

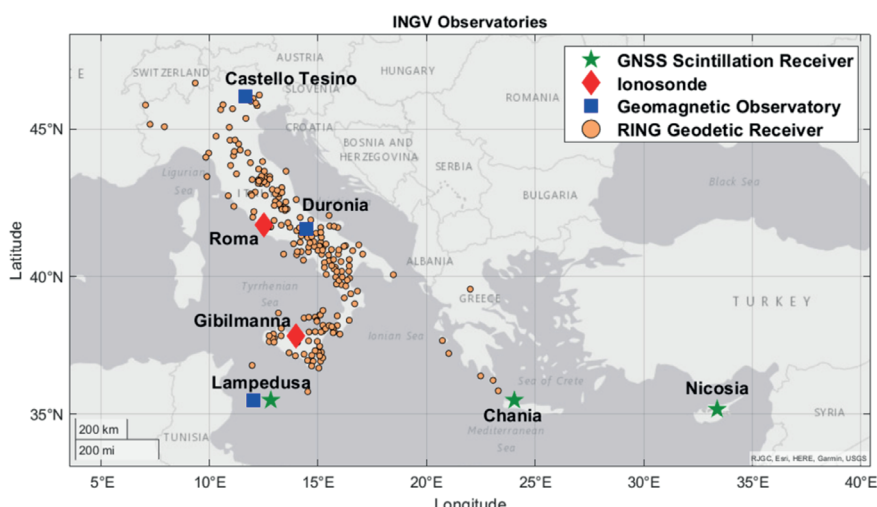
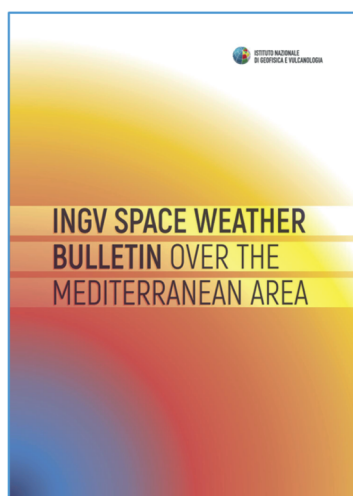


THE INGV SPACE WEATHER BULLETIN OVER THE MEDITERRANEAN AREA

A product developed by the **Space Weather Monitoring Group (SWMG)** of INGV. The bulletin leverages INGV ground-based Observatories located in the Italian peninsula and Mediterranean area, offering a **weekly overview** of Space Weather effects. The product can be valuable to radio amateurs, civil and military institutions, and other stakeholders interested in the effects of Space Weather.

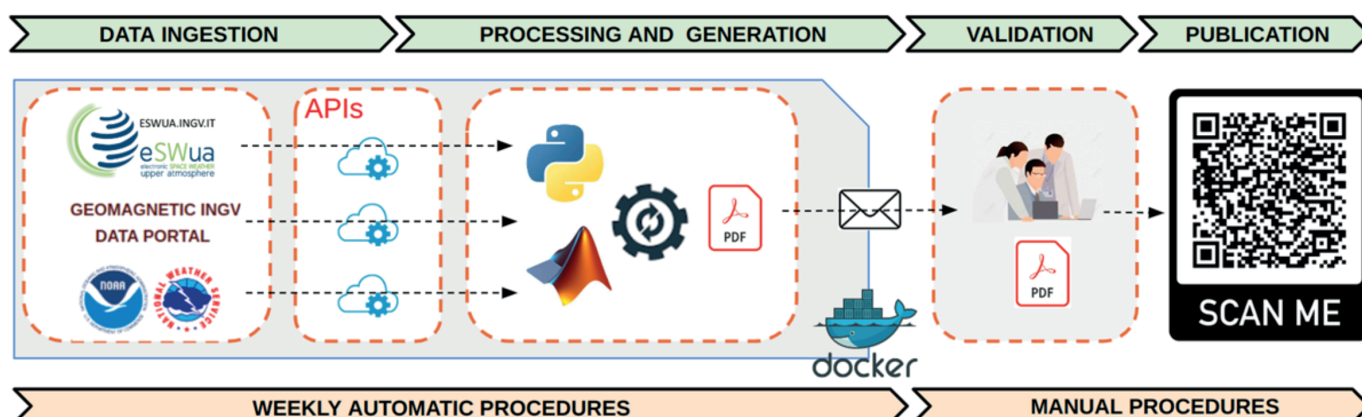
THE INGV GROUND-BASED OBSERVATORIES FOR SPACE WEATHER

INGV manages several ground-based observatories devoted to ionospheric and geomagnetic monitoring over the mediterranean region, among which: the **magnetometers** operating at the geomagnetic Observatories of Duração (41.65°N, 14.47°E), Castello Tesino (46.05°N, 11.65°E) and Lampedusa (35.52°N, 12.55°E); the **ionosondes** at the Ionospheric Observatories of Roma (41.8°N, 12.5°E) and Gibilmanna (37.9°N, 14°E); the **Ionospheric Scintillation Monitoring Receivers (ISMR)** located in Lampedusa (35.52°N, 12.63°E), Chania (35.52°N, 25.04°E) and Nicosia (35.18°N, 33.38°E). Finally, the data from the **GNSS geodetic receivers** of the INGV-RING network (<http://ring.gm.ingv.it>) are exploited for the generation of Total Electron Content (TEC) information over the mediterranean region.



