

## **Magma Chamber Processes in the Upper and Upper Main Zones of the Bushveld Complex, South Africa**

Qian Yuan,<sup>1,2,\*</sup> Bernard Charlier,<sup>2,3,\*</sup> Olivier Namur,<sup>3</sup> R. James Roberts,<sup>4</sup> and Xinbiao Lv<sup>1</sup>

<sup>1</sup>Faculty of Earth Resources, China University of Geosciences, Wuhan 430074, China

<sup>2</sup>Department of Geology, University of Liege, 4000 Sart Tilman, Belgium

<sup>3</sup>Institut für Mineralogie, Leibniz Universität Hannover, 30167 Hannover, Germany

<sup>4</sup>Department of Geology, University of Pretoria, Hatfield, Pretoria, 0002, South Africa

\*E-mail, yuanqian1988@gmail.com

The ~8-km-thick cumulate sequence of ultramafic and mafic rocks of the Bushveld Complex has been divided into Lower, Critical, Main, and Upper zones from base to top. The Upper Main and Upper zones (ca. 2 km thick), located above the Pyroxenite Marker, are commonly considered as the last pulse of magma injected into the Bushveld magma chamber. They are also the largest known sheet of basaltic magma that produced world-class deposits of V, Ti, and P as Ti magnetite and apatite. In this study, we present whole-rock data for major and trace elements (>100 samples at less than 30-m interval) and systematic in situ analyses of plagioclase, olivine, clinopyroxene, and orthopyroxene for samples from the Upper Main and Upper zones collected in drill holes intersecting the Bierkraal in the western limb. We will combine our new data with those presented by Tegner et al., V<sub>2</sub>O<sub>5</sub> in magnetite, and whole-rock Sr isotope data from samples collected in the same drill holes. All together, these datasets will further contribute to our understanding of the crystallization sequence and magma chamber processes. Our closely spaced sampling allowed us to observe subtle compositional reversals in An % in plagioclase and Mg # of mafic minerals in the Upper Main and Upper zones. We will use this information to discuss the closed vs. open solidification of the magma chamber and the ore-forming processes for layers enriched in magnetite ± apatite. We will also use our bulk major and trace element data to discuss how much liquid is likely to have erupted during the crystallization of the Upper Main and Upper zones.