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Introduction

A fully integrated tsunami monitoring unit, funded by the Italian National Civil Protection Department, was installed in July 2025 by INGV, offshore the **Sciara del Fuoco, Stromboli**, under the coordination of two INGV centres, the **CME** (Centro Monitoraggio Eolie) and **CAT** (Centro Allerta Tsunami), and has been operating reliably since.

Assembly and Deployment

The installation depth of about 88 m was selected to **optimize the conversion of pressure data into tsunami height**, minimizing deep-water attenuation effects, as tsunamis generated by mass flows at the Sciara del Fuoco have shorter periods than earthquake-induced tsunamis.

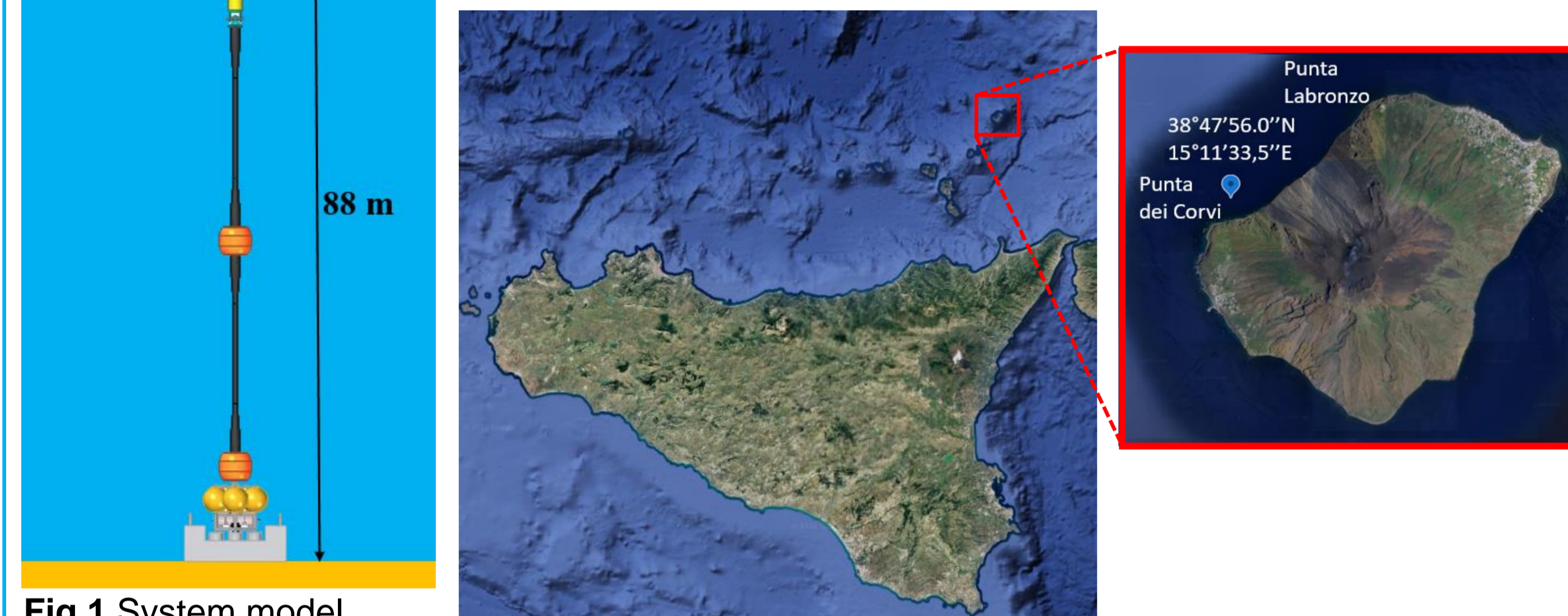


Fig.1 System model (cables not drawn to scale).

Fig. 2 Deployment point.



Fig. 3 The seafloor module anchored to a reinforced-concrete deadweight.

The seafloor module, anchored to a reinforced-concrete deadweight, hosts multiple sensors, including a **pressure sensor** to detect rapid sea-level changes, a **hydrophone** for volcanic and underwater activity and an **accelerometer** to monitor seafloor dynamics. A **mechanical release system** can be triggered acoustically to release the seafloor module from the deadweight. Data are exchanged bidirectionally between the buoy and the seafloor module through the **elastic electromechanical cable** that supplies power and provides elastic mooring.



Fig.4 System assembly.



Fig.5 Installation completed.

