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Science Objectives and Design of the European Seas Observatory NETwork (ESONET)

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The needs for a network of ocean observing systems cross many applied and research areas of earth and marine science. Many of the science areas that can be examined using such systems have direct impacts on societal health and well being and our understanding of ocean function in a shifting climate. The European Seas Observatory NETwork (ESONET) Network of Excellence has been evaluating ocean observatory design requirements, data management needs, standardization and interoperability concerns, social implications, outreach and education, as well as financial and legal aspects of developing such a system. ESONET has great potential to address a growing set of Earth science questions that require a broad and integrated network of ocean and seafloor observations. ESONET activities are also importantly integrating researchers in the European Community, as well as internationally.

There is now wide recognition that research addressing science questions of international priority, such as understanding the potential impacts of climate change or geohazards like earthquakes and tsunamis should be conducted in a framework that can address questions across adequate temporal and spatial scales. We will present the relevant science priorities in the four interconnected fields of geoscience, physical oceanography, biogeochemistry, and marine ecology, and some of the practical ways in which these questions can be addressed using ESONET. Several key questions persist that will require comprehensive interdisciplinary approaches including:

How can monitoring of factors such as seismic activity, fluid pore chemistry and pressure, improve seismic, slope failure, and tsunami warning?

To what extent do seabed processes influence ocean physics, biogeochemistry, and marine ecosystems?

How are physical and biogeochemical processes that occur at differing scales related?

What aspects of physical oceanography and biogeochemical cycling will be most sensitive to climate change?

What will the important feedbacks of potential ecological change be on biogeochemical cycles?

What are the factors that control the distribution and abundance of marine life and what will the influence of anthropogenic change be?

We will outline a set of science objectives and observation parameters to be collected at all ESONET sites, as well as a set of rather specific objectives and thus parameters that might only be measured at some sites. We will also present the preliminary module specifications now being considered by ESONET. In a practical sense the observatory design has been divided into those that will be included in a so called ‘generic’ module and those that will be part of science-specific modules. Outlining preliminary module specifications is required to move forward with studies of observatory design and operation. These specifications are importantly provisional and can be updated as science needs and feasibility change. A functional cleavage not only comes between aspects that are considered generic or specific, but also the settings in which those systems will be used. For example, some modules will be on the seabed and some will be moored in the water column.

In order to address many of the questions posed above ESONET users will require other supporting data from other programs from local to international levels. Examples of these other data sources include satellite oceanographic data, climatic data, air-sea interface data, and the known distribution and abundances of marine fauna. Thus the connection of ESONET to other programs is integral to its success.

The development of ESONET provides a substantial opportunity for ocean science to evolve in Europe. Fur-

thermore, ESONET and several other developing ocean observatory programs are integrating into larger science frameworks including the Global Earth Observation System of Systems (GEOSS) and Global Monitoring of Environment and Security (GMES) programs. It is only in a greater integrated framework that the full potential of the component systems will be realized.