A new tool for rapid and automatic estimation of earthquake source parameters and generation of seismic bulletins:

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RISSC

tool

For

Rapid and

aut**O**matic

Generation of

seismic bulletins

WHO WE ARE

RISS S.r.l. is a Spin-off company recently born from the initiative of the research group constituting the Seismology Laboratory of the Department of Physics of the University of Naples Federico II. **RISS** is an **innovative start-up**, based on the decade-long experience in earthquake monitoring systems and seismic data analysis. The major goal is to transform the most recent **innovations** of the scientific research into **technological products** and prototypes.

With this aim, RISS has recently started the development of a new **software**, which is an **elegant** solution to manage and analyze seismic data and to create **automatic earthquake bulletins**. The software has been initially developed to manage data recorded at the ISNet network (Irpinia Seismic Network) but it is **fully exportable**. The software can be used to manage data from different networks, with any kind of station geometry or network configuration and is able to provide reliable estimates of earthquake source parameters, for different seismic environments.

WHAT WE PROPOSE

Here we present the real-time automated procedures and the analyses performed by the software package, which is essentially a chain of different **modules**, each of them aimed at the automatic computation of a specific source parameter. The P-wave arrival times are first detected on the real-time streaming of data and then the software performs the phase association and earthquake binding. As soon as an event is automatically detected by the binder, the earthquake location coordinates and the origin time are rapidly estimated, using a probabilistic, non-linear, exploration algorithm. Then, the software is able to automatically provide three different magnitude estimates:

• **the local magnitude (Ml)** is computed, using the peak-to-peak amplitude of the equivalent Wood-Anderson displacement recordings;
• **the moment magnitude (Mw)** is estimated from the inversion of displacement spectra;
• **the duration magnitude (Md**) is rapidly computed, based on a simple and automatic measurement of the seismic wave coda duration.

Starting from the magnitude estimates, other relevant pieces of information are also computed, such as the corner frequency, the seismic moment, the source radius and the seismic energy. The ground-shaking maps on a Google map are produced, for:

• Peak Ground Acceleration (PGA)
• Peak Ground Velocity (PGV)
• Instrumental Intensity (in SHAKEMAP® format)
• plot of the measured peak ground motion values

