Abstract ID: 261

Title: KIMBERLITES AND OTHER PRIMARY HOST ROCKS FOR DIAMOND IN NORTH AMERICA

Student: No

Topic: Economic Geology

Medium: Invited Oral Presentation

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Keywords: diamond, kimberlite

Abstract: Kimberlites and other small volume, mantle-derived volcanic rocks are present in time and space throughout North America. Ages range from the 1.1 Ga Bachelor Lake and Kyle Lake kimberlites in the Superior craton, to the <1 Ma lamproites of the Leucite Hills, Wyoming craton. Not all bodies contain diamonds ñ typically only those centered over Archean crust with lithosphere exceeding 120 kilometers thickness contain economic diamond. In the Slave craton, two world-class diamond mines have emerged from a swarm of over 150 kimberlites that are 75-50 Ma in age, with one smaller mining operation at the 172 Ma Jericho kimberlite. Other deposits under feasibility or pre-feasibility study include the ~530 Ma Snap Lake and Gahcho Kue kimberlites located in the southern Slave craton, and the 170 Ma Victor kimberlite and 630 Ma Renard kimberlites in the Superior craton. In the Canadian Prairies, the 101-95 Ma Fort a la Corne kimberlite field in central Saskatchewan and the ~85 Ma Buffalo Head Hills kimberlites of northern Alberta are under advanced exploration. In these latter two examples, there exists a nebulous to non-existent spatial dependence with Archean crust and continental lithosphere.

The preservation of each kimberlite field from erosion is not simply a function of age. Kimberlites exceeding 500 Ma can exhibit crater/diatreme geometries with surface areas exceeding 10 hectares in Nunavut, whereas some kimberlites 50-70 Ma in age in the Slave and Buffalo Hills areas are only hypabyssal sills or dykes less than a few meters in thickness. The largest kimberlites are the Fort a la Corne bodies, where completely preserved volcanic edifices interbedded with Cretaceous shales reach 200 hectares in areal extent. The preservation level can significantly impact the economic potential at each locality, and must be resolved through well-planned drilling evaluation programs.

Both plume theory and plate tectonics have been applied to explain the genesis of kimberlitic magmatism. Kimberlitic magmatism in North America that is ~200 Ma or less in age can be explained by subduction, in a scenario that mimics the more classically accepted metallogenic models positioned more proximal to convergent plate boundaries.