A Crustal model of the region interested by the 2016 Central Italy Seismic Sequence, by integrating Local Earthquake Tomography and Bouger Gravity Anomalies data

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OVERVIEW

The great quantity of geologic, geodetic and geophysical data from the area are synthesized to constrain the crustal and upper mantle velocity structure of the region interested by the 2016 Central Italy Seismic Sequence, by integrating Local Earthquake Tomography and Bouger Gravity Anomalies data. The crustal tomography reveals four contrasting velocity anomalies trending NW-SE and NE-SW, at depths ranging from 20 to 50 km. The upper mantle tomography delineates a prominent slow anomaly at a depth of about 85 km, similar to the one observed in the Adriatic Plate. The Bouger Gravity Anomalies are characterized by a positive central high and negative peripheral values, separated by an S-shaped Bouger gravity eigenvector. The Bouger gravity anomalies show a good correlation with the velocity anomalies of the upper mantle, indicating a close relationship between the upper mantle and the lithospheric mantle. The crustal model delineates a velocity contrast at a depth of about 60 km, corresponding to the transition from the thickened crust to the thinning mantle.

REFERENCES

Nafe J.E., and Drake C.L., "Variation with depth in shallow and deep water marine sediments of porosity, density and the velocities of compressional and shear waves" , Geophysics, 1957, 22, 523-552, doi: 10.1190/1.1438386
Carannante et al., 2013, Chiarabba et al., 2018

RESULTS AND DISCUSSION

Figure 1 Figure 2 Figure 3 Figure 4 Figure 5

Figure 12: YZ slices through the 3D tomographic Vp model. The surface topography is superimposed to the model.

Figure 5: Step depths (km) on the iso-vel model and superimposed the limit of the well-recorded volume (Spedalotto et al.)

Figure 7 The Bouger gravity anomaly predicted average variance reduction 82% with the optimized density model.

Figure 9 Horizontal density slices at 0, 5, 12 km depth. White stars are the epicenters of the Aquila, Norcia and Teramo earthquakes. The blue lines are active normal faults (VBFS - Villars-Bettolle Fault System, LS - Lago di Soriano, MF - Misone Fault System, MC - Mid Central). Black lines are main seismic events (2012 - Mw=6.2 Norcia, 2013 - Mw=6.1 Amatrice, 2016 - Mw=6.2 Norcia, 2016 - Mw=6.5 Norcia, 2016 - Mw=6.2 Amatrice, 2016 - Mw=6.6 Norcia, 2016 - Mw=6.2 Norcia). The white lines are the traces of the two density sections cleaned on Fig. 9.