ArtEmis Newsletter

Welcome to the ArtEmis Newsletter!

Summary:

ArtEmis is a Horizon-Euratom project funded by the European Commission which brings together 14 partners from 9 countries. It started on 1st October 2022 with the aim of addressing one of the most damaging natural hazards on earth: earthquakes. The ultimate goal is to improve radon-based earthquake forecasting methods. The artEmis project will develop a smart and cheap sensor system with about 100 units monitoring radon, temperature, acidity, and other observables in ground water in real time. The data from the sensor system will be combined with seismic and geological data and analysed via machine learning algorithms. The sensors will be placed along fault zones in earthquake prone areas in Greece and Italy, and in Switzerland.

To stay further informed with updates about the ArtEmis project, please do also visit our official website (linked below).

ArtEmis' Website

Newsletter #2

Message from ArtEmis Project Coordinator - Prof. Ayşe Atac Nyberg

Dear reader,

Welcome to our second artEmis newsletter, which provides the recent status on our project. Despite the summer months and holidays, our participants kept on working hard and produced exciting results!

During the summer phase of the project, all delivery delays were finally settled and production of six demonstrator sensor units started (see fig. 1) in Darmstadt, GSI. One unit was taken to our partner institution SURO in Prague for gamma activity calibration in water (see fig. 2). The data reveal excellent sensitivity and are currently being analysed quantitatively. The next stage will be performing further test measurements including all measurement parameters and combining the sensors in a communication network. We expect to continue our sensor production within the coming months with the aim of having 30 sensors before the new year.

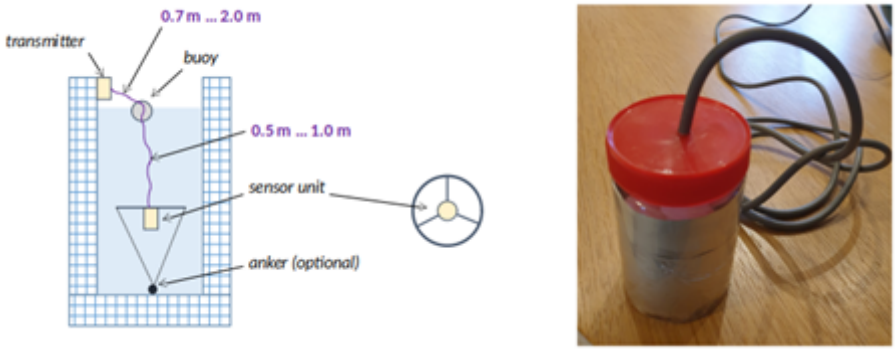

Fig.1 Sensor unit layout and deployment. Figure prepared by Juergen Gerl and Gururaj Kumar.

Fig. 2: Measurement set-up with 1 m^3 water tank (left), and Sensor Unit and anchor before insertion (right). Figure prepared by Juergen Gerl.

In parallel to this, we were preparing reports, databases of geology, hydrology and seismotectonics of the selected measurement areas in Greece, Italy and Switzerland. Our sensor experts visited the suitable measurement sites, like wells, springs and caves where we can access the ground water and gathered detailed information on the physical properties as well as the availability of mobile networks and power lines in the area. Based on this field study, we are now able to determine the most suitable locations for the first test experiments. Below, in Fig. 3, you can see pictures from a few of these sites.

a)

b)

c)

d)

Fig. 3 a) S13 drainage hall LNGS lab (Gran Sasso Underground Lab), Italy, b) Stiffe cave, Italy, c) Village well Kefalonia, Greece and d) Cave lake Kefalonia, Greece. Foto by Juergen Gerl and Gururaj Kumar.

In collaboration with GSI, KTH has been working on the gateway that connects the sensors to the servers in the Internet “cloud”. Several platforms have been evaluated, and requirement specifications for the communication have been settled: The communication between the sensor and the gateway will take place over an RS-485 cable. The gateway will connect to the Internet using wireless communication over the 4G mobile network.standards protocol for Internet of Things messaging. Data exchanges will utilize the JSON data format, more specifically as JSON-RPC for control and SenML for sensor data.

A prototype of the gateway is developed. It will support a first line-up of a sensor system at KTH, including a transmitter emulating data from the radon sensor, cable and cable interface, and data transfer to a MQTT broker/server.

Our challenge now is to build a sensor network, which will transfer data from the sensors to servers, where the data will be combined, stored and analysed. We expect to start our measurements with the existing sensors in early 2024. There is an exciting time coming ahead of us where we move on from design to implementation and operating the sensors. We will be glad to keep you informed along our path.

Prof. Ayşe Ataç Nyberg, KTH

artEmis Project Coordinator

ArtEmis conferences 2023-24

Prof. Eleftheria Papadimitriou, Prof. Karakostas Vasileios, Dr. Crhistos Kourouklas (AUTh) and Prof. Ayse Atac Nyberg (KTH) will represent the ArtEmis consortium at the 8th International Colloquium on Historical Earthquakes, Palaeo-Macroseismology and Seismotectonics, taking place between the 17th and the 20th of September 2023 in Lixouri, Kelafonia Islands. Prof. Eleftheria Papadimitriou, Prof. Karakostas Vasileios and Dr. Crhistos Kourouklas (AUTh) will also represent the ArtEmis consortium in The 39th General Assembly of the European Seismological Commission (ESC) will be held in Corfu, Greece, from 22 to 27 September 2024.

The conferences will be an excellent introduction moment and showcase of ArtEmis and the progress of our work. We strongly encourage partners to participate, as these conferences provide an ideal platform to network and actively engage in meaningful discussions with other participants and fellow consortium members.

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