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Abstract

The Directorate-General for the Territory (DGT) is the entity responsible for establishing and maintaining the National Geodetic Infrastructure.
The CORS GNSS Network (ReNEP) comprises 42 stations in mainland Portugal and, in partnership with the Regional Networks, 4 stations in the Autonomous Region of the Azores and 1 station in the Autonomous Region of Madeira, providing effective coverage of the entire national territory. As part of its ongoing commitment to improving the services provided to the community, the DGT has modernized its GNSS equipment to receive signals from the GPS, GLONASS, Galileo and BeiDou constellations.
The Regional CORS Networks are the responsibility of the Regional Governments of the Azores and Madeira.
The DGT has also reconfigured the National Geodetic Network (RGN), which now comprises only geodetic reference marks that have GNSS observations, in order to improve the geometric consistency of the network. To further improve the homogeneity and accuracy of the coordinates of the reconfigured network, the GPS observations acquired between 1997 and 2005 were reprocessed and subjected to a global adjustment.
The DGT continues to invest in the maintenance of the tide gauges at Cascais and Lagos, in order to maintain the definition of the vertical datum and register the data for the mean sea level.

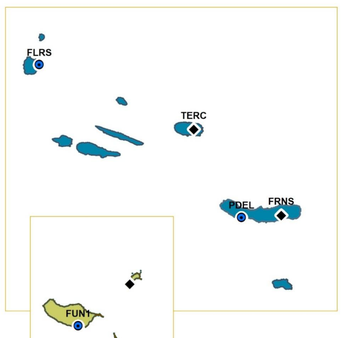
National Permanent GNSS Stations Network (ReNEP)

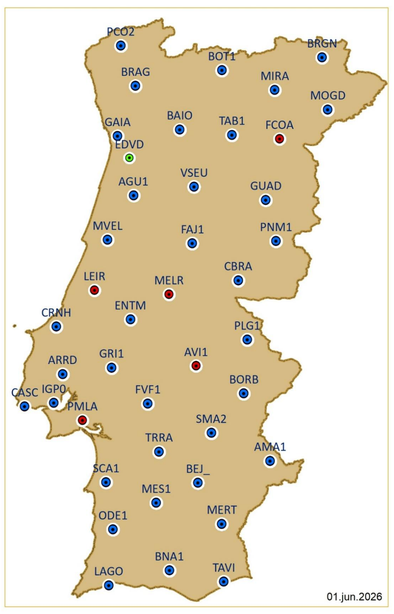
- Materialization of the national reference system
- Allows an accurate positioning

42 CORS in mainland
4 CORS in Azores
1 COR in Madeira









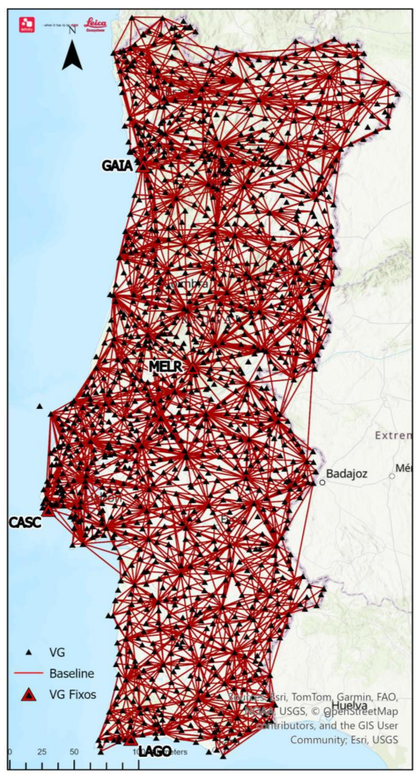
DGT (GPS + GLO + GAL + BDS)
DGT (GPS + GLO + GAL)
DGT (GPS + GLO)
Partner

- Continuous Streaming
- RTCM over NTRIP
- Hourly and daily RINEX files

ReNEP data available for International Networks:
- 4 CORS for the International GNSS Service (IGS)
- 7 CORS for the European Permanent Network (EPN)
- 45 CORS for the European Plate Observation System (EPOS)
- 40 CORS for the EPN densification network

Coordinate System:
Mainland: ETRF97 at epoch 1995.4

Geodetic adjustment Network









For the global network adjustment, the GPS observations acquired between 1997 and 2005 were reprocessed. These observations had originally been collected using different equipment, methodologies, and technologies available at the time. In 2025, an additional observation campaign was undertaken to strengthen the connection between the reconfigured network and the ReNEP. Subsequently, a network-wide adjustment was performed, by the colleagues from the University of Lisbon, incorporating all observations collected between 1997 and 2025. The result is the determination of RGN's ETRF2020 coordinates based only in GNSS observations.

