο Ν και το λάθος με κόκκινο Χ

 <p>Όταν μεταδίδουμε σεισμό σφραγίζουμε για να βρούμε τη ρήξη.</p> <input type="checkbox"/>	 <p>Όταν μεταδίδουμε σεισμό αποκτάμε κοντά σε καλώδια.</p> <input type="checkbox"/>
 <p>Ο σεισμός είναι ένα φυσικό φαινόμενο.</p> <input type="checkbox"/>	 <p>Μετά το σεισμό αναζητούμε ελεύθερους χώρους μακριά από κτήρια.</p> <input type="checkbox"/>
 <p>Όταν μεταδίδουμε σεισμό απομακρυνόμαστε από τα παράθυρα.</p> <input type="checkbox"/>	 <p>Για προστασία από το σεισμό έχουμε σχέδιο και κάνουμε ασκήσεις.</p> <input type="checkbox"/>


Virtual Reality Environment for School Seismology

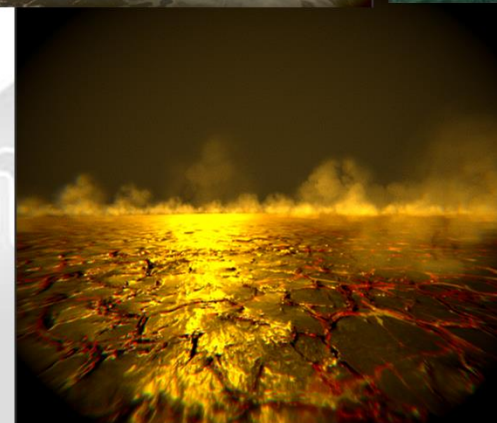
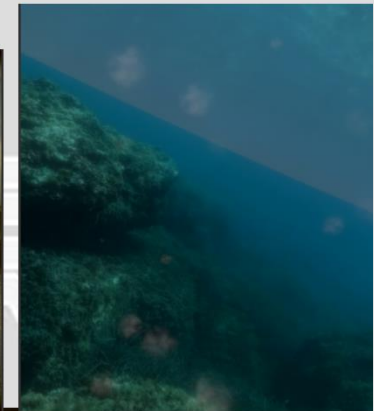
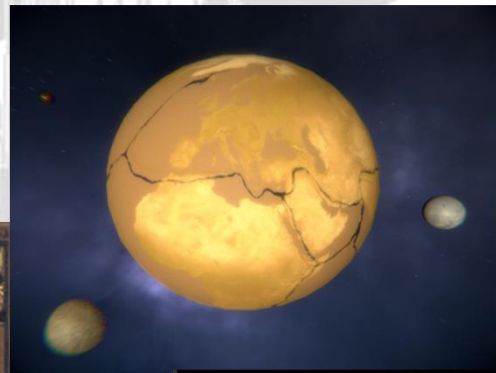
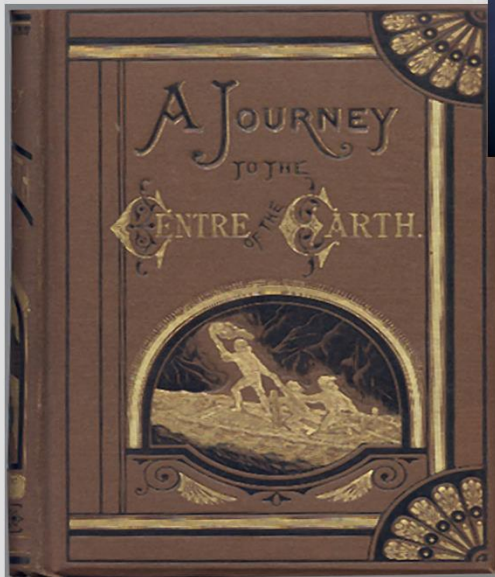


- Virtual reality and digital media have become important exciting educational tools.
- The surprise created by immersion in virtual reality, sharpens the user's attention resulting in a more efficient intake of information related to the various geological and geodynamic phenomena.
- Aiming to understand basic concepts of the seismic phenomenon and the causes that generate it, VR and digital products were planned and developed, being under improvement and enrichment.

