

Using charcoal fluxes, trace metal inventories, and Pb isotopic ratios to trace pyrogenic remobilization and deposition of contaminants in a Patagonian lake in Chile

KINGSLEY O. ODIGIE^{1*}, PATRICIA JANA²,
ALBERTO ARANEDA², ROBERTO URRUTIA²
AND A. RUSSELL FLEGAL¹

¹WIGS Laboratory, Environmental Toxicology, University of California at Santa Cruz, 1156 High Street, Santa Cruz, CA 95064, USA

²Group of Paleolimnological Studies (GEP), Aquatic Systems Research Unit, Environmental Sciences Center EULA-Chile, University of Concepcion, Concepcion, Chile

Temporal changes in the amounts of labile trace metals (Pb and Zn) and their positive correlations ($r = 0.5$ to 0.8 , $p < 0.01$, $n = 30$) with temporal changes in charcoal fluxes in age-dated sediments collected from Lake Thompson in Patagonia, Chile attest to the substantial mobilization of trace elements that occurred in that region in the mid-1900s. This remobilization corresponds with the extensive historic slash and burn practices employed in the development of Patagonia during the last century. But the relatively low enrichment factors of Pb and Zn, normalized to Fe, in the sediments indicate that they were predominantly derived from natural, rather than industrial, sources. Those natural origins were further evidenced by the Pb isotopic ratios ($^{208}\text{Pb}/^{207}\text{Pb}$: $^{206}\text{Pb}/^{207}\text{Pb}$) of the sediments, which remained consistent over the past century and are comparable to previously reported natural values in central and southern Chile. However, the remobilization of Pb and other contaminants is expected to increase in much of the world, including southern Chile, with the projected increase in the number and intensity of wildfires associated with climate change.