Development of complex, sub-vertical layering in the Cortaderas gabbro intrusion, Central Chile

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The Cortaderas intrusion is a small gabbroic unit spatially associated with the Lower Cretaceous felsic Illapel Plutonic Suite of central Chile. It is unmetamorphosed, largely unaltered and not significantly tilted. Most of the intrusion has well-developed, vertical to steep layering dominantly defined by variations in abundance in plagioclase and amphibole. In some places the layers are regular and rhythmic, with a spacing of about 0.5?2 cm, but elsewhere layering is more complex with solitary plagioclase-rich bands ~1 cm wide. In some areas layers are convoluted, sometimes with channel-like structures, apparent cross-cutting relationships, and balloon-like structures. Pegmatoids occur as patches and layers, in some places with miarolitic cavities. Plagioclase and amphibole dominate the mineralogy, with minor clinopyroxene as relicts in amphibole, and minor olivine. Chemical and isotopic data from different samples cannot be linked by any single, simple process and several different magma sources are necessary. We propose that the intrusion is a fossil conduit originally linking magma sources possibly associated with the base of the Illapel Plutonic Suite to basaltic-andesite to andesitic volcanism. The first magmas flowed along a major fault, heated the host rocks and solidified as unlayered gabbros. Later magmas flowed up the same structure but cooled slowly in the preheated host rocks, producing the layered parts of the intrusion. Layering was produced by non-dynamic processes, perhaps similar to that which produces Liesegang banding. Plagioclase and pyroxene crystallised first to produce a loose framework close to the walls of the conduit. Latent heat from growth of amphibole may have facilitated equilibration by development of layering and coarsening. The channel-like and cross-cutting structures may have resulted from interactions of chemical diffusion waves with discontinuities in permeability of the crystal framework. During the development of the crystal framework, the interstitial silicate liquid became enriched in water, partly dissolving earlier structures and crystallising as pegmatoids, some

with miarolitic cavities.