

Geomorphology of the Gubbio Basin (Central Italy): understanding the active tectonics and earthquake potential

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Abstract

The Gubbio Basin is a 22 km long, 4 km wide depression located within the North-Central Apennines fold-and-thrust belt. The basin is bounded to the east by the Gubbio Fault, a W-dipping, normal fault dissecting a large Jurassic-Oligocene anticline. Although located along one of the main seismogenic zones of the Peninsula, both historical and instrumental seismicity is limited with the only exception for the 29 April 1984, Ms 5.3 earthquake, which occurred about 10 km southwest of the basin. Most of the literature attributes this seismicity to the Gubbio Fault. New geomorphic and geologic investigations based on field and aerial photo surveys and DEM analyses provide new insights on the active faulting in the area and are used to infer potential seismogenic sources. Limited evidence of ongoing deformation along the surface expression of the Gubbio Fault was found, possibly because of low rates of deformation versus fast erosional processes. The western side of the basin appears to be controlled by an east-dipping normal fault, antithetic to the Gubbio Fault. Standard dislocation modeling was used to understand the role played by the Gubbio Fault and its antithetic. The Gubbio Fault was divided into a high-angle section above 3.5 km and a low-angle section between 3.5 and 6 km depth. Based on different tests we conclude that both sections of the Gubbio Fault as well as the antithetic fault contributed to the present setting of the basin. At present the antithetic fault appears to be the most effective in producing a geomorphic signature and controlling the basin width. The high-angle Gubbio Fault played a major role in the basin growth but now its activity rate appears minor. Because of the characteristics and location of the 1984 earthquake, the low-angle Gubbio Fault is assumed to be presently active and seismogenic. Based on the integration of geologic, geomorphic and seismological data we suggest that the low-angle Gubbio Fault is formed by two individual sources capable of M 5.3-5.9 earthquakes. The southern source ruptured in the 1984 earthquake while the northern source did not rupture recently nor historically.

Keywords

tectonic geomorphology; normal fault; seismogenic; sources; Umbria-Marche Apennines - 29 April 1984 Gubbio earthquake

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References

DOI: <https://doi.org/10.4401/ag-3458>

Published by INGV, Istituto Nazionale di Geofisica e Vulcanologia - ISSN: 2037-416X

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
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