Gravity features of the Middle Aterno Valley

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A gravity study was carried out to identify the geological and structural features of the Middle Aterno Valley. It was targeted to assess the seismic hazard of the city of L'Aquila and surrounding areas, after the Abruzzo 2009 earthquake.

In this study a set of approximately 2000 gravity stations measured partly by the Servizio Geofisica of ISPRA and partly by the University of Rome were used. New stations were established in some critical areas with a nearly homogeneous distribution and a data separation of 500 m: more than 100 gravity stations have been located on L'Aquila city (BLUMETTI *et alii*, 2002). All the available data have been reprocessed and uniformed.

The Bouguer anomaly map was computed using a density value of 2600 kg/m^3 for both Bouguer and terrain corrections. It has been drawn with 1 mGal contour interval taking into account an estimated error affecting the data of 0.020 mGal.

Gravity anomalies have been used for the construction of a 3D model of the area. These data, together with geological surface data allowed for the understanding of the Plio-quaternary tectonic setting of the basin.

The study area has been differentiated into different domains with respect to structural and morphological features of different styles of faults.

Geology and gravity data show that the local amplification phenomena are due to the fact that the historical center of L'Aquila was built on a coarse breccias (debris-flow deposits with decameter scale limestone blocks) overlying sandy and clayey lacustrine sediments. As these sediments have a low density, gravity prospecting very easily identifies them. Residual anomalies, showing a relative gravity low corresponding to the historical center of L'Aquila, and surrounding areas, indicated that these sediments are up to 250 m-thick.

Gravity prospecting also revealed the uprooting of the Meso-Cenozoic reliefs which outcrop in the middle of area the basin in the area of Coppito. Here, the gravity anomalies are negative and not positive as would be expected from outcropping geological bedrock.

Gravity prospecting showed that paleo-landslide and debris flow deposits have a considerable thickness and influenced the Quaternary evolution of the Middle Aterno Valley. Moreover steep gradients of residual anomalies are indicative of other structural alignments. The residual anomalies trends show a complex geometry of the buried geological bedrock. This buried morphology is conducive to strong propagation of seismic waves.

Based on residual anomalies a gravity model was built, which cross-cuts the Middle Aterno Valley in a NNE-SSW direction (Fig.1). The computation showed a considerable thickness of the Quaternary sediments.

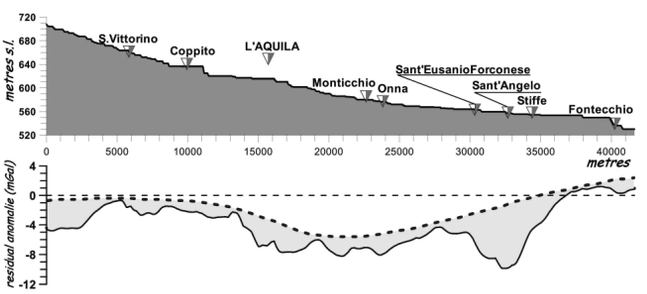

Fig. 1 – Elevation longitudinal profile, residual gravity anomaly (solid line) and regional anomaly (dashed line) along the Aterno river.

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