



Department of Geology Seminar Series Presents

Dr. Katie McFall

Research Associate
School of Earth & Ocean Sciences
Cardiff University

*Primary volatiles in the Northern Limb of the Bushveld
Complex and their effect on PGE mineralisation*

WEDNESDAY, OCTOBER 30 - 11:30am

Science 411

Everyone is welcome to attend!



GEOLOGY
FACULTY OF SCIENCE

smu.ca



Dr. Katie McFall, Research Associate, School of Earth & Ocean Sciences, Cardiff University

Title: *Primary volatiles in the Northern Limb of the Bushveld Complex and their effect on PGE mineralisation*

Abstract

High-temperature 'primary' volatiles have been suggested to have an important influence on the development of PGE mineralisation in layered intrusions, however their source, abundance and role in mineralisation are still highly debated. Unlike the rest of the Bushveld Complex, the Northern Limb intrudes the reactive country rocks of the Transvaal supergroup and is therefore the ideal place to study the effect of volatiles on magmatic sulphide Ni-Cu-PGE deposit formation. The Aurora Ni-Cu-PGE deposit is unusual in that base metal sulphides (BMS) have low PGE concentrations. Instead PGE grade is controlled by platinum group minerals (PGM), 75% of which are hosted in hydrothermal alteration minerals. Cumulate plagioclase, orthopyroxene and olivine crystals in Aurora contain primary fluid inclusions. These include aqueous brine inclusions with homogenisation temperatures >850°C and salinities >65 wt.% NaCl equiv. Experimental work has shown that these fluid conditions can support the hydrothermal transport of PGEs and the presence of high temperature, primary fluid inclusions in cumulus magmatic silicates shows that volatiles were present while the system was at least partially molten. Brine inclusions were also identified in primary magmatic silicates in other PGE deposits across the Northern Limb, including the Platreef, the mineralised Troctolite Unit and the Waterberg PTM project. Assimilation of dolomite from the Lower Transvaal supergroup is proposed to have released volatiles which remobilised PGE, modifying magmatic sulphide deposits across the Northern Limb.

Biography

Dr Katie McFall is a postdoctoral research associate at Cardiff University, studying the behaviour of precious and semi-metals in high temperature magmatic-hydrothermal systems. She is part of the UK research council funded TeaSe consortium, working on finding a sustainable supply of the critical metals tellurium (Te) and selenium (Se), which are used in solar panels. Katie obtained her PhD from the University of Southampton in 2016, which focussed on the behaviour and distribution of critical metals in porphyry copper deposits, and in particular the role of semi-metals in hydrothermal PGE transport. Her postdoctoral research has included investigating the control of tectonic environment on porphyry Cu deposit metal endowment, and characterising the unusual fluid-modified Aurora Ni-Cu-PGE deposit in the Northern Bushveld Complex. Her current research is on the effect of volatiles on magmatic sulphide deposit formation in layered ultramafic intrusions