The geochemical similarities between double volcanic trends at Hawaii and Samoa

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The geographic loci of modern Hawaiian volcanoes and Samoan volcanoes in the Pacific Ocean both show two subparallel trends, namely Loa (southern) vs. Kea (northern) trends at Hawaii and Malu (southern) vs. Vai (northern) trends at Samoa, respectively. Although Hawaii and Samoa are over 4000 km apart, the double volcanic trends at Hawaii and Samoa both started at ~2 Ma, and there are remarkable geochemical similarities between the double volcanic trends at both hotspots.

It has long been known that there are important geochemical differences between Loa and Kea trend shield lavas at Hawaii. Specifically, compared to the northern Kea trend lavas, the southern Loa trend lavas have higher $^{2o8}Pb/^{2o4}Pb$ at a given $^{2o6}Pb/^{2o4}Pb$, i. e., higher $^{2o8}Pb^*/^{2o6}Pb^*$. Similarly, at Samoa, the southern Malu trend lavas lavas also have higher $^{2o8}Pb/^{2o4}Pb$ at a given $^{2o6}Pb/^{2o4}Pb$ than the northern Vai trend lavas.

At both Hawaii and Samoa, $^{2o8}Pb^*/^{2o6}Pb^*$ are correlated with ε_{Nd}. In detail, at Hawaii, the southern Loa trend lavas form a steep negative $^{2o8}Pb^*/^{2o6}Pb^*$ vs. ε_{Nd} trend, and the northern Kea trend lavas form a nearly horizontal $^{2o8}Pb^*/^{2o6}Pb^*$ vs. ε_{Nd} trend. At Samoa, the $^{2o8}Pb^*/^{2o6}Pb^*$ vs. ε_{Nd} trend formed by the northern Malu trend lavas is less steep than that observed in the southern Vai trend lavas.

These observations lead to the following questions: What caused the initiation of double volcanic trends at Hawaii and Samoa? Why did they start at the same time even they are separated by over 4000 km? Why are the inter-trend geochmical differences at Hawaii and Samoa so similar? If the geochemical differences between the double volcanic trends reflect the geochemical structures of the mantle plume, the Hawaiian and Samoan plumes, over 4000 km apart, must have similar geochemical structures.

The lead content in Chinese coals and their environmental impact

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The results showed that the Arithmetic mean of Pb content in China coals is 13 ppm, close to the Unite States' 11ppm (NCRDS), and the maximum value is 790 ppm. There is no obvious difference in Pb's distribution in different coalfields of China, and also no direct relation between the Pb content with the degree of coal metamorphism. Brown coal and anthracite may all contain high levels of Pb, and the source of high levels of Pb coal perhaps due to the Lead minerals. In 2008, China's annual consumption of coal was 28.5 million tons, and more than 85% was used as steam coal, while coal-burning make about 66% of the Pb contained in coal discharged into the atmosphere, so it was estimated that China's coal-fired atmospheric Excretion of Pb was about 24 thousand tons. Because of the widespread use of unleaded gasoline, coal has become the most important source of industrial Pb, while burning coal is a major migration way. Pb isotope tracing showed that Pb pollution in Chengdu were mainly from burning of coal. Pb content of the plant and the soil near thermal power station were significantly higher than the reference value of this area. Coal combustion process is a considerable portion of Pb migration to fly ash and bottom ash, and the average concentrations of Pb can reach 51.91ppm and 41.62ppm respectively. In Changchun area, the Pb content of fly ash can reach up to 150ppm.

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