Geophysical Research Abstracts
Vol. 20, EGU2018-16408, 2018
EGU General Assembly 2018

Fluvial adjustments to Late Quaternary tectonic activity in the NE extreme of Pannonian Basin

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Phases of Late Quaternary evolution of fluvial systems in CE Europe were previously linked to the main phases of climatic changes. However, the detailed reconstructed trends of fluvial erosion and aggradation and channel pattern methamorphosis also show that local and regional tectonics affected the organization of the drainage network, as seen in records from the Great Hungarian Plain (GHP, Pannonian Basin), which document that the last large scale drainage pattern configuration occurred during Late Pleistocene – Holocene, under the influence of subsidence activation in small scale sedimentary basins. The new tectonic settings had led to the reposition of Danube River and the large-scale, westward avulsion of the Tisa, the largest tributary of the Danube. This event ahs been dated to ∼20,000 cal BP (possibly later, at 18,000-14,000 cal BP).
The area is a tectonically active subsidence affecting the lower reaches of the main rivers in the area –Tisa and its tributaries - Somes and Crasna Riverr. In the lower plains this subsidence area occurs as a humid, marshy surface known as Ecedea Plain, now drained trough a series of hydrotechnical interventions starting with XIXth century.
In this study we report new data on the Late Quaternary fluvial history from this area. Based on morphological, sedimentological and chronological data, four phases of drainage reconfiguration as adaptation to the local tectonic dynamics are distinguished:
- Phase 1: palaeoTisa avulsion occurred previously than thought, more than 40,000 yrs. ago, likely not linked to climatic changes, but to tectonic influences.. After the avulsion, the previous flow direction, along the present day Ier Valley, was further used by Crasna River, a former local tributary of Tisa.
- Phase 2: Crasna abandoned its SW course trough Ier Valley for a NW course, along the limit of Nyirbator Plain (Ecedea Plain), prior 14,000 cal BP. Meanwhile, starting with LGM, Tisa repositioned further to the north, and Somes River, one of its local tributaries, occupied the NNW extreme of the present day Somes Plain.
- Phase 3: subsidence activation of the Eastern half of Nyirbator – Somes graben system determined the avulsion of Somes, from NNW to NW, around 5200 yrs. ago. Tisa River had also changed its position, moving slightly to the West during this time.
- Phase 4: an increased subsidence along Ecedea Plain, after ca. 2900 yrs. ago, imposed the new positions of Somes, Crasna and Tisa Rivers. This new configuration is maintained thereafter.
Our results point to a strong influence of local tectonics over climatic changes as the main driver of large-scale river channel adjustments.