A LANDSCAPE-BASED MODEL TO CHARACTERIZE THE EVOLUTION AND RECENT DYNAMICS OF WETLANDS IN THE UMZIMVUBU HEADWATERS, EASTERN CAPE, SOUTH AFRICA

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This study presents a landscape model approach to characterize the evolution and recent dynamics of palustrine wetlands within a landscape perspective in the semi arid headwaters of the Umzimvubu catchment (20,000 km²), South Africa. Geophysical methods and sediment analysis have been combined to provide information on spatial and temporal landscape dynamics in general and specific characteristics of different wetland types. The landscape model has been used to evaluate the impact of climate and anthropogenic influences on wetland evolution during the Holocene and to support the landscape-based assessment of those wetlands due to Holocene as well as recent hydro-geomorphological and ecological dynamics and funtioning. This is much more important for management and conservation purposes, since noticable afforestation activities in the basin headwaters since 1989 indicate significant changes due to recent wetland dynamics. In detail, seismic refraction methods have been applied to 7 selected reference wetlands to identify the thickness of sediments, their structural layering and physical properties. The seismic profiles show that all wetlands are characterized by relatively homogeneous sediment layers ranging from 2 to 3.5 m above underlying bedrock. The overall layer thickness is neither associated with the extent of wetlands tributary area, nor with wetland type or size significantly. Geochemical and physical parameters (grain size, pH, TOC, N, S, Al, Fe, pF, hydraulic conductivity, etc.) have been determined by sedimentological analyses of soil cores and samples from several wetland transects. Soil profile analysis indicates that wetland evolution was induced by a late Holocene infilling of former valley bottoms with fine materials. This process started about 3370±51 14C years BP according to radiocarbon dating. Significant layers of clay and silt in upper parts of the profile are addressed to phases of increased sedimentation of fine materials as a consequence of either climate change and/or anthropogenic influences associated to low fluvial dynamics and sparse vegetation cover. In addition, Fe-/Mn-concretions indicate soil formation processes associated to increased short-term groundwater fluctuation. Consequently, an impervious layer has been developed that controls the seasonal hydrological dynamics and therefore enables recent wetland conditions.