

$^{87}\text{Sr}/^{86}\text{Sr}$ variations in plagioclase of the Main and Upper zones, northern Limb, Bushveld Complex

FREDERICK ROELOFSE*¹ AND MPHONG MANGWEGAPE¹

¹Department of Geology, University of the Free State, PO Box 339, Bloemfontein, 9300, SOUTH AFRICA

(*correspondence: roelofsef@ufs.ac.za)

Numerous studies on the Bushveld Complex [1-4] and other layered intrusions [5] [6] have shown the existence of isotopic disequilibrium, both between and within particular (cumulus) minerals, with a wide variety of processes having been proposed to explain this phenomenon. For the Bushveld Complex, these processes include the blending of semi-consolidated crystal mushes during subsidence, the density driven mixing of minerals from isotopically distinct magma pulses, the infiltration of isotopically distinct contaminants and the intrusion of variably contaminated crystal mushes from deeper crustal staging chambers.

Here we report the results of a detailed in-situ (LA-ICP-MS) Sr-isotopic and trace element investigation conducted on plagioclase from the Main and Upper zones of the Bushveld Complex as intersected by the Bellevue [7] and Moordkopje [3] drill cores. The lower part of the Main Zone displays highly variable initial Sr-isotopic ratios, coupled with near constant plagioclase An%. Lower and less variable initial Sr-isotopic values are recorded for the Main Zone above the troctolite layer and for the Upper Zone, which is coincident with a “normal” differentiation trend as exemplified by plagioclase An%. We interpret the present results as being the product of i) the repeated intrusion of variably contaminated crystal mushes from a deeper staging chamber that gave rise to the lower parts of the Main Zone; ii) a “final” voluminous influx of magma from a deeper staging chamber that underwent fractionation within the presently exposed parts of the Bushveld Complex, that gave rise to the upper Main and Upper zones.

[1] Chutas, Bates, Prevec, Coleman & Boudreau (2012) *Contributions to Mineralogy and Petrology* **163**, 653-668 [2] Prevec, Ashwal & Mkaza (2005) *Contributions to Mineralogy and Petrology* **149**, 306-315 [3] Roelofse & Ashwal (2012) *Journal of Petrology* **53**, 1449-1476 [4] Yang, Maier, Lahaye & O'Brien (2013) *Contributions to Mineralogy and Petrology* **166**, 959-974 [5] Tepley & Davidson (2003) *Contributions to Mineralogy and Petrology* **145**, 628-641 [6] McBirney & Creaser (2003) *Journal of Petrology* **44**, 757-771 [7] Ashwal, Webb & Knoper (2005) *South African Journal of Geology* **108**, 199-232.