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Quaternary landscape evolution of tectonically active intermontane basins: the case of the Middle Aterno River Valley (Abruzzo, Central Italy)

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The Middle Aterno River Valley is characterised by different Quaternary tectonic depressions localised along the present course of the Aterno River (Central Apennine) .This valley includes the L'Aquila and Paganica-Castelnuovo-San Demetrio tectonic basins, to the North, the Middle Aterno Valley and the Subequana tectonic basin, to the South.

The aim of this contribution is to improve the knowledge about the Quaternary geomorphological and tectonic evolution of this portion of the Apennine chain. A synchronous lacustrine depositional phase is recognized in all these basins and attributed to the Early Pleistocene by Falcucci et al. (2012). At that time, this sector of the chain showed four distinct closed basins, hydrologically separated from each other and from the Sulmona depression. This depression, actually a tectonic basin too, was localized South of the Middle Aterno River Valley and it was drained by an endorheic hydrographic network.

The formation of these basins was due to the activity of different fault systems, namely the Upper Aterno River Valley-Paganica system and San Pio delle Camere fault, to the North, and the Middle Aterno River Valley-Subequana Valley fault system to the South.

These tectonic structures were responsible for the origin of local depocentres inside the depressions which hosted the lacustrine basins. Ongoing surveys in the uppermost sectors of the Middle Aterno River Valley revealed the presence of sub-horizontal erosional surfaces that are carved onto the carbonate bedrock and suspended several hundreds of metres over the present thalweg. Gently dipping slope breccias referred to the Early Pleistocene rest on these surfaces, thus suggesting the presence of an ancient low-gradient landscape adjusting to the local base level..

Subsequently, this ancient low relief landscape underwent a strong erosional phase during the Middle Pleistocene. This erosional phase is testified by the occurrence of valley entrenchment and of coeval fluvial deposition within the Middle Aterno River Valley. These fluvial deposits are deeply embedded into the lacustrine sequence, thus suggesting the happening of a hydrographic connection among the originally separated tectonic depressions. This was probably due to the headward erosion by streams draining the Sulmona depression that progressively captured the hydrological networks of the Subequana basin, the Middle Aterno Valley, the L'Aquila and Paganica-Castelnuovo-San Demetrio basins to the North. Stream piracy was probably helped by an increase of the regional uplift rate, occurred between the Lower and the Middle Pleistocene.

To reconstruct the paleo-landscape that characterised the early stages of these basins formation we sampled the remnants of the Quaternary erosinal/depositional surfaces and reconstructed the ancient topographic surfaces using the Topo to Raster tool of ArcGIS 10.0 package. Finally we have cross-checked the geological and geomorphological data with the model of the Middle Aterno River paleo-drainage basin obtained through the GIS based method.

References

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