CAPE GEOSITES

COGMANS KLOOF

Spectacle of the Cape Fold Belt

Large-scale folding in the Table Mountain Group is a striking geological feature in Cogmans Kloof (view towards east).

THE CAPE GEOSITES SERIES

Cogmans Kloof is just one of the many geologically interesting sites in the Cape. This brochure forms part of an educational series that was compiled by the Geoheritage Subcommittee of the Western Cape Branch of the Geological Society of South Africa and is downloadable free of charge from the Branch website (https://www.gssawc.org.za). Bilingual descriptive plaques were placed at the sites during a programme sponsored by SANLAM in the 1990s.

The plaque in Cogmans Kloof disappeared during refurbishment of the road (R62) that started in 2015 and was completed in April 2022, the reconstruction was done by AECOM consulting engineers with the contractors being Basil Read (2015-2018) and Haw & Inglis (2018-2022). The Geoheritage plaque has been replaced by signage installed by Montagu Tourism. This document includes reference to the new signage (Figures 1 and 2).

Figure 1: Location map for Cogmans Kloof. The plaque is located on the left-hand-side of the road. See geological map below for more detail and GPS coordinates.

INTRODUCTION

Cogmans Kloof is a poort (gorge) through the Langeberg Mountains between Ashton and Montagu on the R62 to Oudtshoorn. It is named after the Cogmans, a Khoi chiefdom that existed in the area around the beginning of the 18th century. The pass was constructed by Thomas Bain between 1873 and 1877 and follows the course of the Kingna River, which flows southwest from Montagu.

GEOLOGY AND GEOLOGICAL HISTORY

Cogmans Kloof gorge is almost entirely incised within intensely folded sandstone of the Table Mountain Group (TMG). At the southern (Ashton) end of Cogmans Kloof, the Malmesbury Group underlies these younger folded sandstones that dominate the scenery of the kloof. The Malmesbury Group is composed of greywacke, phyllite and schist with minor quartzite, conglomerate and gritstone; limestone is present at Robertson to the west. These formations were deposited, folded, and faulted by approximately 500 million years ago. In contrast to the horizontal contact between the Malmesbury and Table Mountain Groups on Table Mountain, this plane (called an angular unconformity) at Cogmans Kloof is vertical because it was folded along with the other strata (Figure 3).

Figure 2: The plaque describing the area has been placed on the northwestern side of the road - GPS coordinates -33.802970°, 20.096264°.

Figure 3: Angular unconformity between rocks of the Malmesbury and Table Mountain Groups along the eastern flank of the R62 provincial road. The tip of the geological hammer marks the contact with Malmesbury on the right (south) and overlying TMG on the left (north). GPS: 33.8242°S/20.0907°E.

The TMG north of the unconformity within Cogmans Kloof (Figures 4 and 5) is dominated by fine- to coarse-grained, quartzitic sandstones of the Peninsula Formation and the Nardouw Subgroup. Sandy sedimentation was briefly interrupted by a period of glaciation (Pakhuis Formation diamictite) and mud deposition (Cedarberg Formation shale) above the Peninsula Formation and below the Nardouw Subgroup. Shale of the Cedarberg Formation can be seen above the car park in the central part of the gorge (Figure 5), but diamictite of the Pakhuis Formation is absent here due to its confinement to palaeotopographic hollows at the top of the Peninsula Formation. The sediments of the Table Mountain Group were deposited on fluvially-dominated, alluvial plains with sporadic, thin, transgressive, shallow, marine intervals 400-480 million years (Ma) ago when Africa was part of the supercontinent Gondwana. The beds have been thoroughly lithified by processes associated with deep burial, compaction, cementation, and tectonic deformation (folding and faulting). Originally the layers of sand (now sandstones) would have been almost flat lying. If you look around in the gorge, you will see that these layers (beds) are now for the most part steeply inclined. This is because during the Cape Orogeny, from 280 to 230 Ma ago, the whole mass was subjected to tremendous, approximately horizontal compressional forces. These forces were directed in several pulses from the south towards the north and resulted from an interaction between major tectonic plates located far to the west and south. The folding occurred incrementally and very slowly over some 50 million years through a process that we call plastic deformation and would have given rise to a very high mountain belt (Figure 4). Sedimentary rocks of the lowermost sequences in the Karoo Supergroup were deposited just before the onset of the Cape Orogeny.

