

Mafic - felsic magma interaction in the Torres del Paine Igneous Complex (Patagonia, Chile)

Contact persons: Bégué Florence and Lukas Baumgartner

Context

The Torres del Paine Igneous Complex is a very shallow (~70 MPa) bimodal felsic-mafic laccolith, with over 1000 m high vertical granite cliffs. Multiple pulses mafic magma (~250m of gabbroic and dioritic rocks) forming a sheet complex under-accreted and intruded the main granite in thin layers leaving intercalated felsic magma in between. At the interface between these mafic sheets and the granite, small “diapir”-shaped features of leucocratic magma start to form and rise through the denser and unsolidified, mafic magma. This results in tube-like structures that move upward; a miarolitic cavity (i.e. former fluid-filled space) is often associated with these pipe structures towards the top or the central part of the tubes (see photo below). Another intriguing feature is the development of a reaction zone in the mafic magma surrounding the pipes, which allow for a detailed study of the geochemical interaction of felsic-mafic interaction.

Objectives and Methods

The main goal of this study is to identify and explain the chemical exchange between the leucocratic melt rising in the pipe structures and the surrounding mafic magma, and to understand the role that magmatic fluids play in their formation.

The project will require detailed petrographic analyses. Elemental maps and in-situ geochemical analyses will be acquired mostly with an electron microprobe, and trace element analysis will be performed with laser ablation ICP-MS. This work will be carried out on already available samples, and there will not be any field work involved.

Literature

Leuthold, J., Müntener, O., Baumgartner, L.P., Putlitz, B., Ovtcharova, M., Schaltegger, U., 2012. Time resolved construction of a bimodal laccolith (Torres del Paine, Patagonia). *Earth Planet. Sci. Lett.* 325–326, 85–92. <https://doi.org/10.1016/j.epsl.2012.01.032>

Michel, J., Baumgartner, L., Putlitz, B., Schaltegger, U., Ovtcharova, M., 2008. Incremental growth of the Patagonian Torres del Paine laccolith over 90 k.y. *Geology* 36, 459–462. <https://doi.org/10.1130/G24546A.1>

Patwardhan, K., Marsh, B.D., 2011. Dynamics of the development of the Isle au Haut gabbro-diorite layered complex: Quantitative implications for Mafic-Silicic Magma interactions. *J. Petrol.* 52, 2365–2395. <https://doi.org/10.1093/petrology/egr049>

Wiebe, R.A., 2016. Mafic replenishments into floored silicic magma chambers. *Am. Mineral.* 101, 297–310. <https://doi.org/10.2138/am-2016-5429>



Mafic-felsic interaction in the mafic sill complex of the TPIC; pipe-like features of less dense silicic melt rising through the monzodiorite; presence of miarolitic cavities in the central and top portion of the pipe and formation of a reaction zone in the mafic magma surrounding the pipe features.

Choice of orientation : (supprimer les orientations qui ne conviendraient pas)

2) Geochemistry, Alpine tectonics, Ore Deposits