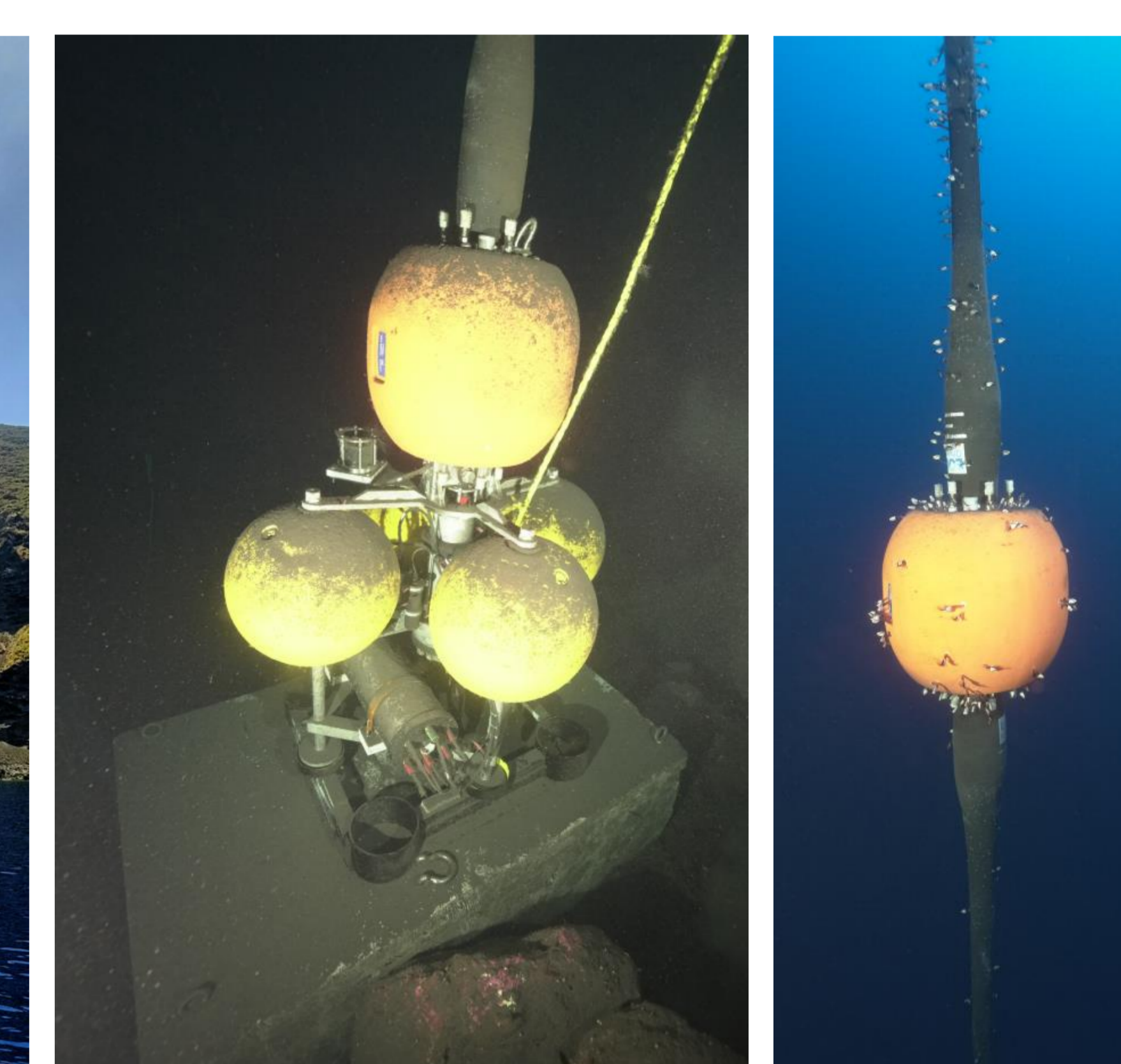


Fig. 6 Underwater inspection of the seafloor module and of intermediate connection buoy.

Elastic Cables Test

The elastic cable, manufactured by EOM Offshore, can extend up to 2.5 times its unstretched length while maintaining its mechanical and electrical integrity. To reach the installation depth, two cable segments were connected using an intermediate connection buoy.



Fig. 7 Electrical transmission tests before and after force-extension test.



Fig. 8 Force-Extension test.



Fig. 9 Constraints and force measurement.

