Megafans of the Northern Kalahari Basin

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We identify eleven megafans (partial cones of fluvial sediment, >80 km radius) in the northern Kalahari Basin, using several criteria based on VIS and IR remotely sensed data and SRTM-based surface morphology reconstructions. Two other features meet fewer criteria of the form which we class as possible megafans. The northern Kalahari megafans are located in a 1700 km arc around the southern and eastern flanks of the Angola's Bié Plateau, from northern Namibia through northwest Botswana to western Zambia. Three lie in the Owambo subbasin centered on the Etosha Pan, three in the relatively small Okavango rift depression, and five in the Upper Zambezi basin. The population includes the well-known Okavango megafan (150 km), Namibia's Cubango megafan, the largest megafan in the region (350 km long), and the largest nested group (the five major contiguous megafans on the west slopes of the upper Zambezi Valley). We use new, SRTM-based topographic roughness data to discriminate various depositional surfaces within the flat N. Kalahari landscapes. We introduce the concepts of divide megafans, derived megafans, and fan-margin rivers.

Conclusions. (i) Eleven megafan cones total an area of ~190,000 km2. (ii) Different controls on megafan size operate in the three component basins: in the Okavango rift structural controls become the prime constraint on megafan length by controlling basin dimensions. Megafans in the other les constricted basins appear to conform to classic relationships fan area, slope, and feeder-basin area. (iii) Active fans occupy the Okavango rift depression with one in the Owambo basin. The rest of the population are relict but recently active fans (surfaces are relict with respect to activity by the feeder river). (iv) Avulsive behavior of the formative river—axiomatic for the evolution of megafans—has resulted in repeated rearrangements of regional drainage, with likely effects in the study area well back into the Neogene. Divide megafans comprise the majority of the identified features, some of which have delivered water and sediment alternately to neighboring basins in the course of normal avulsion activity, likely resulting in significant changes in the hydrologies of two of the study-area subbasins. (v) Paleoclimatic inferences extracted from fluvial and lacustrine sediments therefore need to take account of avulsion-driven drainage configurations, especially where these are autogenically controlled.