GENERATION AND PUBLICATION

The INGV Space Weather bulletin is generated through a **fully automated routine** deployed as a microservice within the INGV IT infrastructure. The bulletin is automatically generated every Monday, followed by a manual validation step to ensure the accuracy of the information and to add the introductory text summarizing the week's events.



The sections of the INGV Space Weather bulletin

SOLAR ACTIVITY

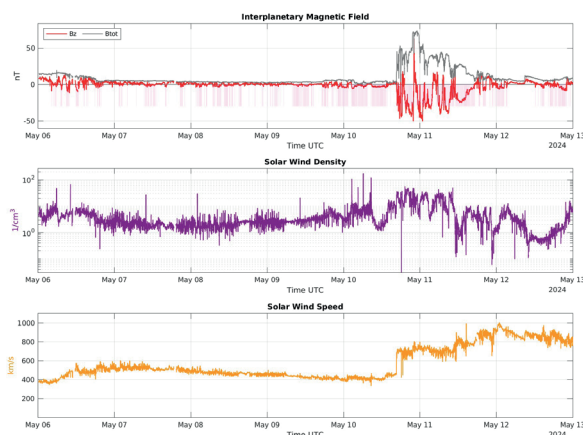
A survey of solar activity is taken from **NOAA Space Weather Prediction Center (SWPC)**, <http://www.swpc.noaa.gov> in order to have a background for Space Weather effects on Earth.

Observations from GOES-16 and GOES-18 NOAA satellites:

- X-ray flux
- Solar proton flux

Observations from NASA's DSCOVR spacecraft:

- Interplanetary Magnetic Field (IMF)
- Solar Wind observations (speed and density)



IONOSPHERIC ACTIVITY

In this section of the bulletin are reported the weekly time-series of:

- **foF2**, its relative deviation from the median over the previous 27 days and the **MUF(3000)F2** from the ionosonde of Roma and Gibilmanna;
- the **mean TEC** calculated over the mediterranean area and its relative deviation from its median over the previous 27 days;
- the **amplitude scintillation index** from the ISMRs of Lampedusa, Chania and Nicosia.

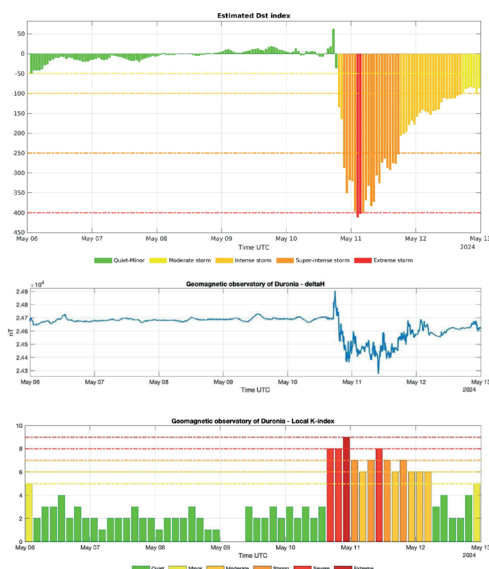
These data are available through the **INGV eSWua portal** (<http://eswua.ingv.it>).

GEOMAGNETIC ACTIVITY

In this section of the bulletin are reported:

- planetary **Kp** and **Dst** geomagnetic indices from NOAA-SWPC;
- variation in the horizontal component of the Earth's magnetic field (**deltaH**) as measured at the INGV Observatories of Castello Tesino, Durnonia, and Lampedusa;
- **local K-index** computed at the Durnonia Observatory.

The data from INGV geomagnetic Observatories are available through the **INGV Geomag portal** (<http://geomag.rm.ingv.it>).



The INGV SWMG thanks the SWPC at NOAA for making data available. The data in Section 2 and part of Section 4 of the bulletin are accessed from <https://services.swpc.noaa.gov/json/>. The information is in the public domain, unless specifically noted otherwise, as detailed in their Disclaimer (<https://www.weather.gov/disclaimer>).

The ionospheric and geomagnetic data upon which Sections 3 and 4 of this bulletin are based, are owned by the Istituto Nazionale di Geofisica e Vulcanologia (INGV) and distributed under a Creative Commons Attribution 4.0 International License (CC BY 4.0).

