Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

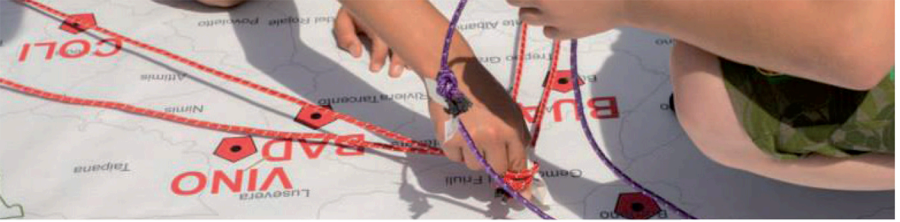
DEPARTMENT OF SEISMOLOGICAL RESEARCH

DEPARTMENT OF SEISMOLOGICAL RESEARCH - CRS

Observe the sudden and the slow movements of the Earth, understand their mechanisms and origin, and formulate ways to protect communities from earthquake hazards.
These are the objectives to which the OGS Department of Seismological Research (Centro di Ricerche Sismologiche - CRS) has committed over the last decades. They remain the goals for our future.

The OGS Department of Seismological Research (CRS) carries out experimental, theoretical and applied research in the fields of seismology, geodesy and earthquake engineering.

CRS was established with passage of Law 828/82, outlining reconstruction after the 1976 Friuli earthquake. Since then, Regional and Italian National Civil Protection authorities support data acquisition and research on local and regional seismicity and seismic hazard.
Currently, CRS employs about 50 people, who maintain and develop monitoring networks and data center, and conduct studies on tectonic processes and crustal deformations in north-east Italy and worldwide.


COLI
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RESEARCH FIELDS

With its headquarters in Udine and secondary labs at the OGS main office in Sgonico (province of Trieste), the Department of Seismological Research – CRS manages various infrastructures, such as:

• OGS seismometric network in north-east Italy, and communication resources for the alert systems of the Regional Civil Protection Departments of Friuli Venezia Giulia, Veneto and the Autonomous Province of Trento;

• FREDNet, the geodetic network for monitoring the crustal deformation of north-east Italy with permanent Global Navigation Satellite Systems (GNSS) receivers;

• ASAIN - Antarctic Seismograph Argentinean Italian Network, the broadband stations at the most extreme latitudes of the world;

• Broadband Seismometer at the EvK2CNR Pyramid International Lab in the Khumbu Valley, on the Nepali side of Mount Everest;

• Local seismic networks aimed at monitoring the natural seismicity and possible induced micro-seismicity at two underground gas storage facilities, in the foothills of the Veneto and in the Po Plain near Lodi;

• OGS Mobile Seismometric Network, an array of seismic stations for temporary monitoring of seismicity including densification of the permanent network, and site and building response analyses.

Research is implemented through national and international collaborations, Ph.D. and post-doc programs involving a number of universities, and cooperation with industry.

SEISMIC MONITORING

CRS manages the north-east Italy seismometric network, operating since 1977 and the long-standing Trieste station (Worldwide Standardized Seismographic Station Network from 1963 to 1992). Currently, the network includes 41 stations (rts.crs.inogs.it) equipped with high dynamics/high sensitivity sensors, all connected in real time to the acquisition center in Udine. The network operates both for research and civil protection purposes, and it is integrated into national and international seismic monitoring systems by means of data exchange with networks of Italian and foreign agencies. Such is the case of the most recent international project, "Central and East European Earthquake Research Network" (CE3RN or CE3R Network), which integrates the national networks of Italy, Austria, Slovenia, Croatia, Albania, Hungary and the Czech Republic.
Six international seismological stations in Antarctica, operating since 1992, one in Nepal and two in Argentina, are maintained by research funds; data are freely available to the worldwide seismological community through the international organizations IRIS and ORFEUS.
CRS also contributes to European Union and Nato Projects for testing Earthquake Early Warning (PRESTo@CE3RN), defining global geodynamic assets of the Alps (AlpArray) and for monitoring nuclear tests (CTBTO).

SEISMOGENESIS AND SEISMOTECTONICS

The seismological data gathered at CRS span more than 40 years. They provide unique insights into space-time clustering and evolution of seismicity, before and after major earthquakes.
Advanced statistical and modelling techniques are applied in order to assess earthquake probabilities, crustal rheology and seismic source properties.
These studies may have strong implications for reducing potential losses, in terms of human lives and economic costs.

