Available online at www.sciencedirect.com

SCIENCE DIRECT®

ELSEVIER

Palaeogeography, Palaeoclimatology, Palaeoecology 230 (2006) 230–242

PALAEO

www.elsevier.com/locate/palaeo

Evidence for Megalake Chad, north-central Africa, during the late Quaternary from satellite data

Marc J. Leblanc [a,*], Christian Leduc [b], Frank Stagnitti [c], Peter J. van Oevelen [d], Chris Jones [e], Linus A. Mofor [f], Moumtaz Razack [g], Guillaume Favreau [b]

[a] *School of Geosciences, Monash University, Clayton 3800, Australia*
[b] *IRD-UMR Hydrosciences, BP 64501, 34394 Montpellier cedex 5, France*
[c] *School of Ecology and Environment, Deakin University, Warrnambool 3280, Australia*
[d] *European Space Agency, Keplerlaan 1, Postbus 299, 2200 AG Noordwijk, The Netherlands*
[e] *School of Computer Science, Cardiff University, Newport Road, PO Box 916, Cardiff CF24 3XF, UK*
[f] *School of Technology, University of Glamorgan, Pontypridd CF37 1DL, UK*
[g] *University of Poitiers, 40 avenue du Recteur Pineau, 86022 Poitiers Cedex, France*

Received 22 September 2004; received in revised form 21 July 2005; accepted 27 July 2005

Abstract

The existence of a very large Lake Chad during the late Quaternary, Megalake Chad, has long been questioned. A Megalake Chad would present strong evidence for climatic fluctuations of great magnitude during the Holocene in tropical Africa. In this paper we used satellite data from Landsat and Modis sensors to collect and analyse new information on landforms in a 2 000 000 km^2 region of the Lake Chad Basin. We detected 2300 km of remains marking the ancient shoreline of Megalake Chad. The satellite data also indicated many Saharan rivers and relict deltas leading to the long paleoshoreline. Large dunefield flattenings were observed and interpreted as the result of wave-cut erosion by the paleolake. Similarities were noticed between the landforms observed along the paleoshoreline of Megalake Chad and that of the former Aral Sea. This finding has significant consequences for reconstructing paleohydrology and paleoenvironments through the Lake Chad basin, and continental climate change.
© 2005 Elsevier B.V. All rights reserved.

Keywords: Lake Chad; Paleohydrology; Remote sensing; Geomorphology; Climate change; Ancient shoreline

1. Introduction

The Lake Chad Basin in north-central Africa is the world's largest endorheic basin, covering an area of 2 500 000 km^2 (Fig. 1). The central part of this basin began to fill with sedimentary deposits during the Cretaceous period (Genik, 1992). It is now mainly covered with unconsolidated Quaternary sediments. Presently, most of the northern portion of the basin is dry. Originating in the south, the Chari and the Logone rivers provide most of the inflow to Lake Chad—a vast and shallow fresh water lake bordering

* Corresponding author. Fax: +61 399 054 903.
E-mail address: Marc.Leblanc@sci.monash.edu.au (M.J. Leblanc).

0031-0182/$ - see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.palaeo.2005.07.016

