Z. BIBLIOGRAPHY

Z2. Morphology

In South African Journal of Geology

S.Afr.J.Geol.,1997,100(3),185–194

Cartographic analysis of the African Surface Complex between Albertinia and Mosse Bay, southern Cape, South Africa

M.E. Marker
Department of Environmental and Geographical Sciences, University of Cape Town, Private Bag, Rondebosch, 7700 Republic of South Africa

M.J. McFarlane
Department of Environmental Sciences, University of Botswana, Private Bag 0022, Gaborone, Botswana

Accepted 14 August 1996

Deeply weathered saprolite beneath duricrusts is diagnostic of the African Surface. Detailed cartographic analysis, supported by field investigation, has been applied to the African Surface residuals located between Albertinia and Mossel Bay in the southern Cape, South Africa. Four distinct surfaces at differing elevations exist. These results support the view that the African Surface, as it survives, is polycyclic. Furthermore, the weathering mantles on each of the four surfaces are distinct.

Diepverweerde saprolliet onder hardekors is kenmerkend van die Afrika-oppervlakte. Gedetailleerde kartografiese analise gesteun deur veldondersoek is toegepas op oorblyfsels van die Afrika-oppervlakte tussen Albertinia en Mosselbaai in die suidelike Kaap, Suid-Afrika. Vier afsonderlike oppervlaktes op verskillende hoogtes bestaan. Hierdie resultate steun die stelling dat die Afrika-oppervlakte, soos dit nog bestaan, polisiklies is. Verder is die verweringsmantels op elk van die vier oppervlaktes onderskeibaar.

Introduction to the African Surface

Planation surfaces characterized by deep weathering mantles are widely distributed over the southern continents that once formed part of Gondwana: in Australia, in eastern South America, in India, and in Africa. All are ancient continental areas with long geomorphic histories. In southern Africa, the most complete planation surface eroded over at least 40 to 60 million years following the break-up of Gondwana in the Jurassic Period, was designated the African Surface by King (1962) and the same terminology has been followed by Partridge & Maud (1987). African Surface erosion above and below the Great Escarpment was controlled by two different base levels. Inland of the Great Escarpment, the extensive Highveld surface represents a modified African Surface at c. 1500 m, while seawards of the Great Escarpment, the surface now lies at 250 – 350 m above sea-level (Partridge & Maud, 1987) (Figure 1). Below the Great Escarpment, the then sea-level exerted base-level control. The Great Escarpment, that separates remnants of these two different elevation African Surfaces, is itself the result of erosion since the Gondwana break-up (Ollier & Marker, 1985). Post Miocene uplift and warping has also affected the entire subcontinent, so that the African Surface is deformed both inland and towards the coast.

Below the Great Escarpment the African Surface is identified by diagnostic deep weathering underlying a duricrust cap (Partridge & Maud, 1987). Traces of this 'African Surface' can be identified from Bitterfontein in the Western Cape to East London in the Eastern Cape (Summerfield, 1983a). Along the southern Cape coastal belt duricrusts, usually silcrete and more rarely ferricrete (laterite), cap the saprolite that developed on the African Surface. These remnants in the southern Cape are concentrated in the Caledon–Swellendam, Heidelberg–Riversdale, Albertinia–Mossel Bay, and Grahamstown areas. Subsequent erosion has caused a tabular topography with, in detail, a multiplicity of minor levels. Once the duricrust and its derived lag gravels are removed, the relatively soft saprolite is eroded, first to rolling topography, and subsequently stripped to leave planed bedrock surfaces. The original surface sloped seawards and would also have been graded towards major drainage lines. Present-day concordance of altitude of the tabular remnants, even within a small area, is perhaps unlikely. Furthermore, the southern Cape has undergone faulting and uplift with warping subsequent to the formation of the African planation surface. The African Surface below the Great Escarpment is recognized as being polycyclic and to comprise more than one level derived from the original surface (Partridge & Maud, 1987). Two distinct planation surfaces

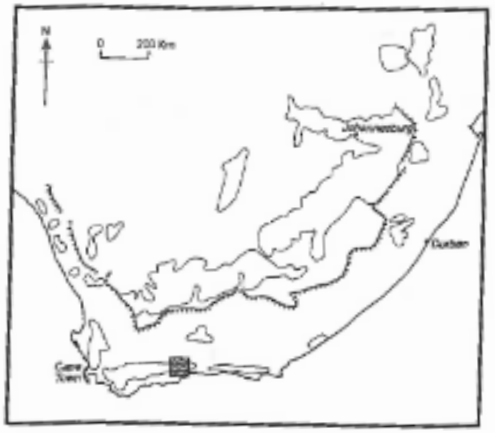

Figure 1 The distribution of the African surface above and below the Great Escarpment (after Partridge & Maud, 1987). Area of study shown by box.

