ESONET NoE - Hellenic Observatory – Mediterranean Sea

The eastern Mediterranean is characterized by significant seismicity, special habitats in deep basins and a very steep drop off in depth from the coastlines.

Scientific context and relevance

The international geophysics and oceanographical scientific community has recently defined as a priority the acquisition of data in those areas of the globe, like the ocean depths, for which at the moment we have few or no data at all. The monitoring of the water column parameters that can be performed by a deep-sea laboratory will provide very useful data for the study of the global circulation of waters in the Mediterranean. Earthquakes generated by offshore seismicity have, in the past, caused great damage to coastal regions, both from earthquakes and the resulting tsunamis. Events originating at sea can only be precisely located by using on-land and underwater seismic stations together. A permanent network of underwater stations will complement the existing land network, enhancing its performance. A further advantage of underwater stations is that, if suitably located, they suffer from a much lower background noise than land stations.
Deep-sea regions have been generally considered as stable environments, not subjected to the strong and rapid modifications related to human influence that characterize the coastal regions. More recent studies have demonstrated, however, that deep-sea regions are subject to strong variations of the trophic and sedimentation rate, even on a seasonal scale. An observatory able to monitor the deep-sea environment by measuring in situ biological, chemical and physical parameters will be able to:

- Monitor seismic activities for geo-hazard prevention;
- Measure benthic-pelagic interchange and turnover;
- Measure oxygen consumption;
- Detect fluid fluxes from the seabed into the ambient bottom-water;
- Project of images of the benthic and pelagic fauna.

The Hellenic region comprises of four distinct networks: NESTOR (existing neutrino observatory cable), BUTT-1 (IODP – site of proposed deep borehole), the Cretan basin and the Rhodos basin. The overall aim of these stations is for the long term investigation of seafloor processes. The objectives are:

- to quantify slow versus fast fluid flow and carbon/methane fluxes;
- to develop long term monitoring observatories for oil/gas industry;
- to create a science platform capable of offering a totally new approach to public outreach and awareness of ocean processes;
- to develop an enhanced 3D visualization of multi parameter datasets;
- to carry out hydroacoustic studies on fluid flow pathways and mineral crusts in upper sediment layers;
- to link fluid, methane flow with tectonic movement and seismic activity monitor the biology and ecology of these deep areas.

An internet operated vehicle (IOV) has been built with the capability to move along the seafloor by video control and to carry out detailed investigations on fluid and particle fluxes in the benthic boundary layer. The IOV should be connected to the internet via a junction box (node) within an underwater network. Once connected the system should remain on the seafloor for extended periods of several months to study the temporal and spatial variations at a given location in the deep sea.
For the NESTOR-ESONET deep sea observatory three crawlers will be built, each equipped with different sensor systems. All crawlers will be connected to one central instrument system (lander), which is located up to 100 m away from the node, carries additional sensors and transfers the data of the IOVs to the land based data centre or offshore installation.