Mineral Dust Entrainment during Wildfires –Lead (Pb) Isotopes as Fingerprints

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Acrid air pollution originating from Indonesian forest fire has become a seasonal phenomenon. The fire causes regional scale haze and air pollution. Much of the Indonesian tropical forests grow on peatland. During a forest fire both the peat soil and the covering vegetation serve as fuel that releases a colossal amount of metals that adheres to particulate matter (PM). PM collected in Singapore revealed that during June 2013 Sumatran forest fire, Pb isotope ratios of haze PM ($^{206}Pb/^{207}Pb$ =1.1724) was significantly different from clear day PM ($^{206}Pb/^{207}Pb$ =1.1584) or biomass Pb ($^{206}Pb/^{207}Pb$ = 1.1548). The relatively higher Pb isotope ratios of haze PM could be explained by 50-70% mixing of crustal Pb ($^{206}Pb/^{207}Pb$ =1.1997) with biomass burning PM (Figure 1). Our study unveils an important process for the Earth system, that besides combustion process, mineral dust remobilized by the blazing fire can be a major source of PM bound Pb during wildfires.

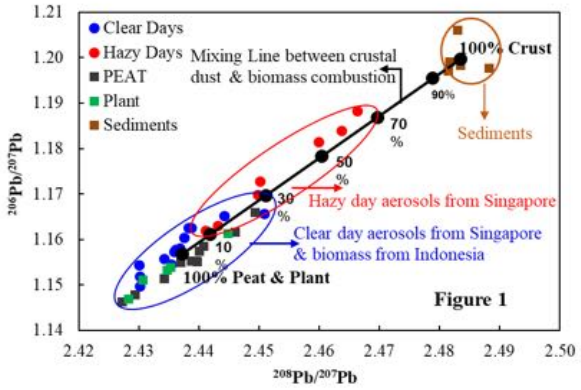

Figure 1: Triple isotope plot for Pb in Singapore aerosols. Two possible end members during haze episodes, biomass burning from Sumatra and Kalimantan, Indonesia & sediments from Kuching in Borneo island are plotted.