A geological cross-section through the various geological units is shown in Figure 6. The Malmesbury Group rocks form the core of a large anticlinorium (arch) consisting of smaller folds in the southwest of the area. A syncline (trough) near Montagu is filled with rocks of the Bokkeveld Group and tight, small folds that decorate the northern, steep limb of the anticlinorium are beautifully revealed on the steep mountain slopes north of the plaque (see frontispiece). The section also shows that displacement, downwards to the south of some 5000 m by the Worcester Fault, which was active between approximately 150 and 90 million years ago, resulted in the juxtaposition of rocks of greatly differing ages.

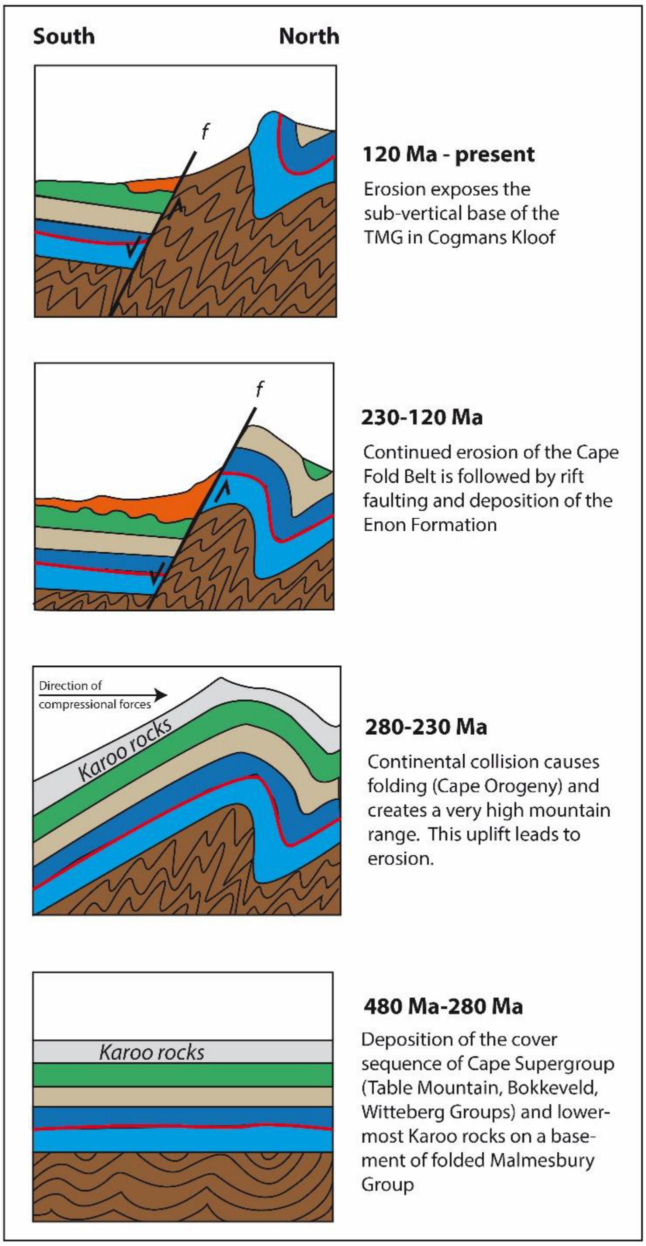

Figure 4: Geological history, (legend of stratigraphic units shown in Figure 5).