Tools used: HTC Vive PRO VR **Headset**, VR ready **PC** (graphics card, RAM, etc..), **Blender** Modelling Software, **Unity 3D** game engine, **SteamVR** Unity plugin.

The scenario of the educational application is about a journey to the Center of the Earth inspired by Jules Verne's book.

The Virtual Tour of the observer starts from the space, and approaches the Earth at the vicinity of Crete. Following the subduction of the lithosphere, he enters the melted mantle at a depth of 150km and he emerges out at the vicinity of Thira after a volcanic eruption. During the narration, terms like lithospheric plates, crust and mantle, subduction zone, volcanic arc, etc. are mentioned and explained.





VR Quake: A virtual reality application on the earthquake phenomenon and the precaution measures.

The VR game will be demonstrated in Athens Science Festival, 21-23/10.

Objectives:

- To enable users to experience a virtual earthquake in a safe way and in a 360° immersive environment.
- To train users to be prepared properly in case of an earthquake.

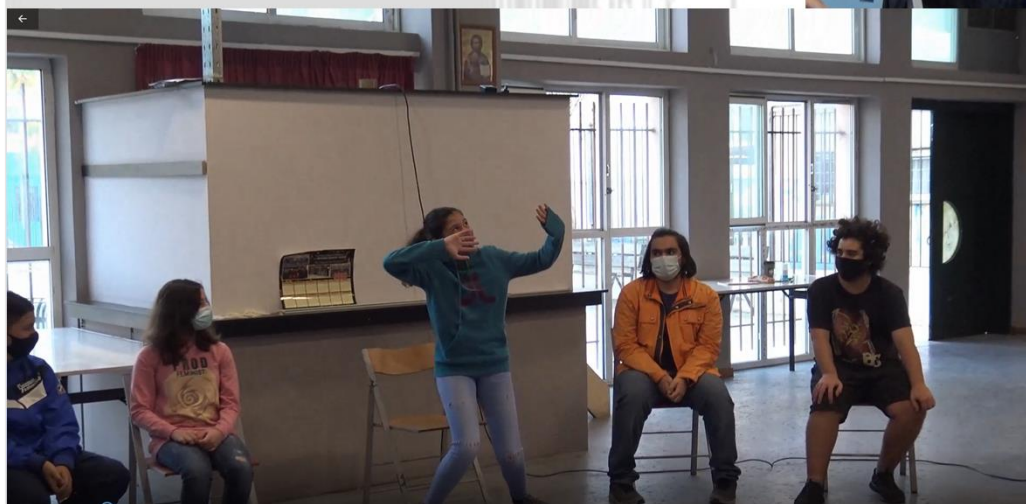


SeismArtTec

- Development technology used: Unity3D game engine.
- Equipment: Head-mounted display (HMD) HTC VIVE Pro.
- Design Content: Immersive Virtual Reality game consisting of a total of 5 levels. In the first two levels the user is trained to move and interact within the virtual environment. In level 3 the user experiences a virtual earthquake, in level 4 the user has to place the objects, which are in a dangerous position in case of an earthquake, in a safe place and finally in level 5 the user has to choose which objects are useful in case of an earthquake.
- Purpose of the game: The user collects points by completing the requirements of each level.



In order to experimentally test and evaluate the **effectiveness of the approach via theatre pedagogy**, a drama-in-education intervention has been designed and implemented in an attempt to enrich the tools of Educational Seismology with those of drama-in-education methodology. The designed intervention has employed mainly the process drama approach (Bowell, & Heap, 2013; Schonmann, 2011; O'Toole, 1992). It has involved over 900 pupils of the primary education, over 140 pupils of the secondary education and over 60 students of the higher education, with strongly positive results.