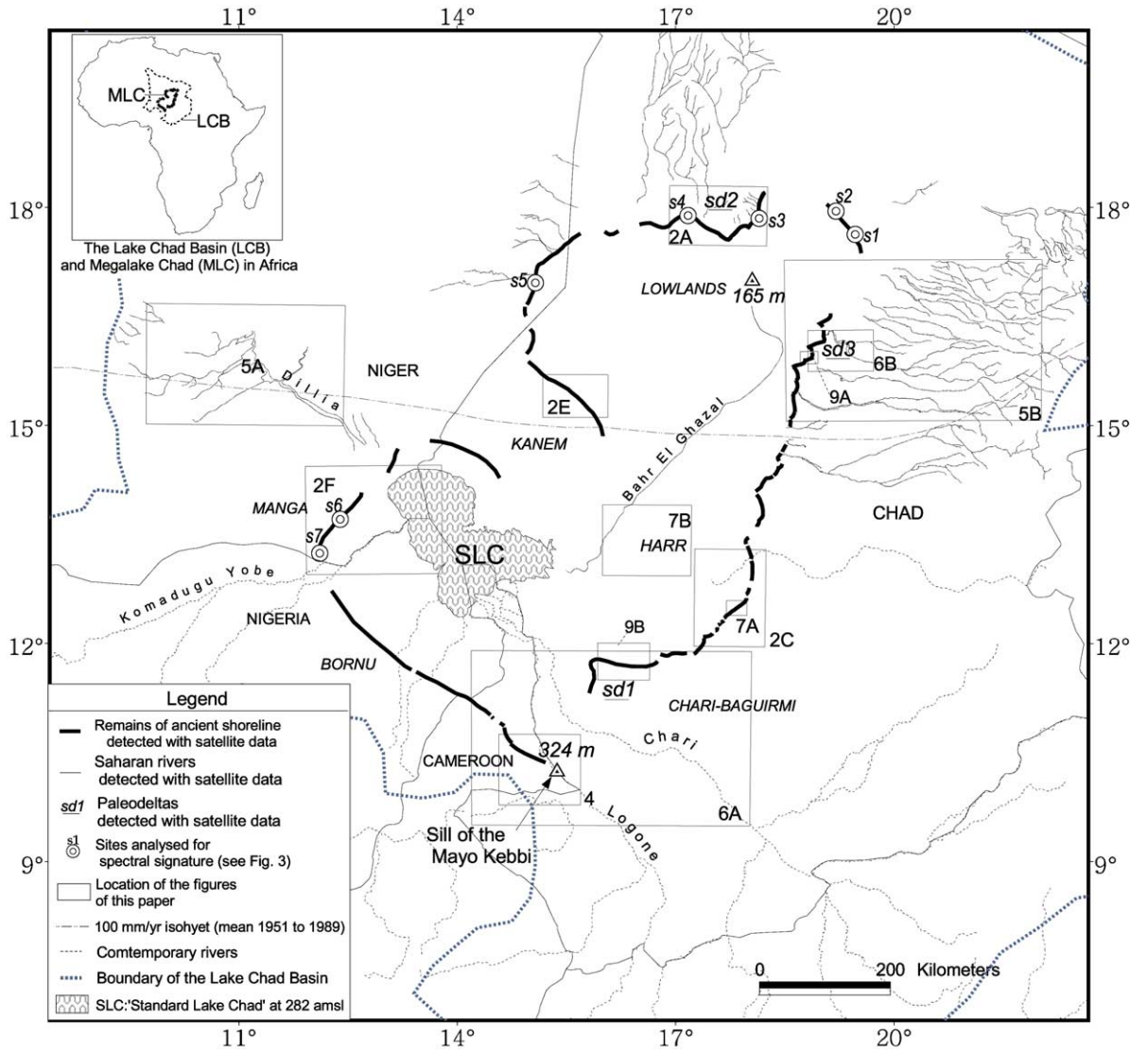

Fig. 1. Study area and the remains of Megalake Chad detected with satellite data. Black rectangles indicate the location of the other figures mentioned in the text. Double circles represent the sites whose lithology was determined using spectral signature.

the Sahara Desert. Due to its endorheic nature and because it is located in a region of little relief, climate fluctuations have a great impact on the areal extent of Lake Chad. For example, from 1960 to 1990 the level of the lake fluctuated approximately between 277 and 284 m amsl and its area from 6000 km^2 to 25 000 km^2 (Olivry et al., 1996). During the last millennium major floods occurred on several occasions. During these events water levels rose above 286 m amsl and the Lake expanded to the north-east, partly flooding the Bahr el Ghazal valley (Maley, 1981; Olivry et al., 1996). Although large portions of the Bahr el Ghazal were inundated during these major floods, the water never flooded the Lowlands—a vast region of northern Chad about 115 m below the current level of Lake Chad and linked to Lake Chad through the Bahr el Ghazal valley (Fig. 1).

The hypothesis of a much larger ancient Lake Chad during the late Quaternary, Megalake Chad, remains controversial. Doubt about the existence of Megalake

Download English Version:

https://daneshyari.com/en/article/4469542

Download Persian Version:

https://daneshyari.com/article/4469542

Daneshyari.com