The Durres earthquakes of November 2019: A geological perspective from the Adriatic offshore

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At 3:54 night time on November the 26th the city of Durres in Albania was hit by an earthquake of Mw 6.2, followed in the next 4 hours by three additional earthquakes with Mb > 5.0. These earthquakes, part of a sequence that continued with much reduced intensity until mid December, caused severe damages in Durres and the adjacent region, counting a final human toll of about 50 casualties and over 2000 injured. The historical catalogues show that Albania has been affected by over 10 relatively strong earthquakes (Mw> = 6.0) in the last 200 years (Kiratzi and Dimakis 2013), testifying to an important seismic history.

The focal mechanisms of the Durres earthquakes show compressive fault planes placed at ca. 10 km depth. These earthquakes are part of a belt of compressional earthquakes that borders to the east the southern Adriatic, including the strong Montenegro earthquake (Mw 7.1) of April 1979, indicating that shortening is currently ongoing at the front of the southern Dinarides and Hellenides.

The geological structure of Albania, at the junction between the Dinarides and the Hellenides, shows structural complexities that have their roots in the Mesozoic paleogeography of the region (Argnani, 2013). The front of the Albanian fold-and-thrust belt extends to the sea, where it has been studied thanks to some seismic acquisition campaigns aimed at investigating the geology of the Adriatic Sea (Argnani 2013). This sector of the thrust front is characterized by the presence of important back thrusts, which are correlated to the spatial distribution of the Mesozoic domains of carbonate platforms and pelagic basins. In the sector facing the southern Adriatic basin the presence of a large thickness of Oligocene-Quaternary clastic sediments filling the foredeep promotes the development of triangle zones and backtrusts. The basal thrust of the triangle zone system affects Mesozoic carbonates at an estimated depth of 10-15 km (Fantoni and Franciosi, 2010) and appears to be the source of the Durres earthquakes. A similar structural setting can be envisaged for the Montenegro earthquake of 1979, as the offshore structures show a continuity, although a substantial change in strike occurs across the trend of the Shkoder-Peja line. A large lateral displacement of the internal units occurs along the Shkoder-Peja transversal line, which marks the junction between the Hellenides and the Dinarides. The shallow water limestones of the more external Kruja domain, however, are not laterally offset. Palaeomagnetic results indicate that the Miocene-Pliocene clock-wise rotation of the western arm of the Aegean opening was accomplished just south of the Shkoder-Peja line; these rotations impose an overall change in
strike of the outer thrusts, although the frontal structures are specifically affected by the nature of the Mesozoic domains entering the thrust system.

References