Representation of the GPS baselines obtained from observations at the geodetic marks surveyed during the 2025 campaign and the 1997–2005 campaigns, integrated with the ReNEP.

Regional Permanent GNSS Stations Networks

REPRAA – Azores CORS Network

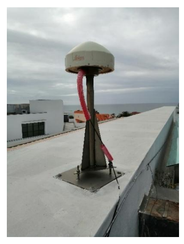




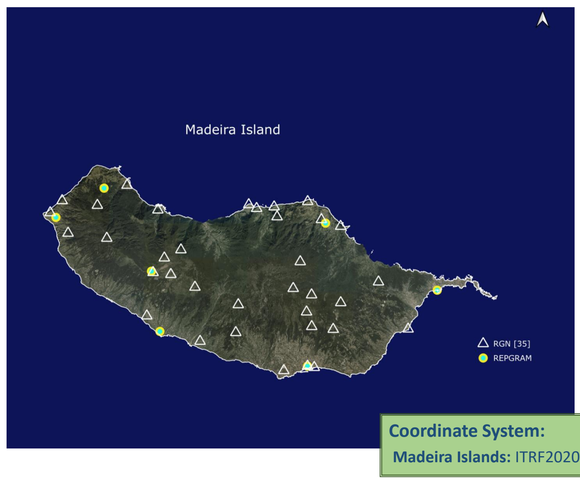
Coordinate System:
Azores Islands: ITRF93 at epoch 1994.0

Reg. Secretariat for the Environment and Climate Change

REPGRAM - Madeira CORS Network and Geodetic Marks



Geodetic Network Adjustment



Coordinate System:
Madeira Islands: ITRF2020 at epoch 2024.0

Reg. Directorate for Territory Planning

Tide Gauges

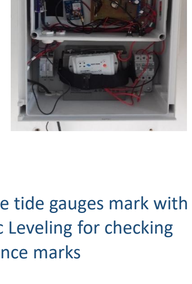
- **Definition of the vertical reference**
- **Determination of mean sea level**

- RADAR technology for water leveling sensors
- Real-time data logging and uploading data to DGT servers and other users
- Sensors for measuring water temperature, air temperature and atmospheric pressure



Radar sensor

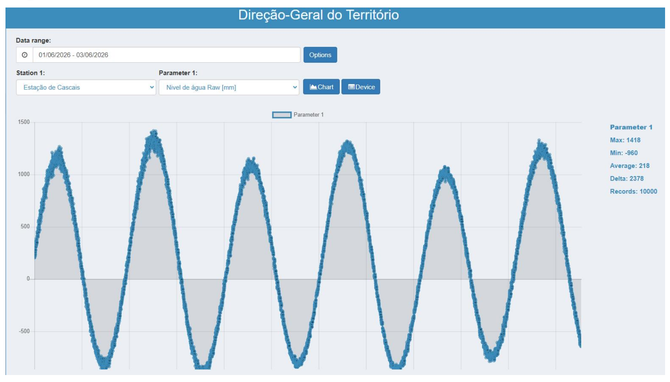
Datalogger



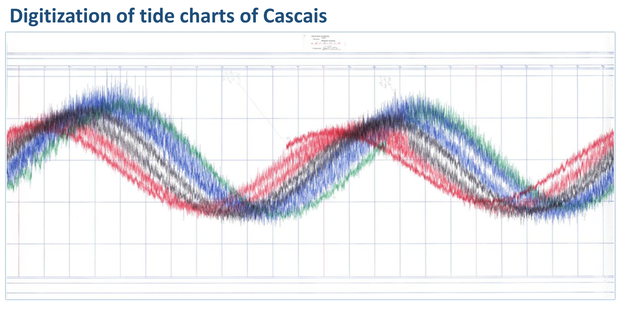
Annual observation of the tide gauges mark with High Precision Geometric Leveling for checking the stability of the reference marks



Digital charts of Cascais



Digitization of tide charts of Cascais





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