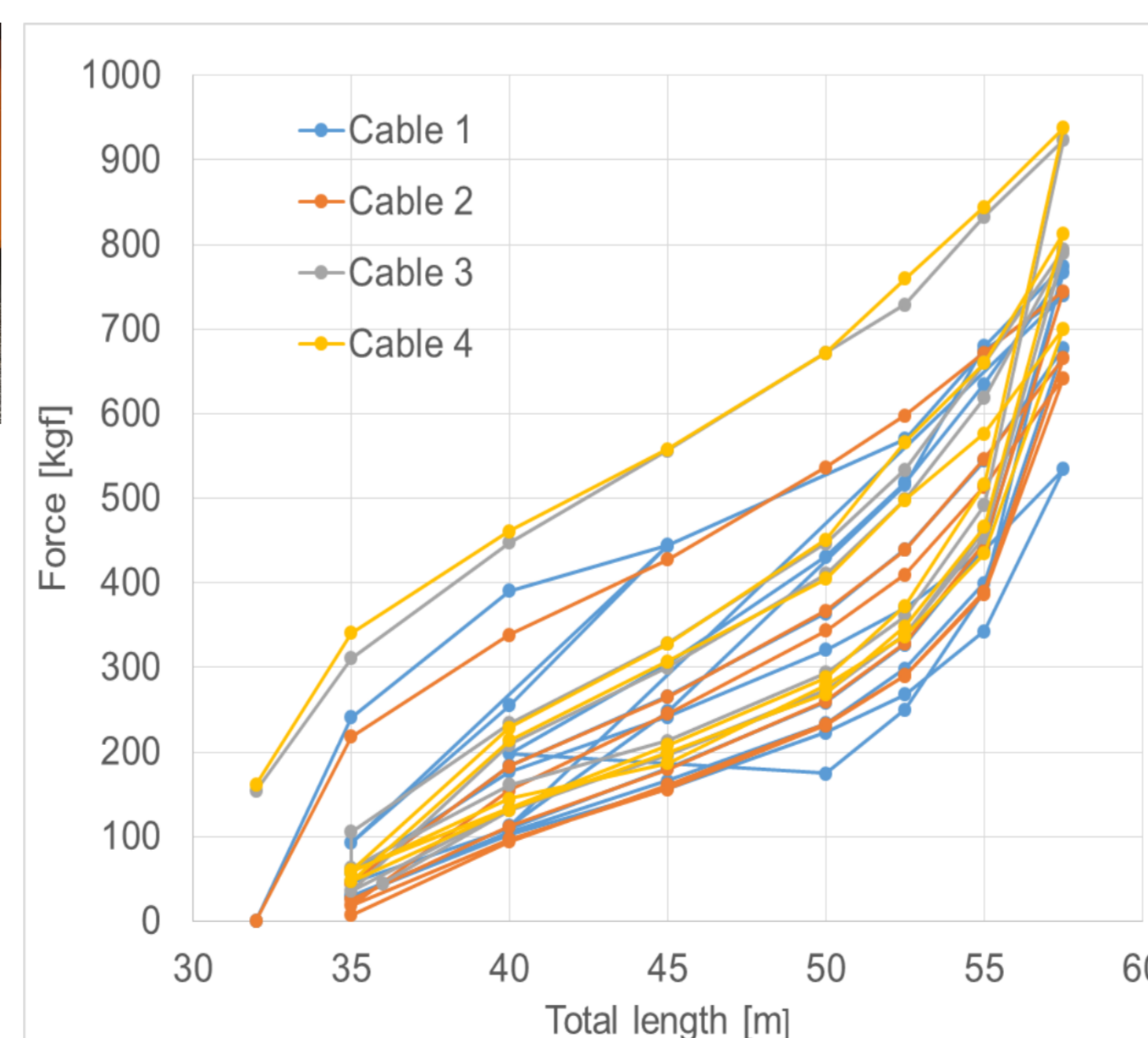


Fig.10 Force-Extension results for the four tested cables.

Data

Data streams are transmitted via radio and Wi-Fi to the shore station on Stromboli Island, then forwarded to the INGV-Osservatorio Etno data center at the COA (Centro Operazioni Avanzate) in Stromboli. From there, the data are transmitted to the INGV-CAT. An STA/LTA algorithm, first introduced by Ripepe & Lacanna (2024) for the tsunami warning at Stromboli from the elastic beacons at a similar location, is applied experimentally to the data stream. The data will become in the future an important source of information for the tsunami warning system in Stromboli.

