

Characteristics and origin of detrital Fe-Ti oxides in heavy mineral sands of Namibia

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Coastal placers are present in the Erongo and Kunene regions of Namibia along current and past shorelines. The aim of this study was to link heavy mineral sand compositions to source regions. All coastal heavy mineral occurrences show quite similar bulk mineralogical compositions, with Fe-Ti oxides and garnets being the main high-density minerals. QEMSCAN analysis reveals a dominance of Fe-Ti oxides in the southernmost placers close to Swakopmund, where the minerals make up to ~75 % of bulk sands. However, Fe-Ti oxides are also present in areas further north. Bulk contents are largest in placers directly north and south of the Ugab River (~25 %) and distinctly less approaching the Omaruru River (~1 to 10 %) as well as in the periphery between the Ugab and the Huab Rivers (~4 %). While QEMSCAN analysis allows to determine the bulk fraction of Fe-Ti oxides and to differentiate between magnetite and ilmenite due to set Ti values as well as rutile (<1 % in bulk sand fraction), it fails to distinguish different minerals of the Fe-Ti oxide group comprising ulvospinel, hematite, (Fe-)pseudorutile, (Fe-)pseudobrookite, goethite and different Fe hydroxides. Systematic analysis of the Fe-Ti oxide fraction via EMPA reveals the presence of diverse Fe-Ti minerals, in particular titanomagnetite, but such analyses also reveal that single mineral Fe-Ti phases are randomly present throughout the heavy mineral fraction. Using only the Fe-Ti oxide fraction does not allow to verify whether the Orange River is the only mineral source for the coastal Namibian heavy mineral sands. Considering the coastal geology, it appears likely that the Omaruru, Ugab and Huab Rivers contribute to the heavy mineral budget of the Namibian coastal placer deposits.