



Gravity data of the Norcia and Castelluccio basins (central Italy): insight for active faulting of the area

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The Norcia and Castelluccio basins are located in the central Apennines, the southeastern extension of the NE-vergent arcuate, Neogene, foreland fold and thrust belt of northern Italy. These intramontane depressions are infilled by Pleistocene-Holocene coarse continental fluvial and alluvial deposits, whereas the bedrock units are represented by limestone and pelagic marls of Jurassic to Miocene age. Several historical and instrumental highly destructive earthquakes have occurred in this area: January 14, 1703 (X MCS, $M=6.6$); September 19, 1979 ($M_s=5.9$, focal depth of 6-8km). Fault data and earthquake focal mechanisms show a predominant NE-SW extension, but strike-slip and even reverse mechanisms have also been determined. The surface of the Norcia basin is flat, slightly inclined to the NW, with only an almost isolated basement hill in the middle. The basin has a predominant NNW-SSE elongation with very straight boundaries constituted by oblique-extensional faults. In addition, Castelluccio Depression is a hanging basin located eastwards of the Norcia area.

In order to determine the distribution of the sedimentary infill, a gravity survey has been developed in the region, including several profiles orthogonal to the basin edges and additional scattered data that improve the map coverage. Measurements have been done in the basins and also in the basement in order to determine the regional anomalies. A Scintrex CG-5 gravimeter with an accuracy of 0.001mGal, a barometric altimeter of 0.5 m of precision, and a Garmin e-trex GPS have been used during the acquisition of the 294 measurements. A density of 2.60 g/cm³ (mean density of the basement limestone) has been considered for calculating the Bouguer Anomalies. Terrain corrections have been determined using the SRTM90-m. The Foligno absolute gravity base station has been taken into account during this survey.

The Bouguer Anomaly is negative in all the area, with a regional trend that decreases northeastwards, indicating an increase of crustal thickness towards the Apennine edge, in agreement with the regional Bouguer map available from whole Italy. Negative residual anomalies up to -4 mGal are located in Norcia and Castelluccio depressions. Norcia has a roughly triangular depocenter located to the northwestern part, where probably are situated the most intense tectonic activity. It is surrounded by sharp west and northeastern scarps, corresponding to faults, the second clearly formed on recent sediments. Surprisingly, the southern half of the Norcia Basin, in spite of its flat character, seems to have a very thin practically absent sedimentary infill. It may represent an old flat surface of erosion, perhaps downthrown during fault activity. Castelluccio basin has a slightly asymmetrical sedimentary infill, controlled by faults located to the northwestern and northeastern borders.