THE 2012-2015 SEISMICITY OF THE SANNIO-IRPINIA BORDER REGION (SOUTHERN ITALY)

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The Sannio and Irpinia seismogenic regions fall in the axial-frontal sector of the Southern Apennine belt. These regions have been struck by several destructive earthquakes, as the most recent 1962 and 1980. Looking at the border between these two areas, destructive earthquakes with Io≥ IX MCS, occurred in 1456, 1702, 1732. Although the location, geometry and kinematics of the causative faults of these earthquakes are still a matter of debate, at present almost three main hypotheses of active faults related to these strong earthquakes have been proposed: the Miranda- Apice, the Pago Veiano-Montaguto and the Mirabella Eclano-Monteverde . These three structures would cross the Sannio-Irpinia seismogenic border (Fig.1; DISS Working Group, 2015).

Instrumental seismicity recorded in the last decades shows a marked difference between seismic activity in the Sannio and Irpinia regions. Irpinia experiences mainly single events with magnitude $M_L \leq 3.5$ and hypocentres located in the first 14 km of depth. The corresponding focal mechanisms show a prevailing normal dip-slip kinematics with NW-SE-striking planes.

Conversely, the Sannio region is characterized by the occurrence of moderate ($M_L \leq 5.0$) and low magnitude seismic sequences and swarms ($M_L \leq 4.0$) with hypocentres deeper than 14 km. The focal mechanisms of single events occurring in this region match those recognized in Irpinia, but events related to two low magnitude seismic sequences showed kinematics compatible with a local NNE-SSW extension (e.g. Milano 2014 and references therein). In the north-easternmost sector of Sannio region deeper strike-slip kinematics can be also recognized (e.g. 2002 San Giuliano earthquake; Di Bucci and Mazzoli, 2002). Despite these significant differences between the two regions the transition between these seismic styles has never been deeply investigated.

In order to try to characterize the seismicity of the Sannio-Irpinia border, we analyzed the present-day seismicity recorded by the Italian National Seismic Network of the INGV. In detail, the analysis is mainly devoted to a short time interval across 2012-2015 years, due to the occurrence of two low- energy seismic swarms. In order to obtain accurate hypocentral distributions and reliable fault plane solutions we collected the waveforms of all seismic events occurred in the study area to perform a re-picking of P- and S- phases and obtaining a reliable hypocentral location. The re-picking also allows to collect P-wave dataset to compute fault plane solutions.

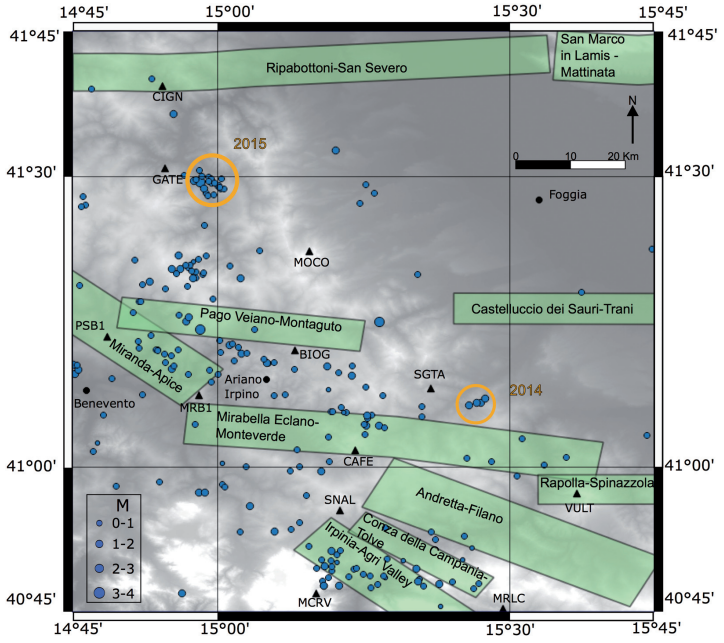

Fig. 1 – Epicentral distribution of the 208 best relocated events occurred between 2012-2015 in the study area. The circles diameter is proportional to the magnitude of events. Triangles reresent the seismic stations of the INGV national network running in the area. The composite seismogenic sources collected in the DISS catalogue (DISS Working Group, 2015) are also shown (green boxes). The two seismic swarms occurred in December 2014 and in July 2015 are highlighted (orange circles).

The relocated events, with magnitude $M_L \leq 3$, clearly show an epicentral distribution aligned along the axis of the Apennine fold-and-thrust belt, with hypocentral depth ranging from 5 to 25 km. A prevalence of oblique-slip kinematics is observed for isolated events. The December 2014 swarm ($M_L < 3$), with hypocenters located between 9 and 14 km in depth, is characterized by normal dip-slip kinematics. The July 2015 swarm ($M_L < 3.5$) occurred at depth between 19 and 23 km and it is characterized by strike-slip kinematics.

In this area of the southern Apennines, the DISS catalog proposes a complex arrangement of possible seismogenic sources (green box in Fig.1). In particular, the study area represents the connection between the NW-SE-striking peri-axial structures and the roughly E-W ones affecting the frontal-foreland sector of the Apennine (Fig.1). Notwithstanding the short time interval investigated, the hypocentral distribution of the relocated events shows an overall deepening towards N and NW in the study area. The hypocentral depths and the kinematics of almost all the focal mechanisms of isolated events, as well as those of the 2014 swarm, are compatible with the NW-SE-striking typical Apennine peri-axial structures. The hypocentral depths (about 20 km) and the kinematics of events belonging to the 2015 swarm agree with the overall dynamics of the Apennine frontal-foreland sectors. It should be noted that this last swarm is located just south of the known north-Apulia seismogenic sources responsible, among the others, for the 2002 San Giuliano earthquake (Fig.1; Ripabottoni-San Severo).

The attitude of the T- and P-axes of the computed focal mechanisms agree with the large scale stress regime acting in the area.

References

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