1997

South African Geographical Journal
Vol. 92, No. 2, December 2010, 105–116

Routledge
Taylor & Francis Group

The geomorphology of the Coastal Platform in the southern Cape

Margaret E. Marker[a,b1] and Peter J. Holmes[b]*

[a]*School of Geography, Oxford University Centre for the Environment, University of Oxford, South Parks Road, Oxford OX1 3QY, UK;* [b]*Department of Geography, University of the Free State, PO Box 339, Bloemfontein 9300, South Africa*

The Coastal Platform is the dominant geomorphic macro-feature of the southern Cape south of the Cape Fold Belt. The southern Cape coast has served, on-shore as well as off-shore, as an important sediment sink, since the mid-Cretaceous, and into and throughout the Quaternary. An understanding of the geomorphic evolution of the Coastal Platform since the Cretaceous provides a context for the subsequent Neogene and Quaternary geomorphic palaeoenvironments of the region. Existing evidence for the evolution of the Coastal Platform is reviewed and synthesised, and new evidence supporting the polycyclic nature of the surface is introduced. The Coastal Platform was planed under hot, humid conditions during the Cretaceous, following the break-up of Gondwana. Simultaneously, the Great Escarpment was eroded inland. This resulted in a much modified African Surface which manifests itself as the Coastal Platform extending from Bot River in the west to Port Elizabeth in the east. Evidence based on detailed map analysis is presented to show that the Coastal Platform is polycyclic. Tabular remnants of the African Surface are preserved on the Coastal Platform by laterite or silcrete duricrusts overlying variable depths of saprolite. At least four discrete surfaces can be recognised in the Albertinia–Mossel Bay area, while in the Sedgefield–Knysna area the surface is bimodal. The relationship between the Coastal Platform and two important landscape components of the region, the Bredasdorp Group limestones and the Knysna coversands, is also considered. Finally, the tectonic stability of the Coastal Platform's Cretaceous surface is questioned. Evidence is drawn from zeta bays developed over half-grabens, down-faulted to the west along northwest–southeast trending faults, and from evidence of displacement in the Cape Peninsula, as well as from stripped basal surfaces of differing altitudes. This evidence demonstrates post-Cretaceous lateral and vertical displacement on the Coastal Platform.

Keywords: Coastal Platform; duricrusts; polycyclic development; fault displacement

Introduction

South of the Cape Fold Belt, the predominant landscape component of the southern Cape is the Coastal Platform. It extends, south of the Langeberg–Outeniqua ranges, from Bot River (34°14′S; 19°12′E) to Port Elizabeth (33°58′S; 23°36′E) (Figure 1). The Coastal Platform displays a relatively gentle seaward gradient. It is a major landscape component which warrants investigation in its own right. Furthermore, the southern Cape coast has served as an important sediment sink, particularly with respect to the deposition and accumulation of marine, aeolian and lacustrine sediment during the Neogene and Quaternary (Dingle *et al.* 1983, Partridge and Maud 1987). The southern Cape has recently been the focus of a concerted and ongoing research programme to better understand the

*Corresponding author. Email: holmespj@ufs.ac.za

ISSN 0373-6245 print/ISSN 2151-2418 online

DOI: 10.1080/03736245.2010.522041
http://www.informaworld.com

2010

CAVE AND KARST SCIENCE Vol. 29, No.2, 2002
Transactions of the British Cave Research Association

ISSN 1356-191X

The karst of the De Hoop Nature Reserve, Western Cape, South Africa

Margaret E MARKER [1] and Stephen A CRAVEN [2]

[1] Department of Geography, Mansfield Road, Oxford, UK

[2] 7 Amhurst Avenue, Newlands 7700, South Africa

Abstract: The De Hoop Vlei Reserve and adjacent areas, only 150km east of Cape Town, support an important coastal karst, which is developed on Tertiary dune limestones. A high density of enclosed hollows with some dry valleys constitute the surface karst. Shallow caves are localised. The complexity of enclosed hollow plan-form increases with altitude and therefore with the age of the limestone surface. A pitting index is given as a measure of difference between areas of differing karst age. There is also evidence for syngenetic karst development of both valleys and hollows.