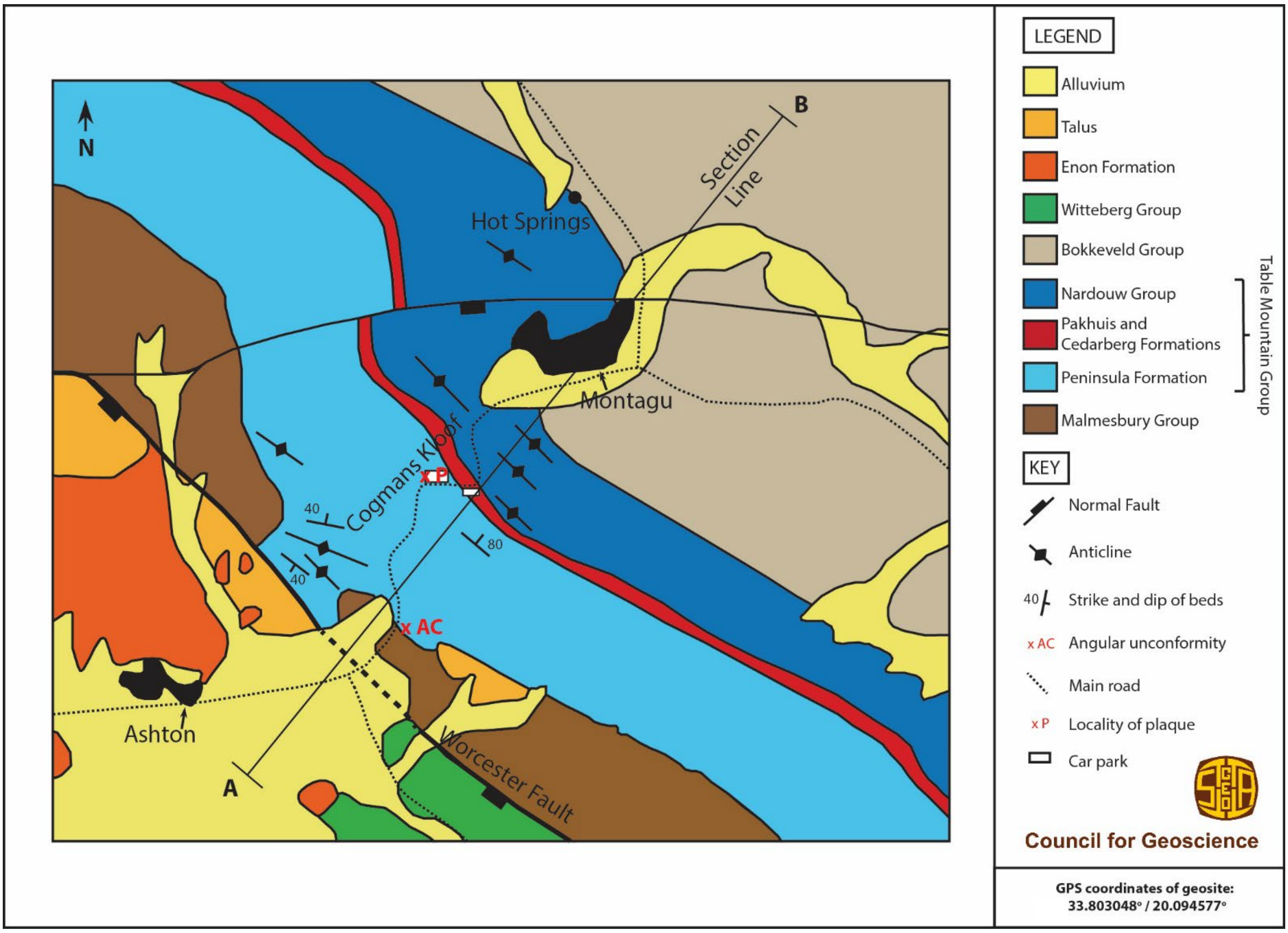

Figure 5: Geological map of Cogmans Kloof.

