

# **The Gubbio normal fault and the Colfiorito fault system within the active faults of the Umbria-Marche Apennines (Central Italy): a comparison between geological and geophysical data.**

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The Umbria-Marche Apennines are characterised by present day seismicity; in the past three decades three moderate earthquakes struck the UMA (Norcia, 1979 M = 5.9; Gubbio, 1984 M = 5.2; Colfiorito, 1997-98 M<sub>max</sub>=5.9). For these events instrumental data concerning the location of the main shocks and of the aftershock sequences are available. The main shocks, characterised by extensional focal mechanisms with a minimum principal stress  $\sigma_3$  oriented NE-SW.

The present day seismic events are associated with the activity of a set of active normal faults, (Umbria Fault System UFS), which strike NW-SE and dip towards SW. Seismic profiles have shown that at least the northern part of the UFS is antithetic to a low angle East dipping low angle normal fault (Altotiberina Fault – AtF, Barchi et al., 1998); this fault borders the Tiber Valley and is the easternmost of the low angle normal faults of the Northern Apennines.

This region is also characterised by the presence of 26 good quality seismic reflection profiles acquired by Agip in the 80'; this data set, recently made available allowed us a to perform a detailed reconstruction of a segment of the UFS, the Gubbio fault (GuF), and to calibrate the interpretation on the southernmost profile crossing the Colfiorito fault system (Cfs) (1997-98 earthquake).

The GuF has been studied in terms of geometry, kinematics and distribution of displacement along its strike; the fault exhibits a listric geometry as it dips at about 60° at surface (e.g. Collettini, 2001) and at less then 20° at depth, where it inverts a pre-existing thrust; the value of slip rate (about 1.25 mm/yr) inferred on the base of the maximum displacement is high with respect to the available slip rates available for this region and suggests a possible longer activity of this fault.

The Cfs is aligned along the same directrix as the GuF (i.e. N135°). This fault system is organised in segments with similar strike and dip at surface (about 50°-60°), which partially overlap and cross-cut the pre-existing thrusts. Seismicity, along the UFS, deepens from NW towards SE, showing depths of the aftershock sequences of about 6-7 km for the Gubbio sequence, of about 9-10 km for the Colfiorito sequence. The deepening of seismicity has been related to the deepening of the AtF detachment which is present at depths comparable with those of the seismic sequences. On the other hand, the detailed review of the available seismic profiles and the comparisons with the hypocenters distributions, allow to argue that beside a structural control, the seismicity distribution is also likely to be controlled by lithological discontinuities (Barchi, 2002). In fact, a general deepening of the Basement-Evaporites boundary towards ENE and ESE is detected from geological cross-sections and from the top Basement reflector contour maps at depths comparable with those of the base of the recorded seismic sequences.

## **References**

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