A NEW MULTISCALE AND MULTISENSOR STRATEGY FOR THE CHARACTERIZATION OF GROUNDWATER DISCHARGE IN COASTAL AREAS – FIRST RESULTS OF THE SUBGEO PROJECT IN PIANOSA ISLAND

R. Giannuzzi[1], L. Capozzoli[2], D. Di Gennaro[2], M. De Girolamo[3], M. Doveri[4], M. Menichini[5], D. Patella[1], M. Polemio[6], A. Santilano[5], G. Romano[1]

[1] Department of Earth and Geo-Environmental Sciences, University of Bari Aldo Moro, Piazza Umberto I, 70121 Bari, Italy
[2] Institute of Methodologies for Environmental Analysis, National Research Council of Italy (IMAA CNR), C. da S. Loja—Zona Industriale, Tito Scalo, 85050 Potenza, Italy
[3] National Institute of Geophysics and Volcanology (INGV), Via di Vigna Murata 605, 00143 Rome, Italy
[4] Department of Earth Sciences – University of Pisa, Italy
[5] Geosciences and Earth Resources – CNR, Pisa, Italy
[6]IRPI CNR – Bari, Italy

The monitoring and characterization of groundwater resources play a crucial role in the sustainable development and management of coastal areas. This is a fundamental aspect considering the climate changes occurring in areas particularly exposed to physical hazards resulting from extreme weather events and the risks of coastal erosion, groundwater salinization, flooding and other hazards in low-elevation coastal zones are higher (Oppenheimer et al., 2019). Moreover, coastal freshwater reservoirs can represent a fundamental resource to address water shortages. The hydrogeological potential and economic factors linked to the submarine groundwater are the starting point of the two-year Italian Research Project of National Relevance (PRIN-2022) SUBGEO. The project focuses on the submarine groundwater discharge analysis with an innovative and integrated geophysical approach based on the use of electric and electromagnetic methods for the twofold targets of coastal underground freshwater reservoir non-invasive characterization and to gain useful tools for the optimal and sustainable management of the coastal areas and resources.

SUBGEO aims to develop an innovative geophysical approach that provides spatially continuous and high-resolution subsurface information from the offshore areas, where the outward fluxes mix with the seawater, to the onshore ones.

The proposed strategy will be i) tuned by small-scale laboratory experiments and by numerical simulations to define the best acquisition procedures and check the sensitivity of the strategy for different subsurface conditions and ii) applied in test areas to verify its effectiveness. The final goal of the project consists of reproducing a high-resolution and detailed hydrogeophysical model for managing the water resources in coastal areas.

Here, we present the general scheme of the developed investigation strategy, the three test areas selected (Pianosa Island (Li), Parco Naturale Regionale delle Dune Costiere (Br) and Sant'Isidoro (Le)) and the outcomes of the first results of the field test activities carried out in Pianosa. These last consists in a 3km long ERT and GPR profile, E-W oriented, crossing the whole Island and a small-scale, high-resolution 3D geoelectrical model centered on a water well.

References

Oppenheimer M., Hinkel J. et al.; 2019: Sea Level Rise and Implications for Low Lying Islands, Coasts and Communities. Supplementary Material IPCC Special Report on the Ocean and Cryosphere in a Changing Climate.

Corresponding author: rossella.giannuzzi@uniba.it