# Mantle melting and hydrothermal fluids at the Montviel alkaline-carbonatite system (REE, Nb), Abitibi, Canada

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The 1.9 Ga Montviel alkaline-carbonatite intrusion (REE-Nb), Abitibi, Canada, comprises silicate rocks that evolved from pyroxenites towards ijolites as well as syenites and granites. Strontium and Nd isotope data demonstrate that the primitive rocks were sourced from the depleted mantle and that they gradually incorporated a crustal component throughout their evolution. A second mantle pulse produced a series of silicocarbonatites and calciocarbonatites that evolved to ferrocarbonatites by incorporation of a crustal component, and Ba- and F-rich hydrothermal REE mineralization. The alkaline-carbonatite system terminated its evolution with an explosive eruption, creating a medium and heavy REE-rich polygenic breccia. The carbonatite was accompanied by a volatile phase which metasomatized pre-existing silicate rocks as well as the carbonatites themselves. Crystallization temperatures measured on biotites [1], which was present in most silicate and carbonatite lithologies, returned magmatic to hydrothermal temperatures of 800°C to 300°C. Biotite was thus hydrothermal in pyroxenites but seem to have been both magmatic and hydrothermal in carbonatites [2]. At Montviel, the REE mineralization is hydrothermal and consists mainly of disseminated LREE-bearing fluorocarbonates with MREE and HREE-enriched zones. Hydrothermal phases and rare Ba-Cl-F fluid inclusions suggest that F and Cl played an important role in transporting the REE in solution. A model for mantle pulses of melt and the role of hydrothermal fluid is proposed.

[1] Henry, D.J., Guidotti, C.V., Thomson, J.A., 2005. The Ti-saturation surface for low-to-medium pressure metapelitic biotites: Implications for geothermometry and Ti-substitution mechanisms. *American Mineralogist* **90**, 316-328. [2] Wyllie, P.J., Jones, A.P., 1985. Experimental data bearing on the origin of carbonatites, with particular reference to the Mountain Pass rare earth deposit. *Am. Inst. Min., Metall.* and *Pet. Eng., Metall. Soc.* New York, NY, United States, United States, pp. 935-949.