***Working Group 2 and 3 - Seismic, Geophysical and Sea Level Measurements and Sea Level Data Collection and Exchange, Including Offshore Tsunami Detection and Instruments***

**NIEP ACTIVITES FOR 2022**

NIEP is active member in the following international projects:

**AGITHAR - Accelerating Global science In Tsunami HAzard and Risk analysis -** NIEP had few occasional activities, as the project was mainly structured through online and/or face to face meetings and exchange of scientific materials. There were few annual virtual meetings attended by NIEP personnel, but also specific reports were sent, when requested. A NIEP representative is part of the Management Committee, but also there are participants in each Working Group of the Project. Moreover, NIEP became part AGITHAR Project in the framework of COST, which is an intergovernmental framework consisting of 41 Full Members, 1 Cooperating Member and 1 Partner Member. This allows researchers from these countries to embark upon networking opportunities by participating in science and technology networks called COST Actions.

**ARISTOTLE eENHSP - All Risk Integrated System TOwards Trans-boundary hoListic Early-warning - enhanced European Natural Hazards Scientific Partnership Project**. In 2022, NIEP, among other partners from Earthquake-Tsunami Hazard Group (EQ-TS HG), contributed to the Emergency Full Reports and Lite Reports (based on ERCC activations) and Routine Operational Reports (three times / week, when Red or Orange EQ - TS events are open). Usually, only for very rare events, tsunami is representing the main hazard, whereas in most of the cases ARISTOTLE is assessing earthquake-triggered tsunamis. Moreover, NIEP has provided the Earthquake Hazard Chair Deputy (January-September) and Earthquake Hazard Chair (October-December) role, one representative participating to the monthly Multi-Hazard Board meeting and discussing the overall performance of the project for all hazards, feedback from ERCC and propose solutions to enhance the service. Further steps where NIEP could contribute, consist in developing a quantitative tsunami impact assessment tool for the TS HG.

The networks of seismic and GNSS stations has been enlarged in the last few years (not specific in 2022), due to the necessity of more precise measurements and past events. For both earthquake and tsunami monitoring, there are 3 sea level stations, 7 GPS/GNSS stations and 30 seismic stations installed in Dobrogea area (along the shore of the Black Sea).

The sea level data can be found in multiple places, such as local websites, but also they are available on IOC and JRC website.

<http://geobs.infp.ro/echipamente.php>

<https://eeris.eu/ERIF-2000-000X-4214>

<http://geobs.infp.ro/marea_neagra.php>

<http://www.ioc-sealevelmonitoring.org/list.php?order=delay&dir=asc&contact=161>

<https://webcritech.jrc.ec.europa.eu/TAD_server/Device/1428> (only Mangalia station)

**Geobs** is a database of geophysical observation (radon, air ionization, CO2 and CO, Black Sea level, magnetic field, meteorological information, infrasound, ULF - VLF radio data, telluric currents, atmospheric static electricity etc.), in real time, displayed and sent at 5 minute intervals.

**Citation: Toader, Victorin; Ionescu, Constantin; MOLDOVAN, IREN; Palangeanu, Lucian (2022), “geobs”, Mendeley Data, V2, doi: 10.17632/28kv3gsgcz.2**

**Geobs** is used in two important national projects **PhENOMeNAL** (Virtual Platform for collecting and interactive analysis of multidisciplinary Geophysical Data) and **AFROS** (Analysis and Forecasting of Romanian Seismicity).

The instalation and maintenance of the sea level stations is accomplished in the framework of the National Romanian Project "**The Research centEr for climAte Change due to naTural dIsasters and extreme weather eVEnts**" - **REACTIVE**, as part of the "Digital Twin Earth Intelligence for Climate Changes", coordinated by the Politechnica University of Bucharest. Moreover, within this project, new sea level monitoring equipment will be acquired for Mangalia, Constanta and Sulina, in order to replace the old or/and broken sensors. Some equipment for storms and extreme events detection will be also installed in the framework of this same Project.

For a better dissemination of the info regarding tsunamis, and also for monitoring the area of interest (Black Sea, but also globally), a **specific tsunami website** has been implemented in the past, and improved recently. <http://ctwc.infp.ro/index.php>

Some related articles, one published in 2019, another one in 2022, are listed below:

**Ghita, C**.; Tuta, L.; Moldovan, I.-A.; Ionescu, C.; Nicolaescu, M. FastICA Algorithm Applied on Black Sea Water-Level Ultrasound Measurements. Atmosphere **2022**, 13, 1973. https://doi.org/10.3390/atmos13121973

**Partheniu R**., Ghita C., Victorin T., Nastase E., Muntean A., Murat E., Moldovan I. A., Ionescu C., Monitoring the Black Sea natural hazards using new technology and equipment, Romanian Reports in Physics, 71, 704, 2019

**Proposals and future work**

As future work, we need to emphasize two major subjects. One of them is the accomplishment of an Early Warning System (EWS) for the Black Sea, in a complex approach, by installing a multidisciplinary network that will include: sea level sensors (radar and pressure), seismic stations (already installed), meteo stations, acoustic sensors (including infrasound), and electric atmospheric field measuring sensors. This phase will be part of National Research Funding Project (2023-2026), “Advances research for new knowledge regarding development, implementation and integration of new methods and instrumentation for data rapid processing, used for a better characterization and evaluation of earthquakes or other natural and anthropic effects”.

As part of the same national research funding program (NUCLEU) proposal, during 2023-2026, called PHAZER - “The seismic phenomena, from global scale to local scale, in a multidisciplinary approach”, specific tsunami related phases are: “Multidisciplinary research for evaluating hazard and risk associated to natural and atrophic phenomena and earthquake prediction”, a more detailed description of future work is “Risk reduction due to tsunami phenomena and other extreme events related to sea level variations”.