

NATURE OF THE LITHOSPHERIC MANTLE BENEATH THE SLAVE CRATON (CANADA) FROM AN INTEGRATION OF GEOPHYSICS AND MANTLE PETROLOGY.

**Yvette Poudjom Djomani¹, Suzanne Y. O'Reilly¹, W.L. Griffin^{1,2}, L.M. Natapov¹,
N.J. Pearson¹, B.J. Doyle³**

¹ GEMOC ARC National Key Centre, Department of Earth and Planetary Sciences,
Macquarie University, NSW 2109, Australia

² CSIRO Exploration and Mining, North Ryde, NSW 2113, Australia

³ Kennecott Canada Exploration Ltd., Vancouver, B.C., Canada

The Slave Province in Canada is a small Archean fragment within the larger North American craton. It is bounded on the east by the Thelon magmatic arc (2.0-1.9 Ga) on the western edge of the Archean Rae Province and on the west by the Great Bear magmatic arc of the Wopmay Orogen (1.88-1.84 Ga). The northern and north-eastern part is overlapped by Upper Proterozoic and Phanerozoic supracrustal rocks. On the south, the Slave craton is separated by the Great Slave Lake Shear Zone from the Lower Proterozoic Chinchaga and Buffalo Head terranes.

We use robust geochemical methods based on mantle-derived xenoliths, heavy mineral concentrates from over 25 kimberlites, and representative diamond populations and their inclusions to construct sections that delineate the composition, structure and thermal state of the lithospheric mantle across the Slave Craton. This analysis reveals a distinct two-layered lithosphere: a shallow ultradepleted, olivine-rich layer and a deeper less depleted layer, interpreted as an Archean plume head.

We enhance gravity data to map large-scale structures and invert gravity and topography data to map lateral variations in the effective elastic thickness (Te) across the Slave Province. The northern part of the craton is characterised by a relatively weak lithosphere ($Te < 25$ km), probably related to the intrusion of the Mackenzie Plume (ca 1270 Ma). The strongest lithosphere is found in the eastern part of the craton ($Te > 56$ km). A N-S zone of low Te along in the middle of the craton may map the deep extension of the suture between the ancient continental block making up the western part of the craton, and the younger accreted terranes that make up the eastern part. The zone of low Te gradient coincides with an area of strongly conductive upper mantle, and with the Nd/Pb isotope lines which define a major crustal boundary at depth, and is a major locus of kimberlite intrusion.