Paper Number: 4830

Assessing the aeolian assumption

Smit, J.J.[1]

[1]Unaffiliated (MGSSA, Pr.Sci.Nat). 13c Unie Street, Parys, South Africa. smit@lantic.net.

Roughly a century ago, J Harlen Bretz investigated features in the Washington Scabland (USA) that he later proposed was formed by catastrophic flooding. This led to one of the great debates in modern earth science [1], with the main criticism coming from uniformitarian adherents. Decades later the debate was settled in his favour when giant current ripples (GCR) were observed from above with the advent of aerial photography [2]. The debate caused geoscientists to recognise similar evidence for catastrophic flooding on Earth and even Mars [1], and helped usher in a new discipline in earth science called palaeoflood hydrology [3].

Primary sedimentary bedforms in the Sahara desert have traditionally been assumed to have been formed by wind, the prevailing geological agent. This appears to be an unwritten presupposition emanating from the strict application of the principle of uniformitarianism and is referred to here as the 'aeolian assumption'. However, satellite data have provided evidence for the existence of up to four large palaeo-lakes in the Sahara during the Holocene [4]. Large areas covered by the lakes are now covered by what was assumed to be aeolian bedforms, causing a rethink of their depositional origin.

It is proposed that large transverse and longitudinal dunes in and around sand seas in the Sahara can be re-interpreted to have been primarily deposited by (catastrophic) fluvial processes, modified by recent aeolian reworking. This interpretation is supported by remotely sensed geomorphic evidence for large bodies of water, the apparent lower preservation potential of aeolian (relative to fluvial) bedforms under submerged conditions, as well as numerous other diagnostic features. These include planated dune tops, fluvial erosional features and isolated hills characterised by sand ramps and opposite erosional features stretching for many kilometres (see **Error! Reference source not found.**). This interpretation is based solely on remote sensing observations and no field work has yet been conducted.

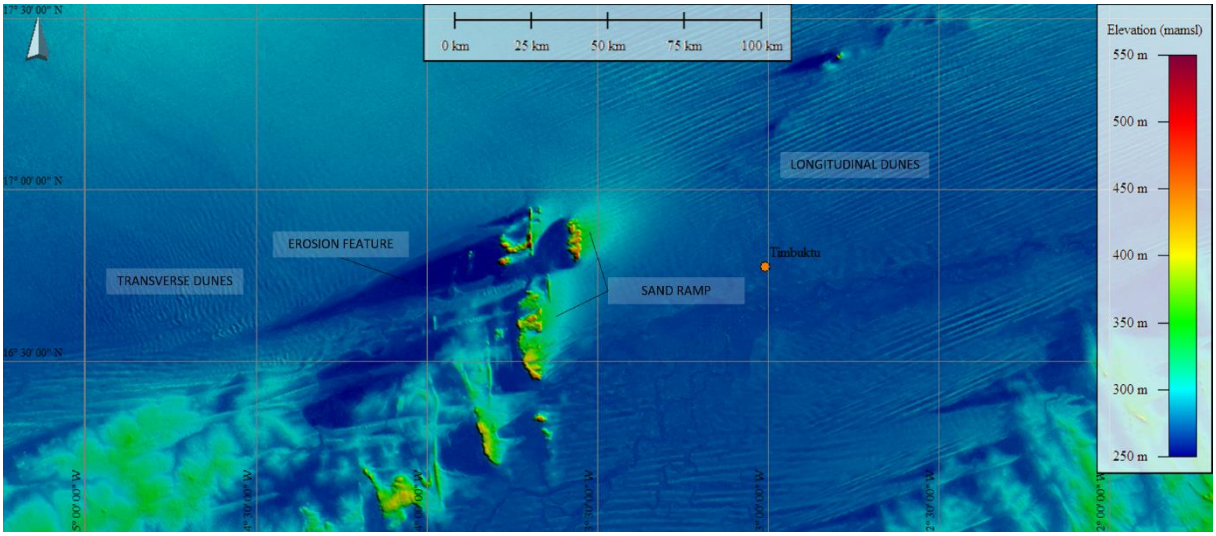

Figure 1: Digital elevation model (SRTM) showing sand ramps stretching more than 20 km up gradient (NE) and erosive features of almost 80 km down-gradient (SW) of hills west of Timbuktu in Mali. This is consistent with a subaqueous hydraulic jump with palaeo-current from the north-east.

References:

[1] Baker VR (2008) Geological Society, London, Special Publications 301: 33-50

[2] Gould SJ (1978) Natural History. 87(7): 12-18

[3] Baker VR (2008) Geomorphology 101: 1–13

[4] Drake N and Bristow C (2006) The Holocene 16(6): 901-911