86 Million Years of Recorded History in Labrador: Birth, Life and Sleep of the Kiglapait Intrusion

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The Kiglapait Intrusion (KI) is estimated to have been a bowl-shaped body about 3530 km^3 in volume created during an intrusive event lasting thousands of years. It was emplaced into anorthosite and metasedimentary rocks at an estimated roof depth of 9.6 km and a magma depth of 8.4 km; hence with a floor at 18 km depth. The primary magma for the intrusion is estimated to have been a harzburgite from which a large volume of olivine crystallized in transit to the extent that it became saturated with plagioclase by the time it reached the site of emplacement or soon after that event. Piston-cylinder experiments in graphite using the KI bulk composition with Fo added yield saturation with garnet at 13 kbar pressure on the CMAS lherzolite solidus at 1375°C. This result needs to be raised in temperature to about 1400°C to reach a postulated harzburgite composition at 15 kbar. From that result we require uplift into a hot, thinned lithosphere during which olivine is shed in large amounts. The late stages of crystallization leading to eventual emplacement are schematically developed in an ACF diagram that shows 13-kbar equilibria at high experimental temperatures. Experimental compositions of Cpx and Opx are highly enriched in Al and it is shown that olivine fractionation will pass through the compositions of these aluminous minerals to reach a relatively evolved saturation with only plagioclase and olivine to make the thick Lower Zone of troctolite. Published argon-argon mineral studies on hornblende, biotite, and feldspars have captured a cooling history from ~1298°C to the ambient ~150°C over the time interval 1306 to 1220 Ma, hence the 86 million year history claimed in the title. This enterprise was stimulated by early questions and ideas raised by Mike Rhodes.