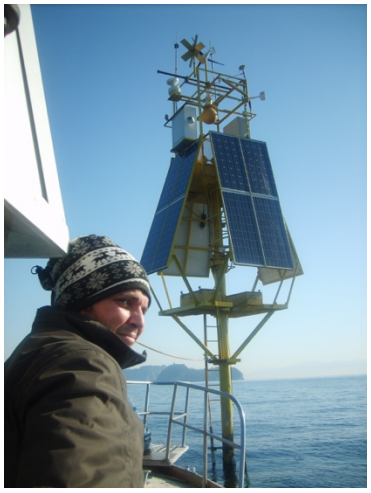
BIO SKETCH



NAME: Dr Sergio Guardato

Science web-search (digital database) ID's:

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https://www.researchgate.net/profile/Sergio_Guardato/research

https://scholar.google.com/citations?user=HmtLZeUAAAAJ&hl=it

https://www.scopus.com/authid/detail.uri?authorId=37047106100

https://loop.frontiersin.org/people/1148069

https://www.earth-prints.org/cris/rp/rp01276

POSITION TITLE: Technologist (Engineer System Designer)

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
MUR, Italian Minister for University and Research	Industrial expert in Physics	04/2016	Industrial Physics
INGV, National Institute of Geophysics and Volcanology, Rome (Italy)	Technologist	09/2010	Seismic network
"Federico II", University of Naples (Italy)	Electronics specialist	06/2006	Undergraduate professor of Electronics

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
INGV, National Institute of Geophysics and Volcanology, Naples (Italy)	Fellow researcher	11/2005	Underwater multi-parametric observatories
INFN, National Institute of Nuclear Physics, Naples (Italy)	Electronics technician	05/2005	Data acquisition systems
ITI, Industrial Technical Institute, Naples (Italy)	Informatics graduate	07/2004	Informatics
"Federico II", University of Naples (Italy)	Physics degree	03/2001	Nuclear Physics and electronics
MUR, Italian Minister for University and Research	Expert in electronics	06/1992	Electronics
ITI, Industrial Technical Institute, Naples (Italy)	Electronics degree	07/1990	Electronics

A. Personal Statement

At present he holds the professional profile of Technologist with a permanent contract at the INGV (National Institute of Geophysics and Volcanology), "Osservatorio Vesuviano" - Naples, as head of the development, implementation, management and maintenance of the permanent marine infrastructure for monitoring and multi-disciplinary seabed research MEDUSA, operating in the Gulf of Pozzuoli (NA) – Campi Flegrei volcanic area – collaborating in the development of new geophysical methodologies and techniques for the analysis and interpretation of the multi-parametric data of volcanic deformation collected, relating to the submerged part of the Phlegrean caldera.
His main work is dedicated to the hardware and software design for the sea extension of the seismic monitoring network of the Campi Flegrei area (Pozzuoli - Naples).

In the working group dedicated to the maintenance of the MEDUSA infrastructure, he collaborates in the process of acquisition, archiving and analysis of the collected data for their validation and processing, both for Civil Protection purposes and for the publication of the resulting scientific products.

He carries out surveillance as a computer system technician for volcanic monitoring of Vesuvius, Campi Flegrei, the island of Ischia and Stromboli.

B. Positions

- **Positions and Employment**

From 2006 – Technologist, National Institute of Geophysics and Volcanology, Naples (Italy).

2004-2005 – Technologist, INFN, National Institute of Nuclear Physics, Naples (Italy).

2002-2003 – Scientific professional consultant, INFN, National Institute of Nuclear Physics, Naples (Italy).

- **Other Experience and Professional Memberships**

2022 – Action Leader charge PNRR-IR for the INGV “MEET” project, WP2, Volcano Monitoring Network, 2022-2024.

2021 – INGV, Scientific responsible charge, POR Campania Potenziamento Infrastrutture “pRESERVE”, Improvement of volcanic monitoring in marine area, 2021-2023.

2019 – INGV, Scientific responsible charge, PON Ricerca e Sviluppo “OPTIMA”, Environmental, geophysics and volcanic monitoring in marine area.

2017 – INGV, Scientific responsible charge, WP3, Task 1.1.5 “Tecniche di misura multi-parametriche innovative di spostamento del suolo con utilizzo simultaneo di sensori di pressione ad elevata precisione e di tiltmetro ad elevata sensibilità su fondale marino dell’area vulcanica dei Campi Flegrei.”

2014-2018 – INGV, Scientific responsible charge, Accordo tecnico-scientifico tra l’INGV e l’Istituto di GeoScienze e risorse minerarie (KIGAM, Corea del Sud), implementazione e realizzazione di una rete di osservatori geofisici multi-disciplinari.

