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Late Holocene landscape dynamics and ecosystem stability in the Upper Zambezi Valley

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The summer rainfall zone in central southern Africa is critically vulnerable to changes in hydroclimate. The Intergovernmental Panel on Climate Change expects late 21st century subtropical temperatures to be on average at least 3-4°C warmer than a century earlier. Precipitation forecasts indicate substantial inter-model agreement for some African regions including significant drying in central southern Africa. The Zambezi basin has been identified as being particularly vulnerable to environmental change with down-the-line consequences being identified as potential political unrest, economic disturbances and food insecurity (Swain et al., 2012). Predicting the real environmental impact of changing climates, in terms of future landscape change and ecological response however, relies strongly on records of how these systems have responded to past climatic changes. To date, very few records exist for the Zambezi basin and very little is known about underlying stability or variability of both the landscape and the ecology. In western Zambia 'dambos' can be broadly described as shallow seasonally or interannually waterlogged depressions formed either at the headwaters of ephemeral drainage networks or within the disconnected drainage network itself where low relief facilitates infiltration and acts against channel formation and erosional processes. Sediments from these depressions which span a broad climate and ecological gradient from NW to SW Zambia preserve a palaeoecological record of late Holocene vegetation and fire dynamics and for the first time offer a long-term perspective on the ecological stability of this understudied region. In conjunction with new ages from optical dating of dune and plateau sands, we present new data that suggest the region is sensitive to rapid climate changes exemplified by multi-tiered threshold responses which include i) widespread sediment mobilisation ii) sufficient landscape stability to allow organic accumulation (and preservation) and iii) changing palaeo-vegetation assemblages.