Apparent crystal fractionation trends due to $X(H_2O)X(CO_2)$ variations in a gabbroic melt

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A late Precambrian intrusion of water-rich gabbroic (appinitic) magma, in the Antigonish Highlands of Nova Scotia, was contaminated by reaction with the host rock marbles and basalts. This resulted in variations in (XCO_2) in the melt, and in chemical exchange between the melt and host-rock basalts. Resulting chemical trends closely mimic those expected from crystal fractionation. The intrusive rocks are enriched in Si, Na, K, Rb and Zr and are depleted in Ti, Fe, Mg, Ca, Ni, and Cr. Alteration trends in the host rock basalt have almost the opposite polarity. Elemental mobility in the intrusive suite may be attributed to the interaction of, and variable partitioning between, an H_2O rich silicate melt, a CO_2 rich silicate melt and a CO_2 rich vapour. The extent of host rock alteration defines the edge of the transport system. Similar exchange processes may account for the formation of felsic dykes and veins near the contact zone and may also be important in the genesis of an adjacent alaskite stock. In general super-solidus mobility due to variations in XCO_2 in magmas may be an important fractionation mechanism that is easily overlooked in other areas. This type of mobility may result in compositional gradients in silicic magma chambers any may be especially significant in the genesis of some bimodal or mixed alakalic-tholeiitic suites.