GEODESY AND GRAVIMETRY

Since 2002, CRS has managed a geodetic network (frednet.crs.inogs.it) with 16 permanent high-precision stations equipped with Global Navigation Satellite Systems (GNSS) instruments. The stations measure the deformation in Friuli and in part of the Veneto, thus contributing to improvements in seismic hazard analyses.
A web portal for baseline reference data correction is free to professionals in Friuli Venezia Giulia.
Repeated gravimetric campaigns corroborate the comprehension of the geodynamics of the eastern Alps.

INDUCED SEISMICITY

Italy's first public network for monitoring induced seismicity was deployed by CRS in 2012, at the Collalto underground gas storage facility owned by Edison Stoccaggio S.p.A. The Collalto Seismic Network consists of ten stations and is located in the foothills of the Veneto (rete-collalto.crs.inogs.it).
A second network has been completed in 2016 the Po Plain near Lodi, for monitoring the new Cornegliano Laudense gas storage facility owned by Ital Gas Storage S.p.A.; it will be fully operational about one year before the first gas injection into the natural reservoir. All the data acquired by CRS are freely available from CRS portal (oasis.crs.inogs.it).

SEISMIC HAZARD, SITE AND BUILDING RESPONSE

Seismic hazard assessment is a long-standing topic of CRS. At present, CRS is contributing to the update Seismic Hazard Map of Italy, which will be used by the national Seismic Code. The monitoring of key buildings, and training of volunteers for the fast survey of earthquake effects, are the last mile of the fruitful cooperation between CRS, Regional Civil Defense Departments, and the Universities of Udine and Trieste.
CRS is fully involved in the activities of the Center for Seismic Microzonation (CentroMS), founded in 2015 under the umbrella of the National Council of Research (CNR).
CRS's advanced capabilities in Probabilistic Seismic Hazard Assessment, high-performance 3D full-wave modelling and site response analysis have recently been employed by private enterprises in the energy industry (e.g. Italian dams, the Trans Adriatic Pipeline project, Cameroon's Kribi port, Tungue LNG in Mozambique) and urban development and planning in developing countries (Cuba and Georgia).

OUTREACH

CRS personnel dedicate special attention to science communication and education, considering these areas key to increasing communities' resilience to earthquakes.CRS conducts wide public events dedicated to popular science (Researchers' nights, Open days); educational activity for schools; and ongoing dialogue on the most important social media networks. CRS outreach activities are growing in response to community demand, with the goal of encouraging safer living in an earthquake-prone country.

NATIONAL INSTITUTE OF OCEANOGRAPHY AND APPLIED GEOPHYSICS

The National Institute of Oceanography and Applied Geophysics - OGS - is a public research Institute which acts internationally in the fields of Earth and Marine Sciences, Oceanography, Geophysics and Seismology.
The Institute aims at safeguarding and enhancing the environmental and natural resources and focuses its efforts on evaluating and preventing geological, environmental and climatic risks, and spreading the scientific culture and knowledge.

OGS has four locations in the Friuli Venezia Giulia Region (North-Eastern Italy) and it is structured under four main Departments:
- Oceanography - OCE;
- Geophysics - GEO;
- Seismological Research - CRS;
- Research Infrastructures - IRI.

With its strategic infrastructures of excellence (such as the oceanographic research vessel OGS Explora), OGS makes its own expertise available for research related to environment and climate, biodiversity and ecosystem functionality and to the study of seismicity, hydrodynamic and geodynamic phenomena having an impact on both environment and population.

HEADQUARTER

The headquarter hosts the offices of the Presidency, the Administrative and Technical Departments and the four Scientific Departments. It is located in the municipality of Sgonico, 12 km from the center of Trieste.

Borgo Grotta Gigante 42/C - 34010 Sgonico (TS) - Italy
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SANTA CROCE

The biochemistry and biology labs of the Oceanography Department are adjacent to the sea.

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MIRAMARE

Here are hosted the modelling and High Performance Computing labs of the Oceanography Department.

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UDINE

Here is located the Department of Seismological Research.

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