Heavy metals and Pb isotopic composition of aerosol in Xiamen, western Taiwan Strait, China

B. LEE AND L. M. ZHU*

The State Key Laboratory of Continental Dynamics, Department of Geology, Northwest University, Xi'an 710069, R.P.China
(*correspondence: zhulaimin@nwu.edu.cn)

Rapid industrialization and economic take-off in coastal cities of China have placed great strain on the environment. In the present study, 40 total suspended particulate matter samples were collected in the coast of Xiamen, Fujian province, west Taiwan Strait, P.R. China, from January to December 2003. The samples were analysed for the concentrations of elements (K, Ca, Na, Zn, Pb, W, Se, As, Ni, Ba, Nb, Ta, Zr, Hf, Th, U, Sr, REE, et,al.) by INAA and Pb isotopic composition by MC-ICP-MS.

Most of the elements (except Na and Br) have high concentrations in Jan. to Feb. for the rainless climate and the influence of biomass burning matter derived from Southeast Asia [1], low concentrations from Apr. to Aug. for rain wash out and diffusion of typhoon, and they have very good negative correlation with monthly precipitation (except Ni, As, Sr, Ta, Eu) suggesting the significant seasonal variation. Concentrations of heavy metals as Pb, Zn, Cr *et al*. in Xiamen are much lower than that of contemporaneous Beijing [2], and are close to Qingdao, Dalian, Hong Kong and Tokyo. Pb has 12% elevated compared with the former work in 1991-1993. Enrichment factor suggest that Na and Br are derived from ocean, Pb, Zn, As, Sb, Se, W, Ni are anthropogenic elements and the others are crustal elements. The 40 Pb isotopic compositions ($1.161<{}^{206}Pb/{}^{207}Pb<1.171$, $2.457<{}^{208}Pb/{}^{207}Pb<2.462$) in the aerosols of Xiamen have higher $^{206}Pb/^{207}Pb$ and $^{208}Pb/^{207}Pb$ ratios in summer and lower in winter, showing the slightly influence of airborne Pb from the Pearl River Delta region in summer and Yangtze Delta in winter. A statistical non-parametric test (Shapiro-Wilk) of the isotopic compositions suggest most of the airborne lead of Xiamen is derived from the local sources. The distribution of $^{206}Pb/^{207}Pb$ and $^{208}Pb/^{207}Pb$ ratios indicate vehicle exhaust and nature matters are not the major component of lead in the air[3]. Coal and industrial isotopic signatures can explain the origion of our aerosol samples.

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[1] Liu G.-R. (2003) *Research Report* 27-100. [2] Tomoai Okuda *et al.* (2004) *Sci. Total Environ.* **330**, 145-148. [3] C.S.C. Wong *et al.* (2003) *Atmos. Environ.* **41**, 432-447.

Quantifying the relative roles of weathering and igneous processes on crustal recycling and the origin of continental crust

C.-T.A. LEE

Rice Univ., Dept of Earth Science, MS 126, PO Box 1892, Houston, TX 77251, USA (ctlee@rice.edu)

It is generally believed that the continental crust is too felsic to have derived directly from the mantle. If the parental precursors to continents are instead basaltic, the basaltic drivers of continenent formation must ultimately differentiate into felsic and mafic lithologies, the latter being recycled back into the mantle. An increasingly popular hypothesis is that basaltic magmas crystallize at depth or are re-melted at depth, generating garnet pyroxenitic cumulates or restites, respectively, in the lower crust. Being denser than the underlying peridotitic mantle, these pyroxenitic lithologies are thought to founder or "delaminate" back into the mantle, driving the remaining crust towards felsic compositions. The problem, however, is that formation and subsequent destruction of such mafic lithologies, while certainly capable of driving derivative liquids towards felsic compositions, probably cannot generate the extreme felsic endmembers, such as granites. Granites are thought to have formed as partial melts of pre-existing evolved crust, such as sediments or pre-existing igneous rocks of intermediate composition. Here, we combine Li/Nb and Mg systematics of North American Cordilleran arc batholiths with Nd and Sr isotopic data to show that these batholiths are derived from derivative liquids from a juvenile basaltic parent as well as from partial melts originating from pre-batholithic basement or sediment that had previously gone through the chemical and physical weathering cycle. In particular, we use the coupled behavior of Li and Mg during chemical weathering to help quantify the proportional role of chemical weathering in continent formation. By coupling these observations to studies of garnet pyroxenite xenoliths from the Sierra Nevada, which constrain the igneous differentiation process, we show that Mg is lost from the continents by both chemical weathering and igneous differentiation, followed by delamination. The weathering loss of Mg is eventually returned into the mantle by subduction of altered oceanic crust. Of the original basaltic parent, 40% of the initial basaltic parent is delaminated and 20% is subducted, leaving only 40% for the remaining continental crust.