



CRISP DB INGV 2021- Geology

This document reports the geological analysis performed and archived in the Geology section.

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Note: Many data archived in the Geology section (stratigraphy, geological review, lithological classification and geological classification) come from the agreement INGV-ISPRA (2016) and the Agreement INGV-DPC (2016 to 2021).

1. Geological Map

Geological and lithological maps at the different scales (1:100.000, 1:50.000) are visualized through a Web Map Service (WMS) protocol that queries the ISPRA databases (<https://www.isprambiente.gov.it/en/services/cartography/geological-and-geothematic-maps>). Any dysfunction of the ISPRA web portal prevents the visualization on CRISP front-end. The maps are cutted in a box centered on site position and of 5km x 5km dimension. Instead of visualizing the whole legend, the attributes of the geological formations are displayed in pop-ups by clicking on the maps.

2. Stratigraphy

This section includes the punctual stratigraphic information, derived from well logs and continuous cores, obtained from authoritative national repositories. Italian data are available from several sources, such as:

- Istituto Superiore per la Protezione e la Ricerca Ambientale (ISPRA; <https://www.isprambiente.gov.it/en/databases/data-base-collection/soil-and-territory/geognostic-and-geophysical-data>)



- seismic microzonation (<https://www.webms.it/>)
- geognostic investigations carried out for the characterization of the station sites.

3. Geological review

This section summarizes the major geological features of the seismic station site. These features are synthesized in a short illustrative report containing the geological setting, the geological cross-section passing through the site and the conceptual model of subsoil lithostratigraphy and their lithotechnical properties.

Report and conceptual model were released by ISPRA (Agreement INGV-ISPRA, 2016) through a joint analysis of the data relating to geognostic surveys available at 2016 in the ISPRA and regional databases, in the Database of Individual Seismogenic Sources (DISS) and in the Seismic Microzonation (National Department of Civil Protection). Lithological class subdivision follows Amanti et al. (2008).

Reports are also available on the site characterization of the permanent seismic stations obtained from dedicated geological and geophysical surveys and realized by an expert INGV working group (INGV-DPC, 2016 to 2021).

4. Morphological classification

The morphological classification values derive from morphometric analyses of high resolution digital elevation models (DEM), performed with the semi-automatic procedure of Pessina and Fiorini (2014). The software adopted for the analysis is the ArcGIS (ESRI) software (<https://www.esri.com/it-it/arcgis/products/arcgis-desktop/overview>).

They have been obtained by using two different Digital Elevation Model (DEM):

- 1) a global scale GDEM v.2 (<https://asterweb.jpl.nasa.gov/gdem.asp>) with a resolution of 1" and an estimated vertical accuracy between 7 and 50 meters (Hirano et al., 2003);
- 2) DEM TINITALY/01 with a national coverage of a resolution of 10 meters and vertical accuracy between 0.8 and 6 meters (Tarquini et al. 2017).

The two morphological classification types (Basin and Relief) are obtained by photo interpretation of aerial and satellite images also found in GoogleEarth.

5. Lithological classification

The lithological attributes are taken by querying the Italian Lithological database at scale 1:100.000 managed by ISPRA through the generation of a GML file build on purpose by ISPRA for CRISP (the syntax is defined by the Open Geospatial Consortium-OGC, to express geographical features). It results from the aggregation of the geological units from the Geological Map of Italy at 1:100.000 into 52 classes, and in agreement with the Infrastructure for Spatial Information in Europe (ISPIRE) directive (<https://www.isprambiente.gov.it/en/services/cartography/geological-and-geothematic-map>



s). A 60 m buffer around the site is used, resulting in more than one lithological unit for some station.

6. Geological classification

The geological attributes are taken by querying the Italian Geological database in scale 1:100.000 managed by ISPRA (<https://www.isprambiente.gov.it/en/services/cartography/geological-and-geothematic-maps>) through the generation of a GML file build on purpose by ISPRA for CRISP (the syntax is defined by the Open Geospatial Consortium-OGC, to express geographical features). Descriptive attributes and geological terminology are in agreement with the Infrastructure for Spatial Information in Europe (ISPIRE) directive. The contents of this section is also compiled according to the Seismic Microzonation studies (<https://www.webms.it/>) or dedicated geological surveys realized by an expert INGV working group (INGV-DPC, 2016 to 2021).

7. Fault classification

The information on the existence of faults comes from published sources such as geological maps, tectonic maps, fault databases (e.g. Italy HAZards for CApable faulting catalogue - ITHACA, <http://sgi2.isprambiente.it/ithacaweb/viewer/index.html>; Database of Individual Seismogenic Source - DISS, <https://diss.ingv.it>) or from scientific papers. Proximity is defined within a distance of 50 m from the considered site, without considering their kinematics or activity.

8. Landslide classification

This section contains information on the proximity of the site to any landslides mapped in published sources such as Italian Landslide Inventory (IFFI Inventory; <https://www.progettoiffi.isprambiente.it/en/inventory/>), regional hydrogeologic management plans or geomorphological-geological maps. Proximity is defined within a distance of 1 km.

9. Cross section

The 2D cross sections, passing throughout the site, are derived from specific detailed studies performed within the INGV-DPC Agreement 2016-2021, public scientific papers, archives, or geological publications, if any.