Paleoproterozic Laterites and the Origin of the Giant Iron and Manganese Ore Deposits, South Africa

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Giant iron and manganese ore deposits occur on the Maremane Dome in the area between Sishen and Postmasburg in the Northern Cape Province of South Africa. These iron and manganese ore deposits are all developed in close association with oxidised paleoweathering profiles in the strata of the Late Archean to early Proterozoic Transvaal Supergroup, immediately below an extensive paleoerosion surface at the base of Paleoproterozoic red-beds. Iron ore deposits, like that of Sishen and Beeshoek, have developed where the paleoerosion surface transects iron-formation of the Transvaal Supergroup. In contrast, manganese ore developed where the unconformity transects manganiferous Campbellrand dolomite. Good examples of the manganese deposits are developed at Glosam and Lohatla.

The largest iron ore deposit is preserved at Sishen. The mine produces about 24Mt of high-grade (65% iron) hematite ore per annum, with a potential opencast ore reserve of about 1000 Mt. Between 80 and 90 per cent of the mine's potential ore reserve is situated in the Manganore Iron-formation, immediately below the unconformity that separates it from the overlying Gamagara Formation of the Olifantshoek Group. The Manganore Iron-formation is a correlative of the Asbesheuwels iron-formation of the Transvaal Supergroup, and slumped into paleosinkhole structures in the underlying Campbellrand carbonates during the period of erosion that preceded the deposition of the Gamagara Formation. During slumping, silica was leached from the iron-formation by alkaline ground water solutions and ferrous minerals oxidized to hematite. At the same time some iron was added to the sequence as hematite to form the high grade laminated and breccia supergene ore bodies. Subsequently these ore bodies became eroded and hematite pebble conglomerates accumulated in alluvial fan environments at the base of the Gamagara Formation to form conglomeratic ore representing approximately 10-20 per cent of the potential ore reserve. The Gamagara Formation is a red bed sequence and a correlative of the Mapedi Formation of the Olifantshoek Group.