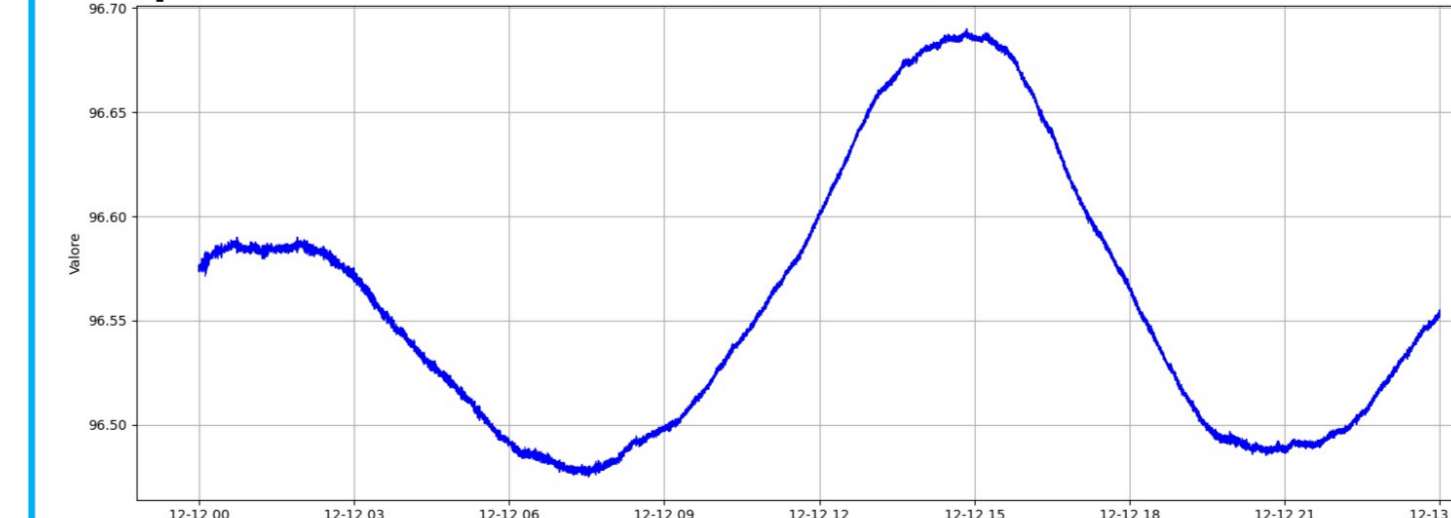


Fig. 11 Pressure data 12/12/2025.

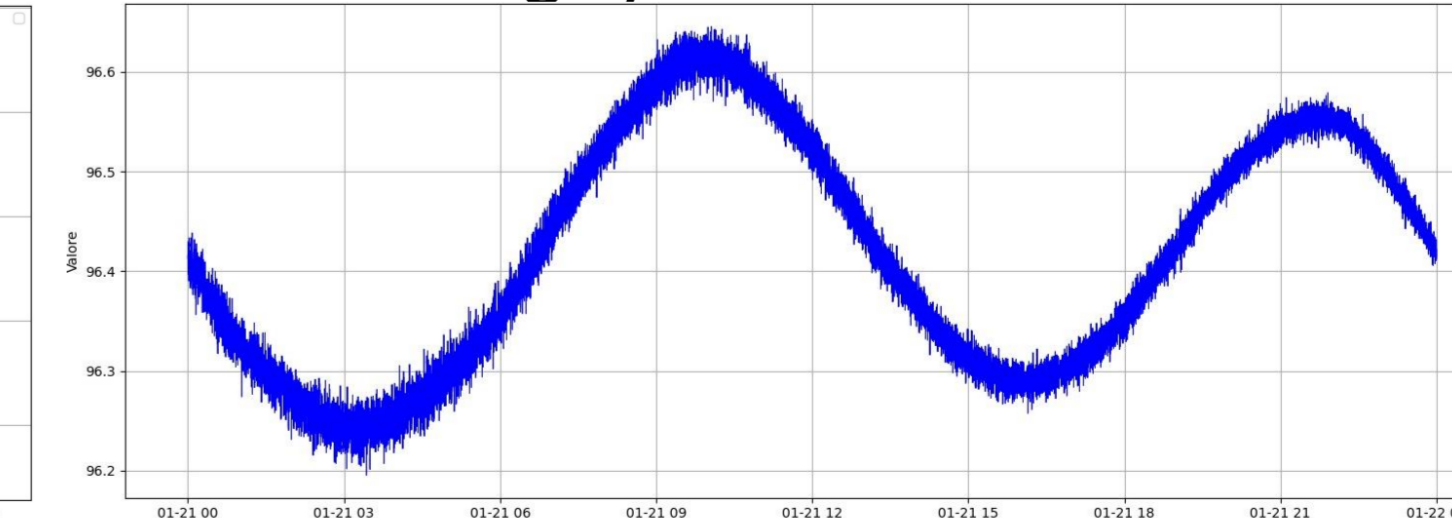


Fig. 12 Pressure data 21/01/2026 (Cyclone Harry).



Fig. 13 Dashboard.

Works in progress

The multi-parameter system offshore **Sciara del Fuoco, Stromboli**, significantly advances **volcanic tsunami monitoring**. By integrating high-resolution pressure, acoustic, and accelerometric data, it enhances early detection and operational alerts, supporting both research and coastal safety. To further increase reliability, the network will be expanded by 2026 with **a second buoy system** at Punta Labronzo and **two beacons** at Punta dei Corvi and Punta Labronzo, completing the Stromboli warning infrastructure.