Moreover, the **“Beat the Quake!” theatre performance** has been produced and staged (June 22, Piraeus Municipal Theatre), using the devised theatre (Oddey, 1994) and documentary theatre methods (Forsyth & Megson, 2009). Nine students of the Department of Theatre Studies of the University of Peloponnese, who volunteered as actors for this performance, took part in the collaborative invention of the play.

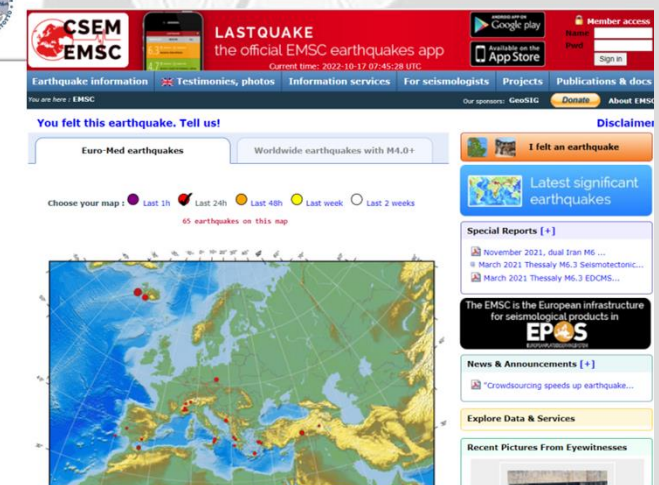
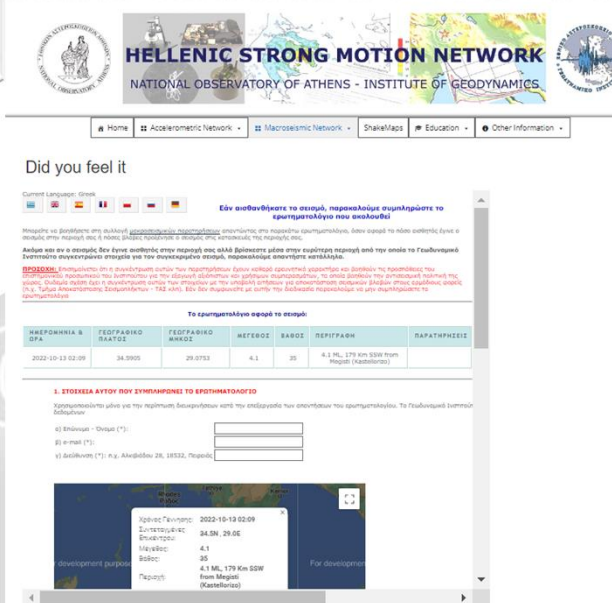




