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Holocene floodplain formation and the effects on recent morphodynamics in the Little Karoo (South Africa)

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During the last five decades significant rainfall events resulted in widespread and serious flooding of large areas of the Little Karoo (Cape Province, South Africa). Consequences of the heavy rainfalls were flooding and dam failure in tributaries of several river basins and the onshore of the southwest Cape Province. Catastrophic flood events that occurred in 1954, 1974, 1981, 1996, and 2003 claimed lives and caused heavy losses on agriculture and infrastructure.

The Little Karoo is characterised as a dry, semi-arid region due to small amounts of annual precipitation. The sparse semi-desert vegetation cover is not at least a result of a long-term overgrazing. The area is drained by the Gourits River and its main tributaries Groot and Olifants River. The floodplains are formed by 5 to 7 m high alluvial benches of sandy and silty river sediments that are cut in by river channels of decametres to 100 m width. The river beds are largely composed of coarse gravels, boulders as well as bedrock.

The long-term seasonal runoff shows a prominent peak on March, disastrous floods occur episodically. High sediment loads during flood events are intensified by the fragmentary vegetation cover. As a consequence the sedimentation of suspension load on the floodplain may accumulate up to several meters during single events as result from the 1981 “Laingsburg flood”. Normally, the deposits are non-bedded.

In order to understand the formation of floodplains of the Little Karoo rivers several cross sections were studied during field survey and were sampled for sediment anal-

yses and radiocarbon dating. The sediment sequences are quite homogenous at the different sites. Frequently, the upper part of the sediments consists of fine sand and is 3 to 3.5 m thick. Macromorphologically, in the upper part of the sequence stratification is absent. Fragments of fossil wood, mainly *Acacia* and *Rhus*, were found in an irregularly distribution. The uppermost stratum is underlain by a 2 to 3.5 m thick sediment complex of fine and bedded sands and silts that contain loam layers and thin humic horizons. The latter are considered to be horizons of initial soil formations. The base of the fine alluvial sediments is formed by pebbles and boulders on the channel bottom.

The dating of several samples of *Acacia* and *Rhus* fragments from the top layer of the investigated cross sections provided ^{14}C ages between 510±50 BP and 210±50 BP. However, an age of 175±25 BP in a humic horizon situated below may indicate reworking and dislocation of the fossil wood remnants in the course of recent flood events. In contrast, radiocarbon data of the humic horizon in the middle parts of the alluvial benches document increasing ages of the sediments towards the basis of the floodplains. Data of humic horizons on top of bedrock and boulders range between 1215±25 and 875±25 BP.

As a result of the present study the formation of pebbles and boulders on top of the bedrock may relate to the (Late) Pleistocene. During the early and middle Holocene relocation is assumed. The sedimentation of the alluvial benches started during the late Holocene and is regarded to be a result of a prominent change of fluvial activity in the Little Karoo. This may have happened as a consequence of climatic change and/or a change of the suspension load in the Gourits River basin. An increase of the suspension load is expected after the beginning of herding in the Little Karoo about 396 - 476 AD which is indicated by archaeological findings at Boomplaas cave.

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