Magmatic evolution of the Quaternary volcanics from Hudson and Lautaro volcanoes, Austral Andean Cordillera

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Near the Chile Triple Junction (CTJ), an about 350 km long volcanic gap in recent subduction-related volcanic activity separates two distinct volcanic zones in the Andean Cordillera; Southern Volcanic Zone (SVZ) and Austral Volcanic Zone (AVZ). Geochemical characteristics of the Quaternary volcanics drastically change across this gap; andesite with adakitic affinity in AVZ and mainly arc-tholeiites in SVZ [1]. This distinction has been attributed to incorporation of contributions of slab melting in south of the CTJ, caused by subduction of the Chile ridge [2]. Therefore, the detail information about geochemical variations and spatiotemporal distribution of volcanic activity provides an important key to figuring out the magmatic evolution in the mantle wedge influenced by the active ridge subduction. Here, we newly report twenty-nine whole rock compositions of major and trace elements, including boron, and Sr, Nd and Pb isotope compositions for the Quaternary volcanics from Hudson volcano in SVZ and Lautaro volcano in AVZ near the CTJ. With precise K-Ar age data in [3], we will address their magmatic evolution. Based on the above data of the Hudson and Lautaro volcanoes, we suggest that the magma source in Hudson volcano might be generated by addition of slab-derived fluid toward mantle wedge having E-MORB affinity rather than E-MORB-like asthenospheric injection through slab window, although the addition rates were much smaller than those of the other SVZs due to a hotter slab subduction. As for the Lautaro volcano, our data also suggest that the magmatic sources were generated by slab melting triggered by the Chile ridge subduction as pointed out by previous literatures (e.g. [2]).

[1] Stern (2004) *Rev. Geol. Chile,* **31**, 161-206. [2] Ramos & Kay (1992) *Tectonophys.* **205**, 261-282 [3] Orihashi *et al.* (2004) *Rev. Geol. Chile* **31**, 207-224.

Seasonal climate change as revealed by ion microprobe analysis of $\delta^{18}O$ in Soreq Cave (Israel) speleothems

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Soreq Cave, Israel, contains a record of continuous speleothem (cave formation) growth from 185ka to present [1]. The speleothems preserve geochemical signals of climate as they grow; fluctuations in their oxygen isotope ($\delta^{18}O$) composition reflect changes in cave-air temperature, local rainfall characteristics, and possibly CO_2 concentrations [2, 3]. The growth rate of Soreq Cave speleothems, however, limits the temporal resolution of conventional sampling methods (0.5mm drill-samples) to a decadal, or longer, timescale. The analytical capabilities of the WiscSIMS CAMECA 1280 ion microprobe, with a spatial resolution of 10µm while measuring $\delta^{18}O$ in carbonates at $1\sigma = \pm 0.15‰$, allow us to analyze sub-annual growth bands in a speleothem.

Sample "2-6" is a drip-formed stalagmite (5.5cm radius) composed of low-magnesium calcite. Eight U-series ages indicate growth from ~2200 to 900 years BP. Fluorescent confocal imaging of "2-6" reveals distinct concentric banding that occurs in light/dark couplets. Within single couplets we observe consistently smooth increases of $\delta^{18}O$ by as much as 2‰ ($\Delta^{18}O$) between the light and dark bands. Modern records of precipitation and cave drip water indicate that these bands may correspond to the annual cycle of wet and dry seasons in the region [4]. Thus, the variability of $\delta^{18}O$ across each growth band is caused by mixing of seasonal rainfall in the vadose seepage zone above Soreq Cave. Analysis of $\delta^{18}O$ across annual bands reveals: 1) changes in "seasonality" across the sample; 2) a rhythmic signal of climate variation; and 3) maximum values of $\Delta^{18}O$ decrease from 2‰ to ~0.5‰ between 2100 and 1500 years BP, corresponding to an estimated decrease in annual rainfall from 1000 to 600mm coincident with the fall of the Roman Empire in the Levant region.

[1] Bar-Matthews *et al.* (2003) *GCA* **67**, 3181-3199. [2] Hendy (1971) *GCA* **35**, 801-824. [3] Mickler *et al.* (2006) *GSA Bull.* **118**, 65-81. [4] Ayalon *et al.* (1998) *J. Hydro* **207**, 18-31.