Furthermore, based on a specific decisional scheme, the automatic discrimination between local earthquakes occurred within the network and regional/teleseismic events occurred outside the network is performed. Finally, for the largest events, if a consistent number of P-wave polarity readings is available, the **focal mechanism** is also computed.
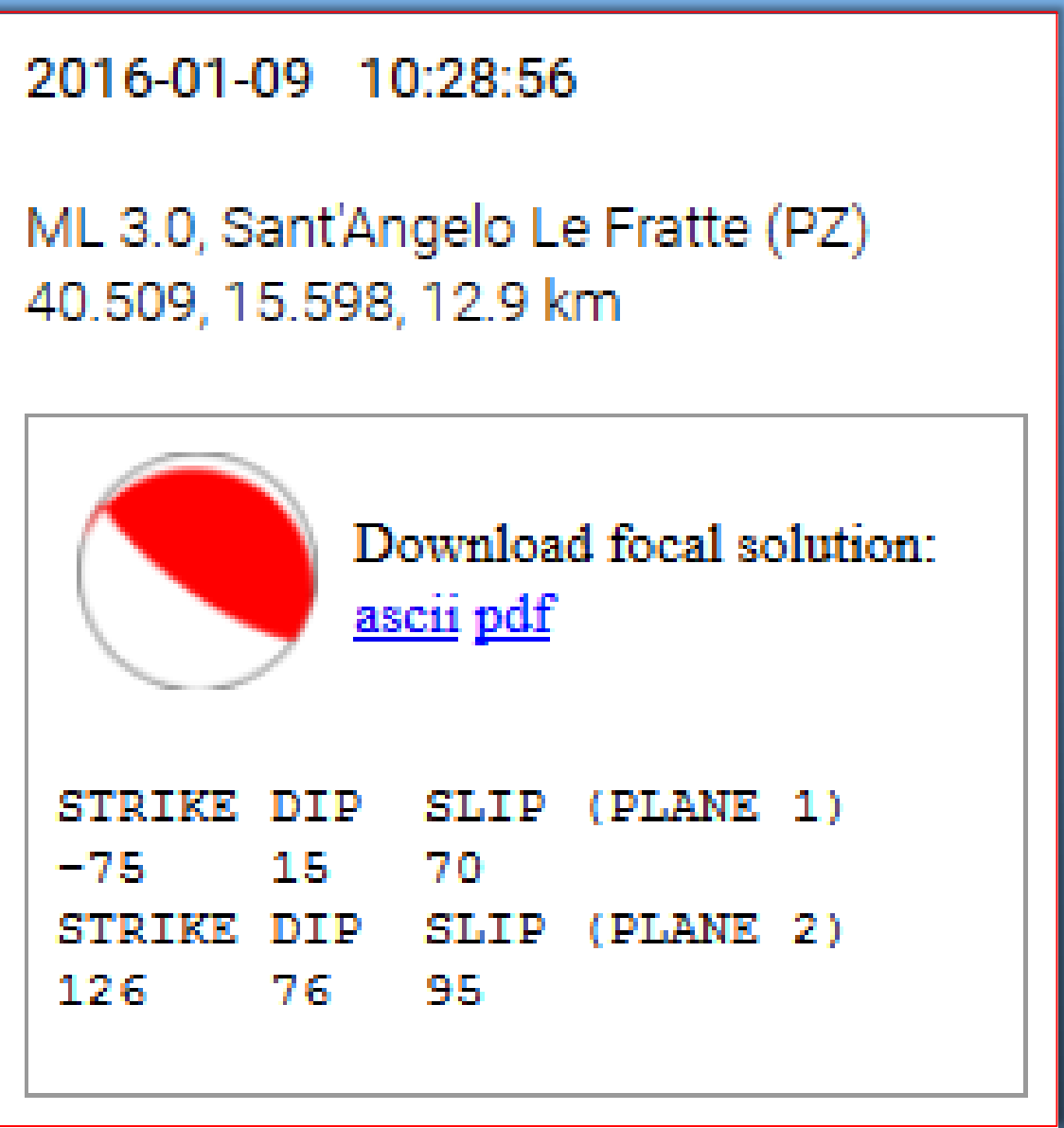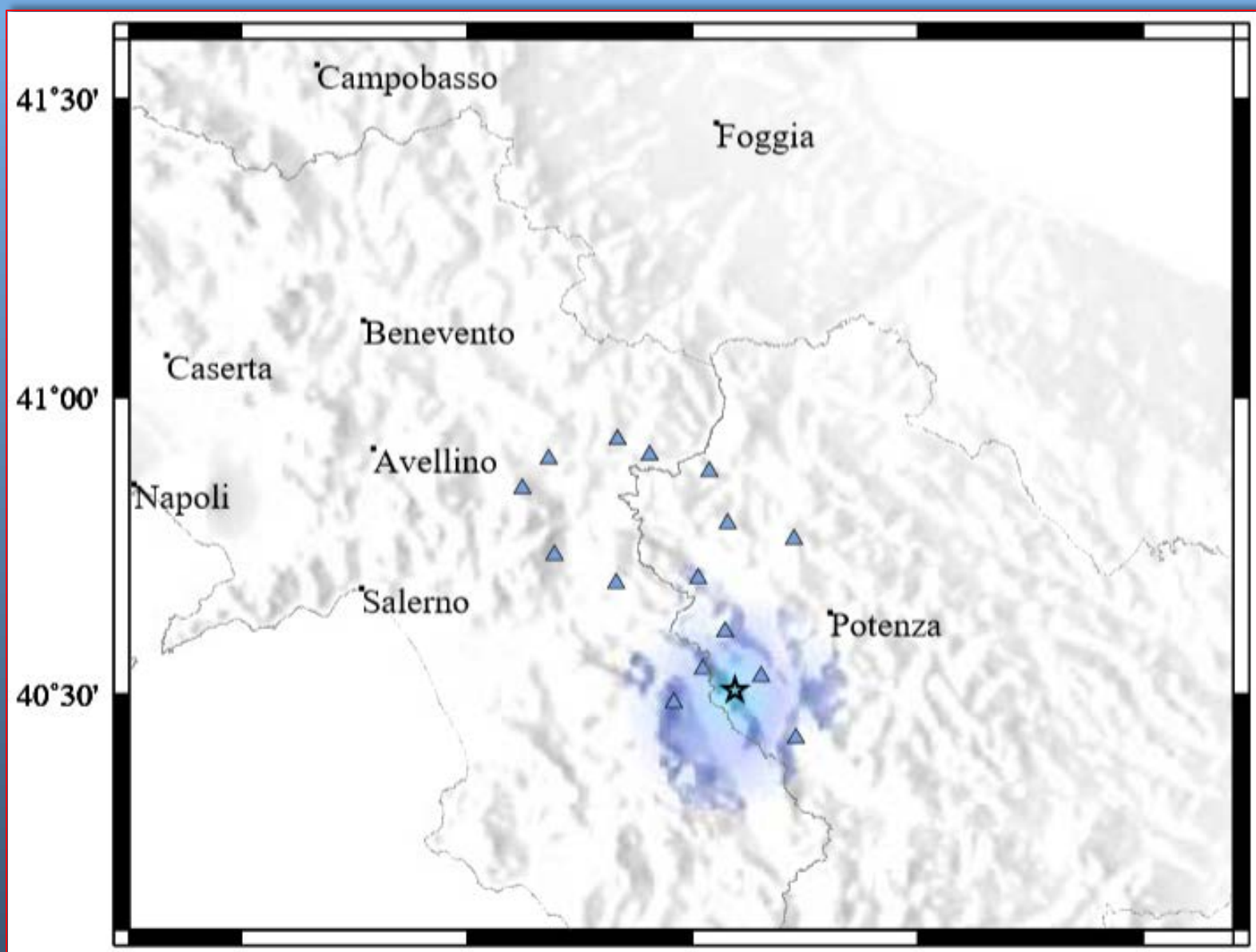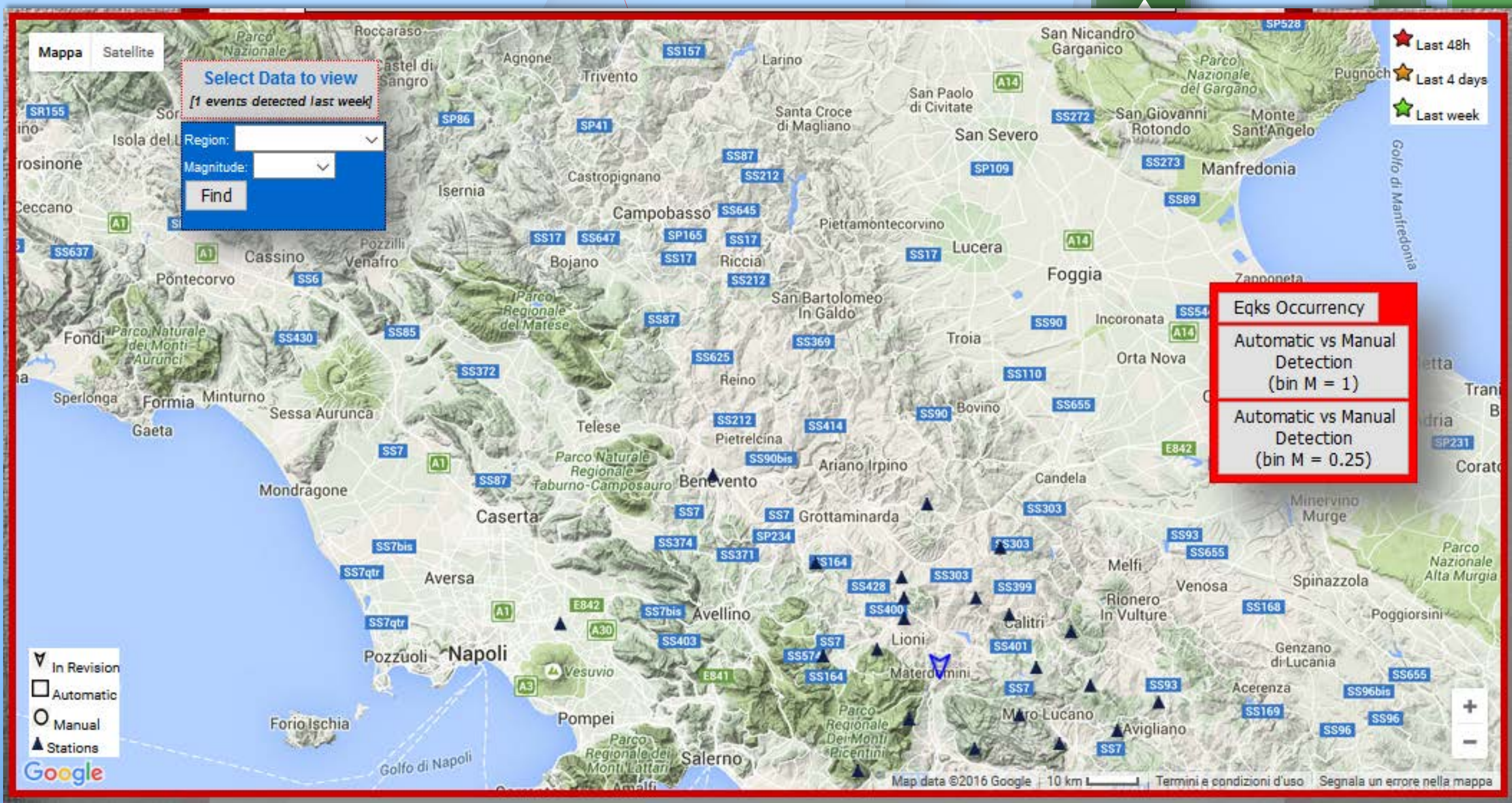
For each event, all of the available pieces of information are stored in a local database and the results of the automatic analyses are published on an **interactive** web page. **"The Bulletin"** shows a map with event location and stations, as well as a table listing the events and their parameters:

the event ID, the origin date and time
the event latitude, longitude, depth
the magnitude estimate Ml, Mw, Md
the number of triggered stations
the S-displacement spectra, the shaking maps

2016-01-09 10:28:56

ML 3.0, Sant'Angelo Le Fratte (PZ)
40.509, 15.598, 12.9 km

Download focal solution:
ascii pdf

STRIKE	DIP	SLIP (PLANE 1)
-75	15	70
STRIKE	DIP	SLIP (PLANE 2)
126	76	95

Egks Occurrence
Automatic vs Manual Detection (bin M = 1)
Automatic vs Manual Detection (bin M = 0.25)

Some of these entries also provide additional information, such as the focal mechanism (when available). The picked traces are uploaded in the database and from the web interface of the Bulletin the traces can be download for more specific analysis.

This innovative software represents a **smart** solution, with a **friendly** and **interactive** interface, for high-level analysis of seismic data and it may represent a relevant tool not only for seismologists, but also for non-expert external users who are interested in the seismological data. The software is a valid tool for the automatic analysis of the background seismicity at different time scales and can be a relevant tool for the monitoring of both **natural** and **induced** seismicity.

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