



## **Quaternary migration of active extension revealed by a syn-tectonic alluvial fan shift. A case study in the Northern Apennines of Italy**

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In areas characterized by the progressive migration of active extension through time, shifts in the position of the active depocenter occur. Such shifts through time produces peculiar geomorphological settings that are often characterized by wind gaps, abandoned valleys, streams captures and drainage inversions. These features provide the opportunity to investigate active areas by studying the recent-most geological history of the related nearby basins.

We investigate this topic in a tectonically active area in the Northern Apennines of Italy, as indicated by both instrumental and historical seismicity (maximum epicentral intensity  $I_0=VIII$ ) and extension rates in the order of 2.5-2.7 mm/yr. In particular, we study the Montefalco ridge drainage inversion. Here, fluvial sands and imbricated conglomerates deposited in a lower Pleistocene depocenter constituted by an extensional subsiding basin, are presently uplifted more than 200 m above the present day alluvial plain. The Montefalco ridge drainage inversion, at about 400 m a.s.l., separates two valleys, the Gualdo Cattaneo - Bastardo valley to the West (300 m a.s.l.) and the Foligno present-day alluvial plain to the East (200 m a.s.l.). Seismic reflection data show that the maximum thickness of the continental sequence in the Foligno valley is in the order of 500 m. This valley is presently occupied by a 37 km<sup>2</sup> alluvial fan produced by the Topino river flowing from NE to SW.

To unravel the Quaternary tectonic evolution of the area, we integrate different data sets collected by field mapping, detailed photo-geological data, sediments provenance information, and subsurface data.

We interpret the Montefalco ridge as a paleo-Foligno-like alluvial fan representing the evidence of the recent migration of the active extension to the East of around 7 km. Considering an age of deformation of 2.5 My, an extension rate of about 2.8 mm/yr is derived, which corresponds to the present-day geodetic rates.

We stress the importance of detailed multidisciplinary studies in the investigation of the time-space extension which affects the steadiness/unsteadiness of faults behavior.