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Tectono-sedimentary evolution of an extensional basin revealed by a combined photo-geological and field-mapping approach. The Montefalco Basin (Northern Apennines, Italy)

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Active extensional basins are important since their sedimentary infills and bounding tectonic structures provide: i) sinks with preservation potential for sedimentary and fossil records of past changes in climate and sediment/water supply, ii) information on the growth, activity, decay and death of normal faults, iii) vast economic reserves of hydrocarbons, water and minerals.
Unfortunately, quaternary extensional basins, especially if located in humid and temperate climate environments, are often characterized by extensively cultivated areas, homogeneous terrains and quite flat morphologies. Furthermore, they commonly host human settlements, together with roads, economic and industrial infrastructures, with a consequent limited availability of good outcrops. Such a limitation can (often severely) hamper an adequate mapping of the sedimentary infill. Therefore alternative methodological approaches (such as aerial photographs interpretation, API) are needed to integrate heterogeneous and incomplete datasets.
This contribution presents an updated photo-geological map of a Quaternary extensional basin in Central Italy, the Montefalco Basin. This basin developed in a continental environment characterized by clayey-sandy lacustrine and fluvial sequences (late Pliocene – early Pleistocene) underlying more recent coarse grained deposits related to alluvial fan environment (early-to-late Pleistocene) and younger palustrine deposits (late Pleistocene). Since the late Pleistocene, regional uplift and local tectonics led to the end of deposition in the Montefalco basin, which experienced a diffuse incision and the modification of the drainage network, in response to the W–to–E migration of active faulting and tectonic subsidence.
The new photo-geological map represents an important improvement compared to the existing data, since it provides unprecedented and spatially distributed information on the geometry of the continental deposits and on the tectonic structures affecting the evolution of the basin.
Furthermore, results demonstrate that integration of accurate photo-geological maps produced through API and geological field mapping, can contribute to: (i) characterize the tectono-stratigraphic architecture and the geomorphological evolution of continental basins, (ii) help mineral reserves investigation, (iii) provide new input for active tectonic studies, (iv) produce new geological maps in other continental and marine basins, where field data are hard to collect.