

Trans-boundary Pb pollution history in Japan archipelago deduced by lake sediment core analysis

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The recent rapid economic growth and accompanying energy consumption in the East Asian region particularly China, have produced increasing emissions of air pollutants in the last decades. There is some evidence that, air masses of air pollutants are transported to Japan. Sediment cores of six lakes situated near the coast of Japan Sea were collected throughout a fourteen-month period in 2009 and 2010 to analyze the deposition of lead (Pb) coming from Asian continent, including Russia, China and South Korea. Age determination and sedimentation rates of the lakes sediments were performed by the ²¹⁰Pb and ¹³⁷Cs dating using the CRS model, in order to know the historical trends of Pb concentration. Cores from four lakes located in the north and center of Japan, showed clear evidence of Pb pollution with a clear decline in the ²⁰⁶Pb/²⁰⁷Pb and ²⁰⁸Pb/²⁰⁷Pb ratios in the recent sediments as compared to the deeper sediments. In two lakes located in central Japan, anthropogenic Pb has accumulated in the core sediments since 1900's. The more affected lakes by anthropogenic lead emissions: Lake Mikuriga, Lake Chokai and Lake Mikazuki, possess an average isotopic composition that differ from the core samples taken in Japan in 1970s and recent wet precipitation samples taken in 2000s in Japan. These results reflect that Pb emissions from the Asian continent could be the source of the Pb input observed. Specifically, in the last decade, at Lake Mikuriga (central Japan, Honshu island), isotopic compositions resembles the isotopic compositions of aerosols in Shanghai collected in 2000s, while in Lake Chokai (north of Honshu island) isotopic compositions resemble the isotopic ratios of bark samples and core sediments taken in Korea in 1990's and 2010's. Finally, in Lake Mikazuki (north Hokkaido island) isotopic compositions resemble the isotopic ratios of aerosol samples taken in north China and Korea. These results suggest that the Japan Sea side mountain lakes located in the north and central part of the country have received since 1980 anthropogenic Pb emissions from the Asian continent.