


## D. DURICRUSTS

### Desk Note D2. Calcretes - Overview



**Calcrete on sand.**

<p><i>Secrets of De Hoop and Environs</i></p>	<p>Field notes on the GEOMORPHOLOGY, HYDROLOGY and ARCHAEOLOGY Between CAPE AGULHAS and CAPE INFANTA</p>	 <p>Geomorphological Research</p>
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#### **Definition**

Calcrete is a hard crust (or duricrust) formed *'in situ'* (on site), from the local, underlying materials, i.e. it was not transported and / or deposited by an agent (wind or water) like other sedimentary formations.

Goodie (1973) has defined duricrust as follows:


*"A product of terrestrial processes within the zone of weathering in which either iron and aluminium sesquioxides or silica or calcium carbonate or other compounds like manganese have accumulated in and /or replaced a pre-existing soil, rock or weathered material, to give a substance which may ultimately develop into an indurated mass".*

Based on the above definition, Watts (1980) defined calcrete as follows:

*"A terrestrial material composed dominantly, but not exclusively of CaCO<sub>3</sub> which occur in states ranging from nodular and powdery to highly indurated and result mainly from the displacive and /or replacive introduction of vadose carbonate into greater or lesser quantities of soil, rock or sediment within a soil profile."*

The following definitions of calcrete are from four separate sources; together they explain the formation of this type of rock:

1. Calcrete, also called Hardpan, calcium-rich duricrust, a hardened layer in or on a soil. It is formed on calcareous materials as a result of climatic fluctuations in arid and semiarid regions. Calcite is dissolved in groundwater and, under drying conditions, is precipitated as the water evaporates at the surface. Rainwater saturated with carbon dioxide acts as an acid and also dissolves calcite and then redeposits it as a precipitate on the surfaces of the soil particles; as the interstitial soil spaces are filled, an impermeable crust is formed.
2. A limestone formed by the cementation of soil, sand, gravel, shells, by calcium carbonate deposited by evaporation, or by the escape of carbon dioxide from ground water. It is also called caliche.
3. A crust or layer of hard mineral or subsoil encrusted with calcium-carbonate occurring in arid or semiarid regions.
4. A sedimentary rock; a hardened deposit of calcium carbonate. This calcium carbonate cements together other materials, including gravel, sand, clay, and silt. It is found in aridisols (desert soils) and mollisols (grassland soils and dark fertile surface horizons).

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### **Calcretes on SA South Coast**

Calcrete is abundant along the coast between Cape Town and Knysna. It was formed through a process of laterisation, whereby the top layers were weathered into soil which, with time, turned into case hardening of the topography. Calcrete forms a capping layer on the limestone formations of the Bredasdorp Group, as well as isolated patches on older formations such as the Enon (conglomerates and clays) and (to a very small extent) on the Bokkeveld (shales). The calcrete layer is cracked, eroded and disintegrating. It can be observed as sheets or as lumps.

It has been assumed that the formation of the calcrete in the area took place from mid-Tertiary to early-Pleistocene, but the evidence is rarely preserved, and complete (intact laterised profiles) did not survive in the area.

### **Calcretes in the Study Area**

Calcrete is the predominant surface rock east and south of the road from Cape Agulhas through Bredasdorp to Cape Infanta and is present in sections of the Bredasdorp Group Formations. It was, nevertheless, given little attention, it is under-researched, and the geology maps of the area do not show the true extent of the calcrete cover (See Chapter W).

Whereas the formation of the calcrete in the area and calcrete profiles deserve a thorough investigation, such research is beyond the scope of this study. Interested readers are referred to the many works of F Netterberg.

The following Field Notes will describe more than ten different types (appearances) of calcrete, which have been seen so far in the Study Area, and which differ from each other in their morphology. The first Field Notes are on the calcrete, which was formed on other rocks and sediments, from old to young, namely the Bokkeveld, Enon and the Bredasdorp Group Formations, as well as Quaternary sediments. The other Field Notes will describe the types of calcrete in geographical units, from the southwest to the northeast (in some areas there a few different types of calcrete). The last three Field Notes describe calcrete features, which do not fall into one of the two categories mentioned above.

The following are the Field Notes about the various calcrete types, or appearances (some Field Notes describe more than one type):

- a. On the Bokkeveld Formations
- b. On the Enon Formation
- c. On the Bredasdorp Group Formations
- d. On the Bredasdorp Plain
- e. In the Ou Werf Valley
- f. As root tubules (rhizoliths)
- g. As Conglomerate cement
- h. Dissolution features
- i. Spatial distribution

The shores of the Heuningns Estuary and the De Hoop Vlei are lined with calcrete-silcrete intergrade outcrops. They are described in the Field Notes on non-pedogenic silcretes.

A field guide to the calcretised landscape in the Study Area is given at the end of this chapter.

Satellite images of the Study Area, showing the geographical areas mentioned above, are given in Figures 1 and 2.



**Figure 1. Satellite image of the western part of the Study Area, showing the areas mentioned in the Field Notes about calcretes in this chapter,**



**Figure 2. Satellite image of the middle part of the Study Area, showing the areas mentioned in the Field Notes about calcretes in this chapter,**