2016-2019 – INGV, Accordo di collaborazione scientifica per lo sviluppo di strumentazione e sistemi innovativi per il monitoraggio geofisico in ambiente marino (2016-2019).

2013-2014 – INGV, Scientific and technological coordinator charge for the "EMSO-Medit" project (PON) "Ricerca e Competitività 2007-2013" WP2 (2013-2014).

2013-2014 – INGV, Technological responsible charge for the "EMSO-Medit" and "Irma" project, Accordo scientifico tra l'INGV e la SZN "A. Dohrn".

2001-2008 – Technical Professor.

C. Contributions to Technology and Science

1) M. Janneh, F.A. Bruno, S. Guardato, G.P. Donnarumma, G. Iannaccone, G. Gruca, S. Werzinger, A. Gunda, N. Rijn-veld, A. Cutolo, M. Pisco, A. Cusano (2023)
Field demonstration of an Optical Fiber Hydrophone for Seismic monitoring at Campi-Flegrei caldera
Optics & Laser Technology, Volume 158, Part A, 2023, 108920, ISSN 0030-3992
https://doi.org/10.1016/j.optlastec.2022.108920
https://www.sciencedirect.com/science/article/pii/S0030399222010660

In this paper, the authors report on the development and field test of a fiber optic seismic hydrophone. The seismic hydrophone was designed to offer performance suitable to operate with resolution down to the sea state zero in underwater environments. The sensing configuration exploits a fiber coil interferometer in Michelson configuration, wrapped around a sensitive composite cylinder. To this aim, the hydrophone was installed in a submarine observatory onto the seabed in the Gulf of Pozzuoli and the optoelectronic read-out system was placed on an instrumented geodetic buoy. During the field trials, we detected several earthquakes occurred in the area and compared the results with a reference piezoelectric hydrophone. The seismic sequence was used to retrieve the sensor responsivity in the frequency range 1–80 Hz. The sensing system reaches a responsivity of about − 300 nm/Pa and exhibits an average noise floor level down to 100μPa/√Hz. The comparison of the traces recorded by the optical and reference hydrophones reveals a high level of similarities with autocorrelation higher than 85 %. The reported field trial at the Campi- Flegrei caldera demonstrates the capability of optical fiber hydrophones to operate in relevant environments for seismological monitoring.
Sergio Guardato contribute statements dealt with the system design and installation, and seismic data analysis.

2) A. de Santis, S. Guardato, F. Conversano, *et al.* (2022)
InSEA Project: Initiatives in Supporting the consolidation and enhancement of the EMSO infrastructure and related Activities
Special issue of Frontiers in Marine Science 'The Discovery of the Unknown Planet: The Ocean"
Front. Mar. Sci. 9:846701.
https://doi.org/10.3389/fmars.2022.846701

The InSEA project ("Initiatives in Supporting the consolidation and enhancement of the EMSO research infrastructure consortium (ERIC) and related Activities") has the objective, as the full name of the project indicates, to consolidate and strengthen the infrastructures concerning the EMSO ("European Multidisciplinary Seafloor and water column Observatory") ERIC (European Research Infrastructure Consortium) and all those technical-scientific activities related to it. In particular, the project is upgrading localized and distributed marine infrastructures, laboratories, observatories and spatial measurement activities in Southern Italian seas to support those activities of surveys in fixed time series points of observation of EMSO ERIC. The project is developing according to six implementation Objectives of Research (OR) that involve four National research Institutions: INGV, ISPRA, OGS and "Anton Dohrn" Zoological Station of Naples. The paper illustrates with more details the relevant objectives of the InSEA project and its most significant implementation phases.
Sergio Guardato contribute statements dealt with the MEDUSA research infrastructure and marine ecosystem observatory design and developments.

3) S. Guardato, GP. Donnarumma, R. Riccio, E. Del Pezzo, G. Iannaccone (2022)
Moment magnitude (Mw) from hydrophone records of low energy volcanic quakes
J. Seismol. (2022)
https://doi.org/10.1007/s10950-022-10095-8

Earthquake magnitude calibration using hydrophone records has been carried out at Campi Flegrei caldera, an active area close to the highly populated area of Naples city, partly undersea. Definite integrals of the hydrophone records amplitude spectra, between the limits of 1 and 20 Hz, were calculated on a set of small volcano-tectonic earthquakes with moment magnitudes ranging from 1 to 3.3. The coefficients of a linear relationship between the logarithm of these integrals and the magnitude were obtained by linear optimization, thus defining a useful equation to calculate the moment magnitude from the hydrophone record spectra. This method could be easily exported to other volcanic areas, where submerged volcanoes are monitored by networks of hydrophones and seismic sensors on land. The proposed approach allows indeed magnitude measurements of small magnitude earthquakes occurring at sea, thus adding useful information to the seismicity of these volcanoes.
Sergio Guardato contribute statements dealt with the design of the study and wrote the first draft of the article.

