Andesite Forming Processes Within Calbuco Volcano, Southern Chile

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Calbuco Volcano, located in the Central Southern Volcanic Zone (CSVZ) in Southern Chile, is the result of the convergent plate margin off the Western coast of South America. Calbuco is a late Pleistocene to Holocene active composite stratovolcano with a history of violent eruptions, the last of which was in 1961. Due to the andesitic lava composition and phenocryst hornblende, Calbuco is unlike most of the other stratovolcanoes in the CSVZ. The presence of hornblende is evidence that the magma is water rich, and one goal is to determine whether the water is from subducted material or crustal contamination. Previous geochemical and petrological studies have determined that this andesitic composition is due to fractional crystallization, assimilation of crustal rocks by basaltic magma, and possibly magma mixing. The mineral assemblage of the lava consists of plagioclase, orthopyroxene, clinopyroxene, olivine, hornblende, oxide minerals. The lava also contains gabbro xenoliths with the same mineral assemblage as the lavas along with phlogopite. Hornblende in the lava is rare, and there are clots of orthopyroxene, plagioclase, and oxide minerals found which may be from the decompression melting of hornblende. A similar reaction is found at Montserrat. Plagioclase grains in the xenoliths are not zoned: in contrast, plagioclase grains in the lavas are extremely zoned. This zoning may preserve a detailed history of the evolution of the magma chamber. A detailed study of the mineral texture and chemistry has been done to determine some of the magmatic processes at work in Calbuco volcano.