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November 24 to 27, Château Frontenac, Québec

Oral Presentations

November 27, 2003 p.m.

Session 6 - Diamonds Session

President: Marc Beaumier, Ministère des Ressources naturelles, de la Faune et des Parcs

3:00 to 3:20	Geology of the Victor kimberlite, Attawapiskat, Northern Ontario, Canada: Cross-cutting and nested craters Kimberley J. Webb (DBC KPU), Barbara H. Scott Smith (SSP), Joanne L. Paul (DBCEI) and Casey H. Hetman (DBC KPU) (E)
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The pipe shapes, kimberlite infills and thus emplacement processes of the Attawapiskat kimberlites, including Victor, contrast with most southern African kimberlite pipes. The Attawapiskat kimberlite pipes formed by an overall two-stage process of initial pipe excavation and subsequent pipe infilling. The Victor kimberlite comprises two adjacent pipes, Victor South and Victor North, which are infilled with two contrasting textural types of kimberlite: pyroclastic (PK) and hypabyssal-like kimberlite (HK). Victor South and much of Victor North comprise PKs that consist of clast-supported, discrete macrocrystal and phenocrystal olivine, juvenile lapilli, mantle-derived xenocrysts and minor country rock xenoliths set in serpentine/carbonate matrices. These partly bedded, juvenile lapilli-bearing olivine tuffs formed by subaerial fire-fountaining airfall processes.

The simple bowl-like shape of Victor South contrasts with the more complex pipe shape and internal geology of Victor North. The northwestern part of Victor North is dominated by dark competent rocks, which resemble fresh HK, but have unusual textures and are closely associated with pyroclastic juvenile lapilli tuffs and country rock breccias ± volcanoclastic kimberlite. Current evidence suggests that the HK is, in fact, not intrusive and that the northwestern part of Victor North represents an early-formed crater infilled with contrasting extrusive kimberlites and associated breccias. The remaining, main part of Victor North consists of macroscopically similar, but petrographically distinct, PKs that have contrasting macrodiamond sample grades. The nature and relative modal proportion of primary olivine phenocrysts in the juvenile lapilli are different, indicating derivation from different phases of kimberlite and thus separate eruptions. The initial excavation of a crater, cross-cutting the earlier northwestern crater, was followed by emplacement of a low-grade olivine phenocryst-rich PK, and the subsequent eruption of a high-grade olivine phenocryst-poor PK, as two separate vents nested within the original crater. The second eruption was accompanied by the formation of an intermediate mixed zone with moderate grade.

The final pyroclastic infill of the main part of the Victor North pipe therefore appears to consist of at least three geological/grade zones.

Thus, the Victor kimberlite was formed by several eruptive events resulting in adjacent and cross-cutting craters infilled with either PK or HK, which is now interpreted to be of probable extrusive origin. Within the PKs are two nested vents, a feature seldom documented in kimberlites elsewhere. This study highlights the meaningful role of kimberlite petrography in the evaluation of diamond deposits and provides further insight into the emplacement and volcanic processes occurring in kimberlites.

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