(Received 8 April 2002; Accepted 12 November 2002)

INTRODUCTION

Some of the most spectacular surface karst and caves in South Africa are accorded conservation status by virtue of falling within the De Hoop Nature Reserve. This reserve, set up originally to preserve and breed endangered animals, is located on the coast of the Western Province, east of Cape Agulhas (34° 50'S: 20° 00'E), some 150km east of Cape Town (33° 55'S: 18° 28'E) (Fig.1). De Hoop Vlei, an important RAMSA bird locality, divides the karst area (Butcher, 1983). Most of the reserve lies east of the Vlei but, as a large area outside the Reserve on the west is held by the Defence Force, it has *de facto* conservation status. This karst area is developed on Cenozoic Bredasdorp Group limestones (formerly known as the Coastal Limestones).

GEOLOGY

To help understand the karst geomorphology mention must be made of the structural context. The Reserve lies within the Cape Mountain belt. Cape Supergroup Peninsula Formation quartzites and sandstones form the mountain ranges, and Bokkeveld shales (also Cape Supergroup) underlie the intervening valleys and plains. North of Cape Town the alignment is north-south whereas eastwards the alignment swings west-east. The Reserve lies south of the orogenic node where the alignment changes (Fig.2). The change in direction can be recognised in the Bredasdorp Range, in the planed and buried ridges that crop out at Struis Bay and Arniston (34° 35'S: 20° 14'E) and in the Potberg, which rises to a maximum altitude of 370m, jutting into the ocean at Cape Infanta (34° 29'S: 21° 51'E) (Fig.2).

The resistant Cape fold ranges have assisted preservation of the limestone between the Bredasdorp and Potberg ranges. Following the break-up of Gondwana (the southern hemisphere supercontinent) a series of fault troughs developed along the coast extending off-shore, in which sediments of Cretaceous and later age have been preserved (Dingle *et al.*, 1983). The Reserve overlies the inner margin of one such half-graben (Fig.3). Two major Tertiary tectonic uplifts account for the present altitude of the limestone. Faulting that resulted is most easily recognised in the Peninsula Formation quartzites, but has also been important in directing dissolution within the limestone. The basic geology of the Reserve is shown on Figure 3.

Cenozoic near-shore limestones occur sporadically along the South African coast from Saldanha (33° 03'S: 17° 51'E) in the west, to northern KwaZulu-Natal in the east. The southern Cape outcrop between Cape Agulhas (34° 50'S: 20° 02'E) and Mossel Bay (34° 11'S; 22° 08'E), of which the De Hoop area forms a part, and that of the Eastern Cape between Woody Cape and Great Fish River (33° 29'S: 27° 16'E) have the highest density and diversity of karst. The limestones

Russell, L, 1982. *Karst surface landforms of the De Hoop Nature Reserve.* MSc dissertation (unpublished), University of Fort Hare.

KARST

SURFACE LANDFORMS

OF THE

DE HOOP NATURE RESERVE

L. RUSSELL

Thesis submitted in part requirement for the degree of Master of Science,

University of Fort Hare, December 1981.

Russell, L, 1989. *Karst surface landforms of the Cape Coastal Limestones*. PhD Thesis (unpublished), University of Fort Hare.

I would like to thank all who have assisted in this research. Fieldwork was facilitated by many landowners not only granting access to their land but also in providing valuable information concerning limestone water table depths. The Cape Provincial Department of Nature Conservation gave permission to carry out research on nature reserves and personnel of the Gouriqua Research Establishment kindly granted access to the government restricted coastal section west of Gouritzmund.

Acknowledgements are also due to the Council for Scientific and Industrial Research for financial assistance made available through a grant to the thesis supervisor.

Mr. G. Cooper at Fort Hare University kindly prepared the photographic material, Mr. B. Mali prepared the limestone thin sections for microscopic analysis and Mr. J. Uys provided valuable advice on cartographic techniques.

I wish especially to express my gratitude to Prof. M.E. Marker for her continued support and encouragement at all stages of the research. Finally I would like to thank Shaun Russell for his assistance with the field studies and later for his patience

ACTA CARSOLOGICA	32/2	4	41-52	LJUBLJANA 2003

COBISS: 1.01

DOLINES AND SINKHOLES: ASPECTS OF EVOLUTION AND PROBLEMS OF CLASSIFICATION

»DOLINE« IN »SINKHOLE« Z VIDIKA RAZVOJA IN TEŽAVE S KLASIFIKACIJO

UGO SAURO[1]

[1] Universitŕ degli studi di Padova, Dipartimento di Geografia, Via del Santo 26, 35123 Padova, Italia

Prejeto / received: 26. 9. 2003