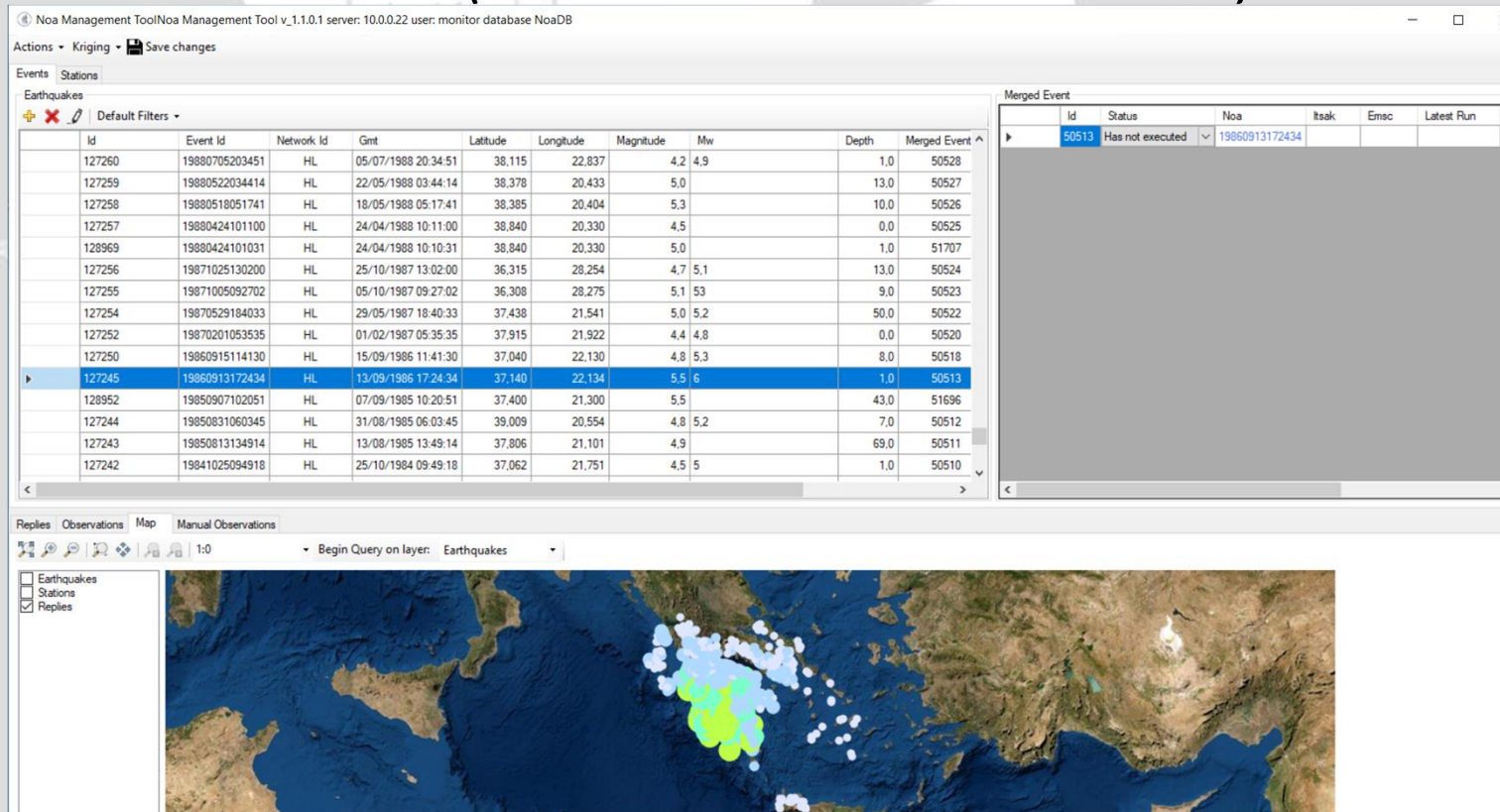
An interesting point of the performance is the **combination of physical and digital aspects, through the use of virtual reality and holographic projection technologies**. The target is to reach the wider audience and to develop a performative Citizen Seismology project, where the citizen is educated for resilience and becomes an active stakeholder both in prevention and in intervention regarding the earthquake.

Concerning the subject of Citizen Seismology, the **development and improvement of a web platform for citizens to upload their observations for moderate / destructive earthquakes** is ongoing. The platform should be able to handle observations / information in multiple forms (text, images, audio, mobile phone application products, etc.) and it should withstand heavy data traffic in cases of massive response from the public at the time of crisis.

It is worth to mention, that the CSEM platform for observations (LastQuake app), as it is available on line, it is used to enrich the maroseismic data sources.



The platform via a **management tool**, which was developed, combines the operation of the strong motion network (station status and information), the strong motion database (records) and the macroseismic bulletins (archive information on important past earthquake events) and it will be connected to other existing databases of NOA-IG (i.e. Moment Tensor database).



