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Formation and evolution of a drainage network during the Pleistocene through a process of homoclinal shifting initiated by headward erosion.

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A homoclinal shifting process in NE of the Ebro basin, NE Iberian Peninsula, reorganized an old flow network into a new one. This process was initiated by the reactivation of a major normal fault (Amer Fault). An anaclinal stream, flowing to the hanging wall block, incised in the fault-line scarp, accessing by headward erosion the less resistant Paleogene units. The result was the formation of a sequence of strike valleys. The first valleys are situated in a more elevated topographical position than the valleys formed later. The last and the most important valley is La Plana de Vic, which is being emptied by differential erosion in front of the resistant base layer.
The study of the lateral migration of a drainage basin since its initial stages has allowed the recognition of the layout of a drainage network and its model of evolution. The new drainage network includes three different subsystems. The main subsystem consists of stream courses flowing along the strike valley. While the other two subsystems flow into the main or can flow directly to the basin sink. These are the anaclinal subsystem, which drains the scarp face of the asymmetric valley, and the cataclinal subsystem, which drains the cuesta. The process of homoclinal shifting makes the strike streams migrate laterally and dip in the less resistant unit. This migration implies the reorganization of the other two tributary subsystems. The sequence of reorganizations may be preserved on the resistant bedrock of the cuesta. This allows the reconstruction of the route of the headward erosion of the initial anaclinal stream course through remnants of ancient strike streams flowing into former basin sinks, and its cataclinal tributaries draining the cuesta.
In the case study of La Plana de Vic the migration route of the basin sink can be reconstructed from its initial position, Early Pleistocene, until present day. Besides, reorganization of the cataclinal network can also be recognized. During the lateral migration three incisions were made in a large anticlinal structure in the north (Bellmunt Anticline) and one incision was made in a crystalline massif (Montseny) in the south. The last of the incisions into the Bellmunt Anticline captured by headward erosion an older drainage network with headwaters in the axial Pyrenees. The result of the homoclinal shifting process was the capture of older drainage basins and the formation of the current drainage basin of the river Ter.