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Tectonic, erosional and climatic controls on sedimentary basin evolution a case study from the Tropoja Basin (Albania)

Lorenzo Gemignani, Daniel Simon, Benedict Mittelbach, Kristina Hippe, and Mark, R. Handy
Freie Universität, Berlin, Germany (lorgem3@gmail.com)

River terraces located in the Tropoja Basin in northern Albania are characterized by high elevation (c. 600 m) and by multiple incision events that highlight the interaction between tectonically induced surface uplift, glaciation, and erosion. The Tropoja Basin is located in the hanging wall of the Shkoder-Peja Normal Fault (SPNF) a crustal-scale normal fault trending orthogonal to the strike of the Dinarides Belt. Neo-tectonic activity along the SPNF is indicated by several recent earthquakes. Glaciated valleys drain into the upper reaches of the Valbona River draining the basin. The processes regulating the evolution of the basin infill and the incision of the river terraces remain unclear.

Our mapping reveals that the Pliocene basin fill is overlain by two sub-horizontal layers of Pleistocene-Holocene sediment: porous conglomerate below and red clay above. The conglomeratic layer contains components derived mostly from Mesozoic limestones in Dinaric nappes in the glacial Valbona and Gashi Valleys. The drainage direction in the basin inferred from paleo flow indicators in both layers was to the SW, i.e., in the direction of present-day flow into the Drini Gorge that cuts down to the Adriatic coast. In addition, we recognize three terrace levels in these sediments, the top two of which are carved by abandoned river channels. The terraces and channels cut across the Pleistocene-Holocene layer contacts and are therefore younger than the layers' deposition. The layers themselves thicken away from the SPNF, and show no preferred dip toward or away from the SPNF. Work is underway to date these terraces with cosmogenic nuclides.

Initial relief leading to the Pliocene infill of the Tropoja Basin is interpreted to be a by-product of SPNF activity, which began already in mid-Miocene time. However, this activity is insufficient to explain post-Pliocene sedimentation in the Tropoja Basin because the thickness and dip of the Pleistocene-Holocene layers do not vary systematically with proximity to the SPNF. We, therefore, interpret the Pleistocene-Holocene basin fill to be glacial, with the basal porous conglomerates deposited during sudden out washing of the glacial valleys due to release of melting water behind moraine dams. The overlying red clay layer is interpreted to be a lacustrine deposit due to damming further down the Drini Valley. The preservation of abandoned stream channels in the terraces may reflect episodic uplift and fluvial down-cutting events. The down-cutting may be attributed either to isostatic uplift of the upper plate of the retreating Hellenic subduction and/or to interglacial unloading.

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