Evidence for different arc basalts in Nicaragua from olivine-hosted melt inclusions

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Preliminary data demonstrates the presence of both high- and low-Ti basaltic melts in olivine-hosted melt inclusions from tephras erupted from cinder cones along the Nejapa cinder cone alignment in Nicaragua. Primitive high-TiO_2 melt inclusions from one cinder cone have generally lower H_2O, clustering around 2.0 wt%, than primitive low-TiO_2 melt inclusions from neighboring monogenetic volcanoes. The moderate water concentrations of the high-Ti basalts suggest that they are not purely decompression melts, but more data are needed to confirm this suggestion. In addition, the melt inclusions analyzed so far may not represent pure magmatic end members, but rather could be mixtures. The preliminary results give us confidence that it will be possible to use melt inclusions to differentiate between the fluid signatures of the high- and low-TiO_2 magmas. Calcium-rich basaltic magmas may also be present beneath Nicaragua. Melt inclusion s from the Tiscapa maar in the Nejapa region are characterized by high CaO contents (CaO/Al_2O_3 0.8-1.0 wt.%) that border on ultra-calcic as defined by Schiano et al. (2000)* and Kogiso and Hirschmann (2001)*. These same melt inclusions have CO_2 abundances that are among the highest measured for arc magma. Experimental work has shown that the elevated calcium of Tiscapa magma enhances CO_2 solubility (Roggensack and Moore, 2007*), so much so that the maximum volatile saturation pressures of Tiscapa melt inclusions (~4 kb) are similar to those of magmas from Cerro Negro volcano. Additionally, the CO_2/H_2O ratio (by weight) of the Tiscapa melt inclusions are much higher than observed at Cerro Negro and other arc volcanoes. It is interesting that the high-TiO_2 and low-TiO_2 magmas of the Nejapa cinder cones have ratios that are intermediate between the highest values of Tiscapa (0.13) and Cerro Negro. This demonstrates that the volatile signatures between basic magma types in Nicara gua and elsewhere can be resolved using olivine-hosted melt inclusions.

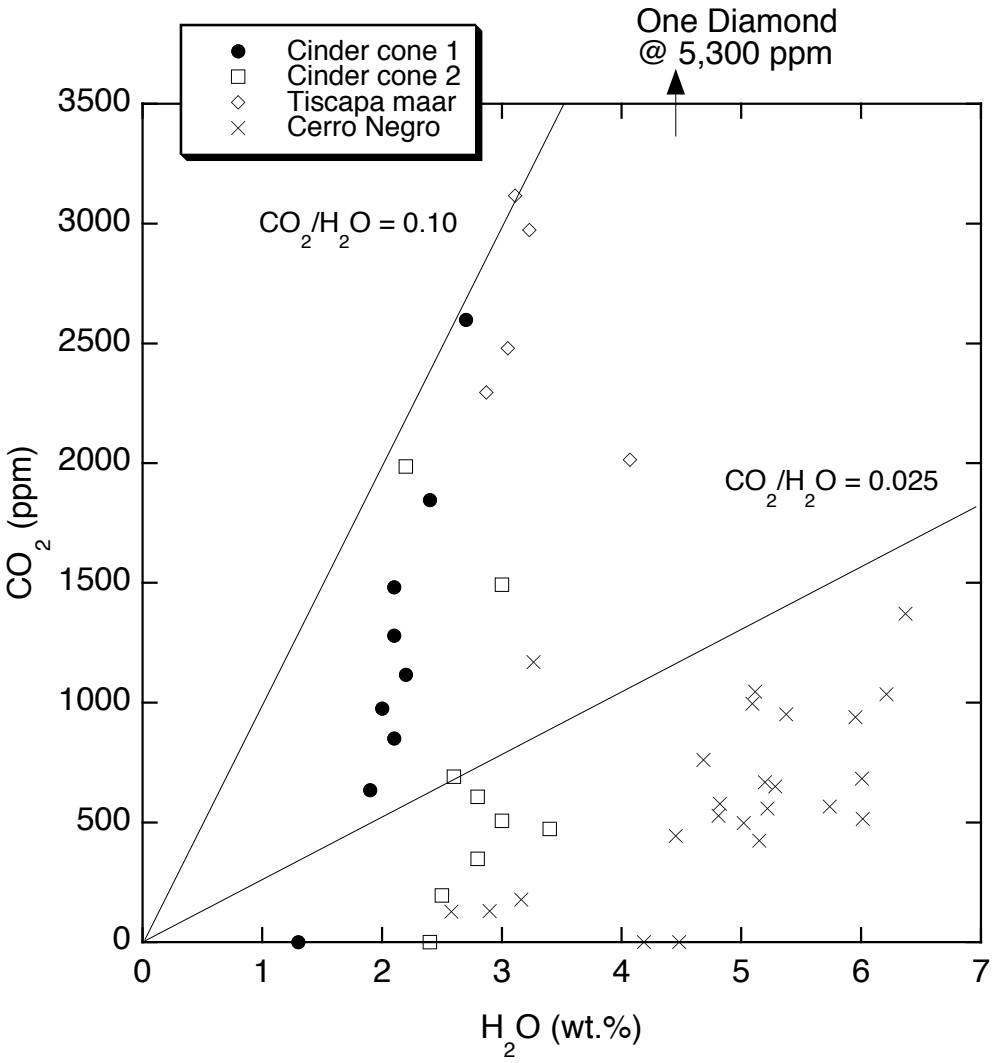

Figure: H_2O and CO_2 contents of olivine-hosted melt inclusions from the Nejapa cinder cones, Tiscapa maar and Cerro Negro volcano.

*References listed in appendix A.