ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

CRISP DB INGV 2021- Housing

This document reports the housing and the data quality analysis of the seismic station archived in the Housing section.

Introduction

The National Seismic Network of Italy (RSN-Rete Sismica Nazionale; Michelini et al, 2016, and Margheriti et al., 2021) is managed by the National Earthquake Observatory (ONT) of the Istituto Nazionale di Geofisica e Vulcanologia (INGV) both in terms of installation and maintenance of the stations and in terms of data flow and management (http://terremoti.ingv.it/).

The data are sent in real time from the stations to the monitoring centers and collected in the European Integrated Data Archives (EIDA). The EIDA Italia node (http://eida.rm.ingv.it/) is the data center managed by INGV that stores and distributes the data collected by the RSN (Rete Sismica Nazionale) and other Italian seismic networks. It also contains MetaData such as the sensitivity of the seismometer or the transfer function of the station. In addition, details on the management of stations are stored in an INGV internal archive (Seisface; Pintore et al 2012).

1. Housing information

Housing information gives a first rough indication about the data quality and the typology of the site, useful for research purposes, for simple maintenance or to improve the quality of the installation and thus of the seismic data. This section includes all the information on the sensor housing and the surrounding environment (for example if the seismometer is in free-field or placed on the floor in a basement or in direct contact with the rock). The "bad" housing and specific noise sources can affect the signal recordings by decreasing the fidelity of the recording with respect to the ground movement caused by the earthquake. In fact, variations in temperature and /or pressure, dripping or air currents on the seismometer, or even the bad coupling between the sensor and the underlying ground often cause alteration of the signal recorded by the seismometers (McMillan, 2002) that may be confused with a site effect.

Due to the large number of stations and the long installation-history of them, it is not always easy to find all the information on housing (data and photos). They have been gathered from photos and interviews with INGV technicians who installed the stations, INGV staff who carried out the station maintenance and local representatives and collaborators where the seismic station is housed (non-INGV personnel).

2. Data Quality

Data Quality provides information on seismic noise in time and frequency. Automatic procedures have been developed by INGV to facilitate the quality check of the seismic network, both in terms of continuity and completeness of the data themself. In particular, the SQLX package (https://www.codevintec.it/nanometrics-sqlx-it), installed at INGV in 2015 (Marzorati and Lauciani, 2015), takes as input the waveforms and metadata contained in the INGV seismic database (EIDA) and continuously produces a series of control diagrams such as Power Spectral Density (PSD, Peterson 1993) and Probability Density Function diagrams (PDF, McNamara and Buland 2004), compared with the reference curves of the Peterson (1993). In this way, it is possible to have a picture of how the noise level is distributed in amplitude and frequency, during the whole inspected time interval (weekly, monthly, yearly).

The figures are downloaded from the internal INGV site, and the results of the automatic analysis are taken from an internal Mysqlx database via dedicated web services (http://terremoti.ingv.it/webservices_and_software) and formatted to be archived in CRISP.

Note: for the analysis, channels with high sample rate are chosen (EH for short period; HH for broadband; BH for STS1-20 sps sensor only; SH for short period with low sps as Lennartz at 62.5 sps).