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Holocene floodplain formation and environmental change in the Gourits river basin, southern Cape region (South Africa)

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Sediments of Holocene floodplain banks in the Gourits river catchment in the southern Cape region, South Africa, were sedimentologically investigated and radiometrically dated. The study resulted in a differentiation into two sedimentation phases. The sedimentation of the older phase starts directly above the bedrock, or respectively, above coarse gravels of the streamlet. These sediments are composed of a 2.5-3 m thick interbedding of sand, silt, and clay. In part, they are stratified by organic horizons and inclusions. The radiocarbon dating of numerous organic horizons as well as fossil wood show that the sedimentation during the older phase occurred between 1215 and 875 BP at the base, and 670 and 15 BP at the top edge of this sequence.
The sediments of the younger phase mainly consist of homogeneous fine sand and are at least 3 m thick, stratigraphically above the sediments of the older deposition phase. However, the sediments of the younger layer can also comprise the entire Holocene deposits situated above the current riverbed. These sediments are mainly of modern age and are partly deposits of centennial flood events.
In any case, the two phases of different sedimentation can be distinguished with rates of ca. 0.3 m in 100 years for the older, and 2-3 m in ca. 50 years for the modern depositional phase. It is notable that 50-70 % in vertical thickness of the studied floodplain sediments has been deposited over the past ca. 250 years. In contrast, only 30-50 % of the sediments were deposited in about 950 years ago. Sedimentation ratios of 1:4 and, respectively, 1:9 are the result of this. Thus, it can be concluded that a change in discharge and, respectively, of sedimentary conditions must have occurred.
According to the present state of knowledge, there is little evidence that the change in sedimentation is the result of climate variations. As a result of the study, the context between land use change and fluvial sediment load as a consequence of increased erosion is indicated and could explain the exceptional thickness of the upper sediments within the sequence of floodplain strata. The context between the onset of sedimentation and the start of pastoral farming by settlers after AD 400, which has been archaeologically verified, supports the hypothesis that the first sedimentation phase was set off or favoured by the degradation of the natural vegetation cover as a result of livestock farming. Later, increased sedimentation as well as an increase in peak flows resulting from increased landscape degradation due to intensified pasture farming by the European settlers has to be assumed.