Global and Planetary Change 69 (2009) 1–15

Contents lists available at ScienceDirect

Global and Planetary Change

journal homepage: www.elsevier.com/locate/gloplacha

Late Pleistocene and Holocene environments in the Nile basin

Martin A.J. Williams *

Geographical and Environmental Studies, University of Adelaide, Adelaide SA 5005, Australia

ARTICLE INFO

Article history:
Received 30 April 2009
Accepted 23 July 2009
Available online 3 August 2009

Keywords:
Nile
Late Pleistocene
Holocene
climate change
floods
swamps
early agriculture

ABSTRACT

Owing to the very gently sloping nature of the flood plain in the lower White Nile valley, which is underlain by a former lake-bed, the depositional record in that area is unusually well preserved. In Egypt and along the Blue Nile phases of erosion have destroyed segments of the sedimentary record, but the White Nile sequence is a good proxy for both the main Nile and the Blue Nile. During the last 15 ka, at least, times of high flow in the Blue Nile and main Nile were synchronous with those in the White Nile.

Not all the White Nile flood deposits have been preserved but calibrated radiocarbon dates obtained on fossil freshwater and amphibious *Pila* shells and fish bones indicate that White Nile levels were high around 14.7–13.1 ka, 9.7–9.0 ka, 7.9–7.6 ka, 6.3 ka and 3.2–2.8 ka. The Blue Nile record is more fragmentary and that of the main Nile even more so except for the Holocene Nile delta. Calibrated radiocarbon ages for high Blue Nile flows indicate very high flood levels towards 13.9–13.2 ka, 8.6 ka, 7.7 ka and 6.3 ka.

Incision by the Blue Nile and main Nile has caused progressive incision in the White Nile amounting to at least 4 m since the terminal Pleistocene ~15 ka ago and at least 2 m over the past 9 ka. The Blue Nile seems to have cut down at least 10 m since ~15 ka and at least 4 m since 9 ka. The time-transgressive and relatively late inception of plant domestication in the Nile valley may partly reflect this history of incision. Nile incision would propagate upstream into the White Nile valley, draining previously swampy areas along the valley floor, which would then become accessible to cultivation.

1. Introduction

The Nile is the longest river in the world with a total length of 6 670 km. The Blue Nile rises in the volcanic uplands of Ethiopia and flows through a spectacular gorge nearly 2 km deep and 35 km wide before it emerges from the highlands onto a vast low-angle alluvial fan. It then flows across this megafan through the semi-arid plains of the central Sudan to meet up with the White Nile at Khartoum. In strong contrast to the highly seasonal Blue Nile, the White Nile emerges from the lake plateau of Uganda and disappears into the vast swamps of the southern Sudan whence it emerges as a river of nearly constant flow throughout the year. The White Nile provides 83% of Nile discharge during the month of lowest flow and is responsible for maintaining perennial flow in the Nile during drought years in Ethiopia. However, the two major Ethiopian tributaries of the Nile (the Blue Nile and the Atbara) provide, respectively, 68% and 22% of the peak flow and 72% and 25% of the annual sediment load. North of Khartoum the main Nile flows through the eastern Sahara desert north into the Mediterranean Sea and receives no further inflow north of the Atbara confluence until it reaches the sea after a waterless journey of 2689 km. The inhabitants of the arid lands of northern Sudan and Egypt owe their very existence to the Nile. By the year 2020 over 300 million people will depend upon the waters of the Nile for their livelihood, so that a clear understanding of present land use and Nile flood history is essential for future planning (Hassan, 1981; Conway and Hulme, 1993; Ayoub, 1999). The lower Nile valley was one of the cradles of urban civilisation, totally dependent on floods from the upper Nile, just as Egypt is today. This great civilisation was based upon sedentary agriculture and a complex social structure (Said, 1997), in strong contrast to the hunter–gatherer communities of the Later Stone Age who occupied the Nile valley before the advent of Neolithic farming some 8000 and more years ago. The question then arises as to how these prehistoric communities might have interacted with the changing environments in the Nile basin and what light this might shed upon the beginnings of food production in this region.

The aim of this paper is to provide an overview of Late Pleistocene and Holocene environments in the Nile basin, which is also relevant to two other interesting questions that we can only touch upon very briefly since they are beyond the scope of this paper. How did environmental changes influence the transition from hunting and gathering to early agriculture in the Nile basin? What are the links between late Quaternary depositional history and present land use in the Nile valley? In order to provide even tentative answers to these questions we need to answer three additional questions. (a) Did the late Quaternary Nile and its major tributaries flow continuously from the Ethiopian and Ugandan headwaters of the Blue and White Nile rivers through the Sudan and on through Egypt to the Mediterranean Sea? (b) At what stage(s) did land suitable for agriculture become physically available in the Nile valley?

* Tel.: +61 8 8303 4170; fax: +61 8 8303 3772.
E-mail address: martin.williams@adelaide.edu.au.