Shake maps (Worden et al., 2020) of strong earthquakes are also connected with this platform as a result of the citizens' observations and the instrumental recordings.

HELLENIC STRONG MOTION NETWORK
NATIONAL OBSERVATORY OF ATHENS - INSTITUTE OF GEODYNAMICS

Home Accelerometric Network Macroseismic Network **ShakeMaps** Education Other Information

ShakeMaps

Date: 04/11/2022 Magnitude: 5

Event ID: noa2022tjtz
Date: 2022-10-08 22:02:28
Code: 38.3052
Lat [°]: 38.3052
Lon [°]: 22.5162
Depth [km]: 12.7
Magnitude: 5
Max Pga [%g]: 10.3769
Max Pgv [cm/s]: 2.714
Max I: V
Hypocenter: 1770

ID	Eventid	Date	Lat [°N]	Lon [°E]	Magnitude	Depth [km]	Max Pga [%g]	Max Pgv [cm/s]	Max I	Status
2	noa2022tjtz	2022-10-08 22:02:28	38.3052	22.5162	5	12.7	10.3769	2.714	V	Instrumental
3	noa2022tjwq	2022-10-08 22:08:00	37.5719	22.6991	4.3	10	0.2027	0.093	II	Instrumental
4	noa2022tjv4	2022-10-08 22:04:00	38.2854	22.2258	5	8	0.9875	0.265	II	Instrumental
5	noa2022tjv8	2022-09-19 03:13:57	38.9889	26.4207	4.2	10.2	1.3661	0.5	II	Instrumental
6	noa2022tjv9	2022-09-17 18:41:41	35.5728	25.6561	4.2	16.7	0.2446	0.142	II	Instrumental
7	noa2022tjv0	2022-09-16 14:10:48	38.1711	21.6511	4.1	19	1.4276	1.362	IV	Instrumental
8	noa2022tjv1	2022-09-16 12:58:08	37.455	21.8071	4.1	23.4	0.6188	0.16	II	Instrumental
9	noa2022tjv2	2022-09-15 14:48:00	39.0386	23.5725	4.1	15	0.4589	0.128	II	Instrumental
10	noa2022tjv3	2022-09-08 07:36:20	37.8708	19.9026	5.4	8.8	2.8887	0.967	II	Instrumental
11	noa2022tjv5	2022-09-05 04:16:09	34.8754	16.4817	5.7	2.5	1.5157	0.966	II	Instrumental

Information for event noa2022tjtz
Origin Time: 2022-10-08 22:02:28
Magnitude: 5
Lat [°]: 38.3052
Lon [°]: 22.5162
Depth [km]: 12.7
Max Pga [%g]: 10.3769 (202-10-08)
Max Pgv [cm/s]: 2.714 (202-10-08)
Max Int: Intensity: V

