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The west coast of South Africa: Gaint depository of placer titanium and zircon

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The relatively narrow coastal plain of the west coast of South Africa is marked by the widespread distribution of areas with anomalous heavy mineral concentrations. The discovery of several significantly large heavy mineral deposits was the result of renewed global interest in titanium and zircon. Today, two of these deposits have entered production: Namakwa Sands near Brand-se- Baai in 1994 and the proximate Tormin operation in 2012.

Several localities along the coastal margin of the west coast of South Africa offer similar potential, but are not economically feasible under current market conditions, or remain unexplored at this stage. In total, the entire west coast of South Africa portrays a superior heavy mineral resource of world-class dimensions, able to sustain mining well into the next millennium [1].

The heavy mineral deposits are associated with semi- to unconsolidated, medium- to fine-grained siliciclastic sediments of Cainozoic to Recent age which were deposited on Precambrian, highly metamorphosed basement rocks.



The influence of fluvial, marine and aeolian processes in restricted depositional environments was instrumental in the concentration and localization of heavy minerals. Generally, the mineralisation is hosted by a geological succession comprising 1) basal high-grade strandline gravels and marine sands (Fig. 1), 2) primarily derived, massive aeolianites reaching tens of meters in thickness and 3) a veneer of free flowing, scavenged aeolian sands.

Figure 1: Heavy minerals concentrating as a strandline deposit in a present-day log-spiral beach environment near Geelwal Karoo, west coast of South Africa

These deposits are generally classified as large scale (>100 million tons) with several featuring resources of more than a billion tons. The total heavy mineral content is variable, ranging up to 10 per cent with some smaller deposits featuring bonanza grades exceeding 30 per cent.

Heavy mineral populations are diverse, but generally with abundant Fe-Ti-oxides of which ilmenite constitutes the greatest part. The remainder of the heavy mineral suite comprises variable amounts of garnet, zircon, hornblende, pyroxene and epidote, whereas magnetite, hematite, aluminosilicates,

glaucanite, leucoxene, monazite, titanite, staurolite, rutile, tourmaline and collophane are commonly present as accessories.

The most important economic minerals are zircon, ilmenite and rutile, but garnets may occasionally contribute to the total revenue. An economically favourable attribute of the west coast placers are the consistent co-distribution of zircon and titanium bearing minerals, which is a provenance characteristic.

References:

[1] Philander C and Rozendaal A (2015) Econ Geol 110: 1577-1623

