

Sill emplacement in a plateau: examples from the Coast Mountains, British Columbia

Christopher L. Andronicos*

Earth & Atmospheric Sciences, Cornell University, Ithaca, NY 14853
ca98@cornell.edu

and

Gabriela Depine

Shell International Exploration & Production, Houston, TX 77079
gabriela.depine@shell.com

Abstract

The Coast plutonic complex of British Columbia exposes the middle crust of a magmatic arc formed in the late Cretaceous and early Cenozoic. It provides one of the best analogues for processes in modern orogenic plateau undergoing vigorous magmatism, such as the Puna-Altiplano. Here we focus on gently dipping sill-like plutons that intruded amphibolite to granulite facies gneiss (central gneiss complex). Near the Skeena River, mineral assemblages in country rocks of the sills track uplift and exhumation from pressures of ~800 MPa to 200 MPa during sill emplacement between ~75 and 50 Ma. The gently to moderately dipping fabrics that host the sills are the result of transposition of an earlier steeply dipping foliation. Sill emplacement occurred during both contractional and extensional deformation as indicated by a reversal in shear observed at a regional scale. The sills are concordant with host rock foliations and mutually crosscutting relationships show that sill emplacement occurred during foliation transposition. Individual sills range in scale from centimeters to kilometers in thickness, with the largest sills traceable for tens of kilometers along strike. Host rock gneiss in many regions are dominated by orthogneiss suggesting much of the crustal column within the central gneiss complex has plutonic protoliths, particularly south of Douglas Channel. This indicates that much of the crust was constructed by repeated episodes of sill injection. However, country rock sills found to the south of Douglas Channel do not appear to have decompressed as rapidly as in the north, and magnitude of high-temperature decompression appears to have been of smaller magnitude. Our results show that heat transported by the plutons into partially molten rock weakened host rocks allowing foliation transposition and strain localization to the margins of the sill complexes. Similar processes are likely to occur in plateau undergoing vigorous magmatism and may be similar to geophysically inferred magma bodies beneath Tibet and the Altiplano.