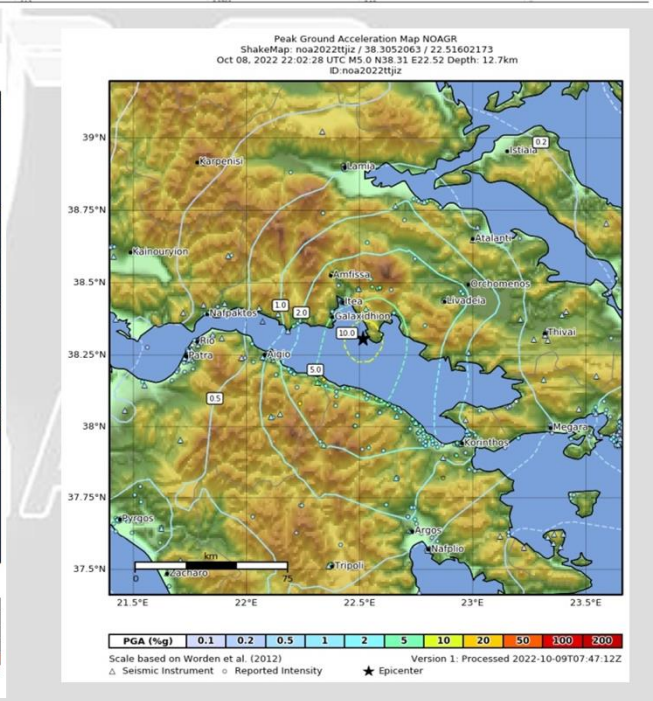
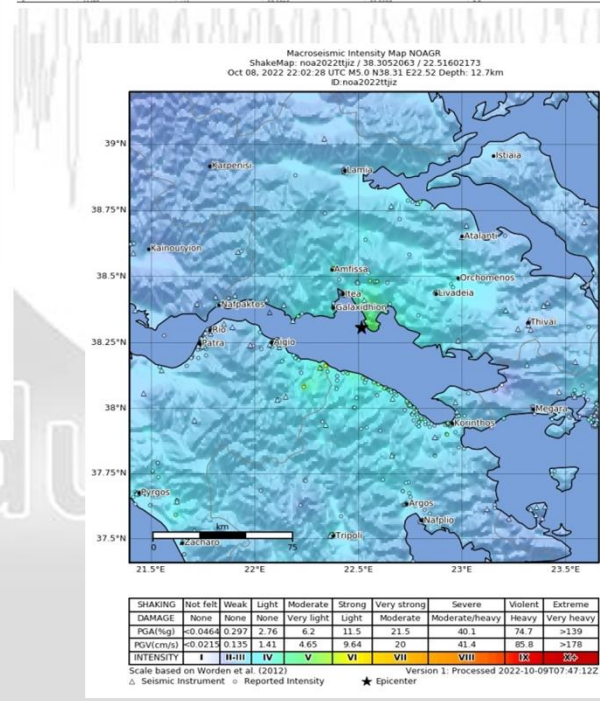
	Instrumental Intensity		Peak Ground Motion	
	Acceleration	Velocity	Acceleration	Velocity
JPEG	intensity.jpg	ppg.jpg	ppg.jpg	ppv.jpg
PSA	psa10.jpg	psa03.jpg	psa03.jpg	psa10.jpg
PDF		intensity.pdf		

GIS Files
Shape File: shapefile.kml
ESRI Raster File: raster.jpg

Station Lists
GeoHome: [noa2022tjtz](#) Test: [noa2022tjtz](#)

Supplemental Data
[intensity.png](#) [ppg.jpg.png](#) [ppv.jpg.png](#)

ID	Code	Name	Lat [°N]	Lon [°E]	Elevation [m]	Epic. Distance [km]	Max Pga [%g]	Max Pgv [cm/s]	Intensity
1	ACHA	HL	38.0748	23.7412	183	108.1	0.302	0.284	II
2	ACOR	HA	37.8902	22.8902	0.0	54.4	0.417	0.224	II
3	AGG	HT	39.0211	22.336	0.0	79.5	0.1409	0.071	II
4	AG3	HL	38.8893	21.4162	45	99	0.1314	-	II
5	AGP	CL	38.999	21.7228	0.0	68.5	0.1149	0.097	II
6	AG2	HL	38.2417	22.0728	120	38.8	0.5544	-	II
7	AUX1	HL	38.1836	22.3193	124	25	0.0334	-	V
8	AUX2	HL	40.5454	23.8759	0.0	400.5	0.0093	-	I



Next Steps:

- A second theatre performance is scheduled at Nafplio by the end of this year, taking into account the review of the available questionnaires from the last June performance.
- Enrichment of VR and holographic material.
- Improvement of the Citizen Seismology Platform.
- Organization of a 1-day workshop for the results to be discussed and enriched by the participants.
- Publication of a book, including the project activities documentation, the evaluation of the results and the overall experience of all participants.

EduSeismArtTec



Thank you for your attention

For more information:

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