

KIMBERLITE EMPLACEMENT MECHANISMS PART 3 : AN OVERVIEW

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Two kimberlite pipe emplacement mechanisms have been identified (Parts 1, 2). The southern African pipes were formed by an intermittent intrusive-extrusive process which sequentially excavated and infilled the diatreme. This process is driven by juvenile gases confined below surface when the magma ascent is impeded by temporary barriers producing a closed system. In southern Africa the barriers include numerous dolerite sills and basalts which are a distinctive feature of the Karoo sedimentary basin into which many of the kimberlites were emplaced.

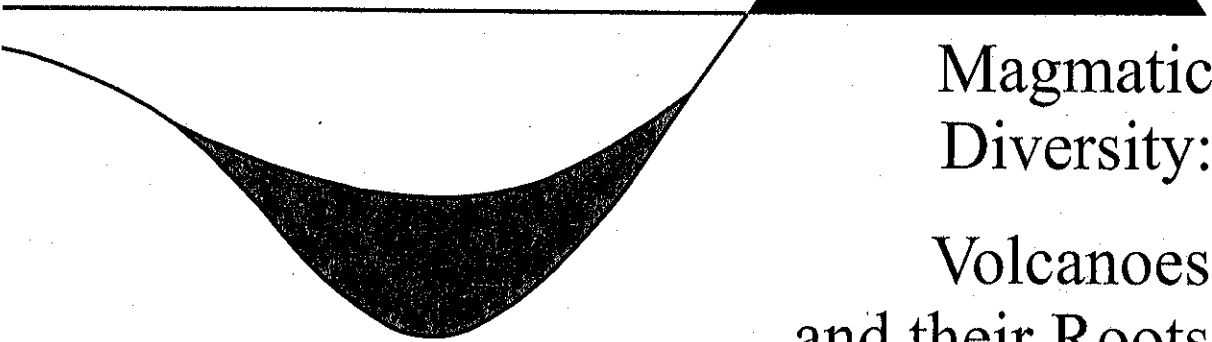
In contrast the pipes in Saskatchewan lack diatremes and were formed by phreatomagmatic maar-like processes. Similar processes may have formed the kimberlites in Alberta. All these kimberlite magmas were offered an easy route to surface through 0.6-2.5 km of sediments which lack any barrier-forming igneous rocks, a distinctive feature of the Western Canadian sedimentary basin(s). The resulting open system precluded the formation of diatremes.

The contrasting maar-like and diatreme emplacement mechanisms show that kimberlites are unique magmas which have their near surface emplacement controlled by their geological setting. Both processes have been repeated in space and time and are represented among the newly discovered kimberlites in Canada. Intermediate combinations of these processes, or different processes, may be required to explain the formation of other pipes such as the unusual Cretaceous kimberlites on the Slave, NWT where the infill of some diatreme-like pipes is predominantly resedimented material.



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Abstracts