4) Iannaccone, G., Pucciarelli G., Guardato S., Donnarumma G. P., Macedonio G., and Beranzoli L. (2020)
When the Hydrophone Works as an Accelerometer.
Seismological Research Letters
https://doi.org/10.1785/0220200129

In this paper, the authors show the equivalence of earthquake-induced ground acceleration and water pressure waveforms for the case of collocated hydrophones and seafloor seismometers installed in shallow water. In particular, the comparison of the waveforms and amplitude spectra of the acceleration and water-pressure signals confirms the existence of a frequency range of "forced oscillations" in which the water-pressure variations are proportional to the vertical component of the ground acceleration. The authors demonstrate the equivalence of the acceleration and water-pressure signals for a set of local earthquakes (epicenter distance of a few tens of kilometers) and regional earthquakes with a wide range of magnitude ($2.7 < Mw < 6.8$), recorded by

seismometers and hydrophones operating in shallow water (depth less than 80 m) in the Campi Flegrei caldera (southern Italy). The authors describe the “forced oscillations” theory, and demonstrate the signals equivalence in the frequency range 0.1–10 Hz, thus extending the frequency range of application of the hydrophones as accelerometers. The high correlation between the ground acceleration, derived from the ground velocity, and hydrophone pressure signals in the mentioned frequency range enables the use of the hydrophone waveforms for standard seismological studies (i.e., earthquake source). The calibration of hydrophones by comparison with collocated accelerometers, or seismometers, is also enabled in a range of frequencies that is very difficult to reproduce in a laboratory. The results of this work also open the possibility of hydrophones being more extensively used in place of accelerometers in marine environments where accurate installation of seismic sensors is difficult or unaffordable.
Sergio Guardato contribute statements dealt with the system design and seismic data analysis.

5) Xie, S., Law, J., Russell, R., Dixon, T. H., Lembke, C., Malservisi, R., Rodgers, M., Iannaccone, G., Guardato, S., Naar, D.F., Calore, D., Fraticelli, N., Brizzolara, J., Gray, J.W., Hommeyer, M. and Chen., J. (2019)
Seafloor geodesy in shallow water with GPS on an anchored spar buoy
Journal of Geophysical Research: Solid Earth, 124-2019
https://doi.org/10.1029/2019JB018242

Measuring seafloor motion in shallow coastal water is challenging due to strong and highly variable oceanographic effects. Such measurements are potentially useful for monitoring near-shore coastal subsidence, subsidence due to petroleum withdrawal, strain accumulation/release processes in subduction zones and submerged volcanoes, and certain freshwater applications, such as volcano deformation in caldera-hosted lakes. The authors have developed a seafloor geodesy system for this environment based on an anchored spar buoy topped by high-precision GPS. Orientation of the buoy is measured using a digital compass that provides heading, pitch, and roll information. The combined orientation and GPS tracking data are used to recover the three-dimensional position of the seafloor marker (anchor).
To measure seafloor motion in shallow water, the authors built a spar buoy and put a GPS antenna and a digital compass (three-dimensional orientation sensor) on top of it. The buoy rests on the sea bottom using a heavy concrete ballast. Rotation and other movements of the buoy are measured by the digital compass and GPS. Position of the ballast can be calculated based on these measurements. The system has been tested in Tampa Bay, Florida, and found that it is able to measure motion of the anchor with an uncertainty of 1–2 cm or smaller.
Sergio Guardato contribute statements dealt with the technical and the design idea of the overall system.

D. Additional Information: Research Support (past three years)

- **Ongoing Research Support**

2022 – Technical Responsible charge for the Agreement between INGV and SZN “A. Dohrn” in the framework project EMSO-MedIT, INGV-SZN, 2022-2025

2022 – Action Leader PNRR-IR for the INGV “MEET” project, WP2, Volcano Monitoring Network, 2022-2024.

2022 – INGV, Technical and Scientific Responsabile Responsible charge, Contratto di Comodato d’uso sottoscritto da ENI S.p.A. ed INGV avente ad oggetto l’implementazione di un “sistema profilometrico per misure di deformazione a fondo mare”.

2021 – INGV, Scientific responsible charge, POR Campania Potenziamento Infrastrutture “pRESERVE”, Improvement of volcanic monitoring in marine area, 2021-2023.

2020 – INGV, Scientific responsible charge for the research programme OR-B2 "Misure multi-parametriche di deformazioni fondo-mare nell'area sommersa della caldera dei Campi Flegrei", PON InSEA.

- **Completed Research Support**

2019 – Scientific responsible charge for the “OPTIMA” project, POR Campania, Monitoraggio geofisico, ambientale e vulcanico in ambiente marino.