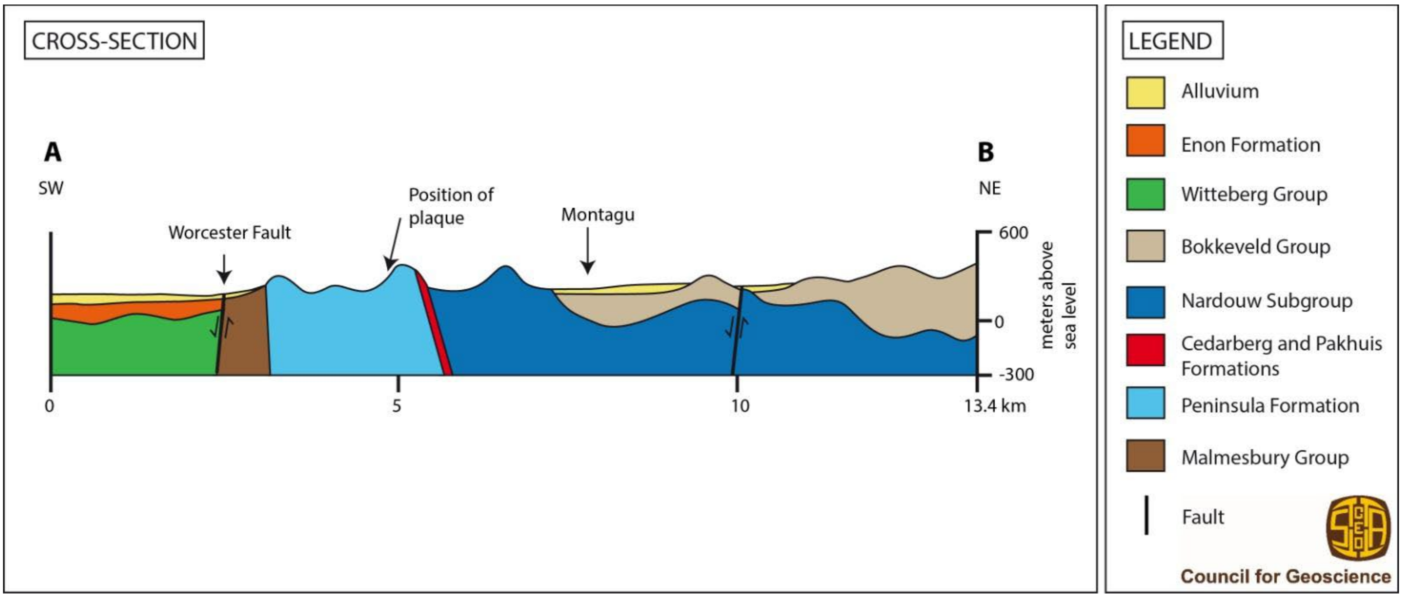

Figure 6: Geological cross-section from points A to B shown in the geological map above.

It is an interesting fact that, were it not for the TMG with its thick quartz-rich sandstones, we would not have had any Cape Mountain Ranges, at least not on their present scale. The sandstones are often very pure and these quartz-rich rocks are extremely resistant to weathering, being chemically relatively inert. Most of the chemical attack is related to lichens, which typically coat the outcrops and generally impart a grey tone, but as you can see, also colourful tints on some of the high rock faces. Their resistance to weathering means that TMG rocks tend to occupy high ground in landscapes, which nature is constantly reducing to sea level. The localised intense erosion that we occasionally observe is usually of a mechanical nature, involving rockfalls, commonly triggered by high-rainfall events and sometimes by large earthquakes. It is probable that this is the dominant mechanism operating to reduce the relief of the Cape Mountains. The rockfalls and sometimes conglomeratic units (like the Enon Formation) provide source materials for the gravels found in the modern river channels.

GEOMORPHOLOGY

The most striking feature of Cogmans Kloof is the way it cuts through the mountain range. It is one of several such features found in the Cape Mountain Ranges, perhaps the best known being the Seweweeks Poort, which slices through the Groot Swartberg Reeks near Ladismith to the east. Exactly which processes acted to form these features are unknown, but several mechanisms probably worked together to produce them.

The rivers may well have existed prior to uplift of the mountain range and their erosional power was able to keep pace with the rise of the land, that is, they could cut down as fast, or faster, than the rate of uplift. Thus, there may have been a superpositioning of streams onto the folded mountain range from some earlier elevated landscape.

Another process that probably played a part is river capture. All the great east-west mountain ranges of the Cape Fold Belt possess deep canyons, cut by streams draining their flanks e.g., a north-bank tributary of the Breede River eroding northwards from the Ashton area towards the Montagu area. These often do not penetrate the mountains, but pairs originating on opposite flanks may intersect. If at some time in the past this intersection occurred and if the land north of the range was higher than in the south, then it is possible that, by aggressive headward erosion of the southern canyon, the drainage from the north may have been tapped and a poort formed through the process of river capture.

The geomorphology of the kloof today is in a sense unique, because it is undergoing continuous modification. Although in any single lifetime little or no change may be apparent, over a longer period, say millions of years, many aspects of the kloof morphology would be expected to change. Broadly these would involve downcutting of the active channel and widening by sidewall retreat. If for any reason, climatic or tectonic, downcutting was reduced or halted, the stream would tend to cut sideways, widening the valley. Renewed downcutting would leave parts of the previously-cut floor abandoned and these would remain as terraces. It is upon one of these terraces that you are standing whilst reading the plaque. A reminder of the powerful forces of erosion was provided in January 1981, when heavy rains in the southern Karoo caused the Keisie and Kingna Rivers to flood and to meet at their confluence in Montagu, before rushing through Cogmans Kloof to Ashton and the Breede River, with considerable loss of life and damage to property. The road subsequently has been raised and realigned to minimise flood damage in years to come.

Figure 7: View from Cogmans Kloof (on 24 July 2023) looking east showing the ancient river erosion of the valley with the modern-day river channel on the left. (Photo: www.hiltonpreston.com).

CONTACT

Western Cape Branch of the Geological Society of SA:
https://www.gssawc.org.za

Council for Geoscience:
http://www.geoscience.org.za/

ADDITIONAL READING

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