

## Strontium isotopes in Chilean rivers: The flux of unradiogenic continental Sr to seawater

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Water samples from Chilean rivers were analyzed for <sup>87</sup>Sr/<sup>86</sup>Sr and Sr concentrations and the average <sup>87</sup>Sr/<sup>86</sup>Sr and continental Sr flux to the southeastern Pacific Ocean. This drainage region had not been studied before, but is similar in its geologic makeup to young, volcanically active arcs and ocean islands that may contribute disproportionately to the seawater Sr budget. Data indicate that the average yield of unradiogenic Sr (~517 moles Sr km<sup>-2</sup> yr<sup>-1</sup>, <sup>87</sup>Sr/<sup>86</sup>Sr ~0.7057) from western South America (1, 220, 853 km<sup>2</sup>) [1] into the southeastern Pacific Ocean is ~2-4 times higher than that from Iceland [2] [3] and the Deccan traps [4], but lower than fluxes of unradiogenic Sr from ocean islands in the Lesser Antilles and Réunion [5]. Active convergent continental margins release about as much unradiogenic Sr to seawater as a 0-1 Myr old mid-ocean ridge segment of equivalent length.

The flux of unradiogenic Sr from active continental margins has likely varied over geologic time scales in response to changes in the surface exposure of volcanic arcs, changes in climate, ocean currents and geographic latitude due to plate tectonics, as well as topographic changes that can affect local rainfall, runoff and erosion. It is therefore likely that active continental margins have contributed to the observed temporal variations in seawater <sup>87</sup>Sr/<sup>86</sup>Sr

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## Effect of chlorine on near-liquidus phase equilibria of basalts

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Volatiles have enormous effects on the formation and crystallization history of basaltic magmas. Previous work on basalt genesis has focused mainly on the effects H<sub>2</sub>O and CO<sub>2</sub> [e.g. 1, 2]. Yet, basaltic magmas can contain up to ~1 wt% Cl [e.g. 3] and little is known about the effects of Cl on basalt genesis [4]. Therefore, we have experimentally investigated the effects of Cl on phase equilibria of basalt.

We have conducted piston cylinder experiments at 1.1 GPa on an Fe-rich model basalt composition with 0-1 wt% chlorine added. Nominally Cl-free experiments yield olivine (Fo<sub>77</sub>) on the liquidus at 1425°C while the experiments with 0.4 wt% and 1 wt% Cl both yield opx as the liquidus phase (En<sub>79</sub>Wo<sub>2</sub> at 1400°C for both Cl concentrations). This shows that Cl extends the orthopyroxene stability field to lower pressure, thereby shifting the olivine-orthopyroxene-melt multiple saturation point to much lower temperatures and shallower depths. The orthopyroxenes of the Cl-added experiments are more magnesian and less calcic than those from the Cl-free experiments (En<sub>79</sub>Wo<sub>2</sub> vs. En<sub>76</sub>Wo<sub>4</sub>). We infer that the opx liquidus field is extended because Cl complexes with Ca and Fe (and perhaps Mg) in the melt, and thus increases the melt's silica activity. Experiments with other chlorine concentrations at wider pressure range are in progress, and should lead to a robust parameterization of the effects of chlorine on basaltic liquidi.

Because the presence of chlorine increases the pyroxene stability field with respect to olivine, the compositions of basaltic melts produced by partial melting of mantle lithologies may be different. This effect is similar to that of CO<sub>2</sub> [2] and may be similarly important in the genesis of alkalic basalts, which are commonly enriched in chlorine [5]. This effect may also help explain the presence of alkali basalts on Mars which is argued to be a chlorine-rich planet [6].

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