

# The Distribution of Platinum Group Elements in the Insizwa Lobe, Mount Ayliff Complex, South Africa: Implications for Ni-Cu-PGE Sulfide Exploration in the Karoo Igneous Province

W. D. MAIER,<sup>†</sup>

*Centre for Research on Magmatic Ore Deposits, Department of Geology, University of Pretoria, Pretoria 0002, South Africa*

J. S. MARSH,

*Department of Geology, Rhodes University, 6140 Grahamstown, South Africa*

SARAH-JANE BARNES,

*Sciences de la Terre, Université du Québec, Chicoutimi G7H 2B1, Canada*

AND D. C. DODD

*Falconbridge Ventures of Africa, P.O. Box 12708, Hatfield, Pretoria 0028, South Africa*

## Abstract

The Mount Ayliff Complex of the Eastern Cape province of South Africa is a layered intrusion of some 800 km<sup>2</sup> surface area and up to 1,200 m thickness. On the basis of compositional similarities and spatial association, it is generally interpreted to form part of the Karoo igneous province. Similarities between the Mount Ayliff Complex and the staging chambers and feeder conduits to flood basalts that host magmatic sulfide ores elsewhere in the world suggest that the Mount Ayliff Complex may have an enhanced potential for Noril'sk-Talnakh-type massive Ni-Cu sulfide ores, an idea that is supported by the well-known sulfide occurrence at Waterfall Gorge. Here, we present major-, trace-, and noble-element data for 30 samples of cumulate rocks from a continuous 1,200 m drill core through the Insizwa lobe of the complex, as well as six samples of a footwall sill, the Taylor's Koppie dike, that was considered a possible feeder zone to the lobe, and through a massive sulfide lens in the footwall of the lobe at Ndzongiseni. We show that most of the Insizwa cumulate rocks contain small amounts of cumulus sulfides. The sulfides, including those at Waterfall Gorge, can be explained by a model in which the sulfides were segregated from magma having chilled-margin composition. On the basis of the composition of the chilled margins, the Insizwa magma contained no entrained sulfides and was depleted in platinum group elements (PGE), although not in Cu and Ni, before emplacement. These compositional characteristics are also observed in lavas of the central Karoo igneous province and suggest only limited sulfide segregation from these magmas at depth. Our findings thus indicate relatively little potential for economic magmatic Ni-Cu-PGE sulfide deposits in the Insizwa lobe.