0921-8181/$ – see front matter © 2009 Elsevier B.V. All rights reserved.
doi:10.1016/j.gloplacha.2009.07.005

(The use made of such land was in part culturally determined, but early farmers could not use the floodplains or alluvial terraces for any purpose until they were reasonably well drained and devoid of perennial swamps). (c) To what extent does the Holocene depositional history of different sectors of the Nile valley correlate with the archaeological evidence of the first appearance of plant and animal domestication? This paper should provide a useful foundation for any future attempts to answer these questions.

2. Late Pleistocene and Holocene environments in the Nile basin

Herodotus (ca. 485–425 BC) was among the first to recognise that the flood plain and delta of the Nile in northern Egypt were comparatively youthful features of the landscape. He noted that the alluvium laid down by the Nile was responsible for aggrading the flood plain and for progressively silting up the overflow channels of the Nile and certain abandoned arms of the Nile near the delta,

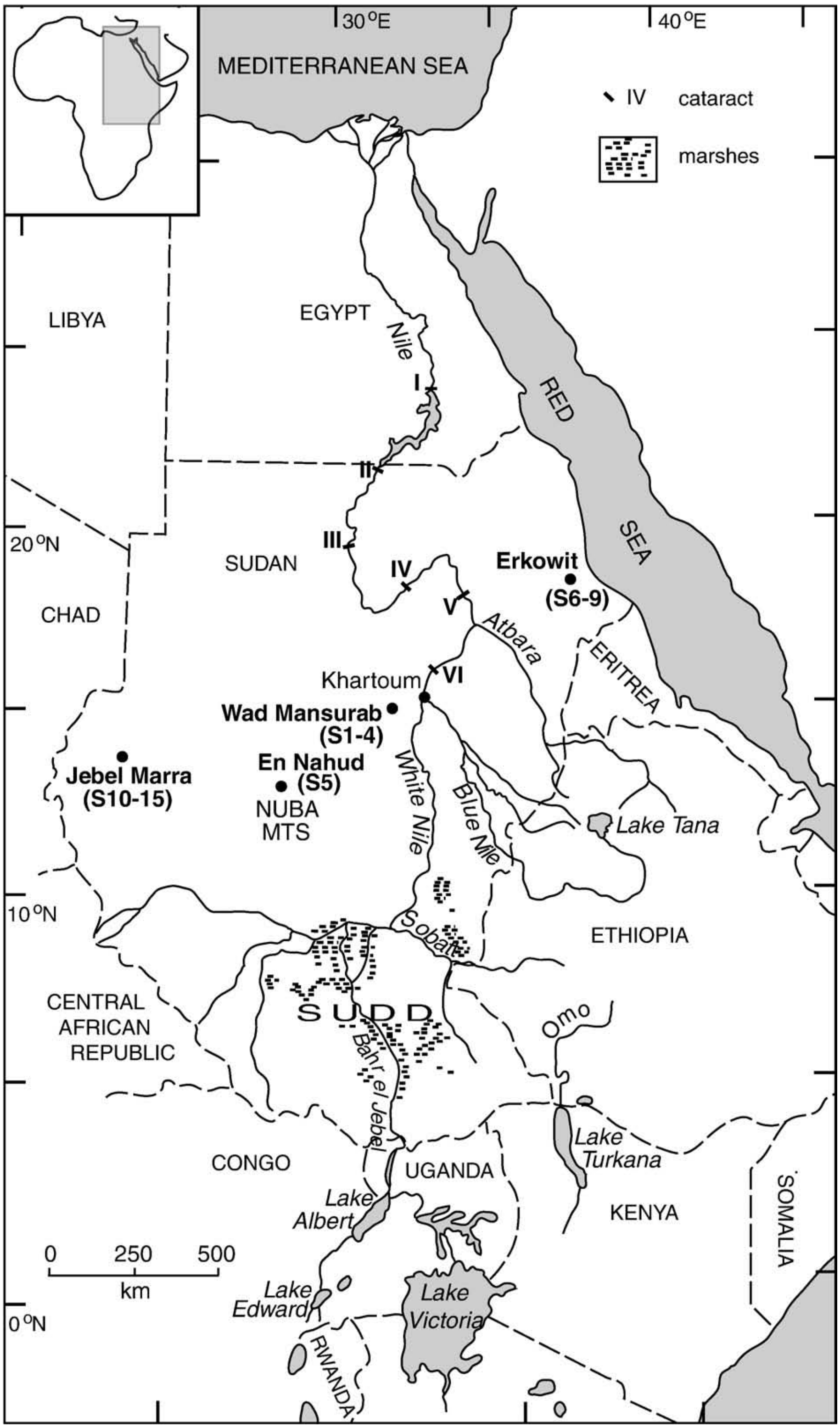

Fig. 1. The Nile basin.