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Tracing the source of the atmospheric lead during Asian dust season in Korea

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Introduction

The air condition in Korea is largely affected by atmospheric dust coming from China during Asian dust period. Ewing *et al.* [1] reported that the influence of Asian dust on atmospheric Pb in California was increased up to 93 % during spring. We measured Pb isotope ratios of aerosol in Korea to identify the source during Asian dust period.

Method

During 2011 and 2012, 22 atmospheric dust samples were collected at the background air monitoring observatory near to Yellow Sea. The samples were acid digested with HNO₃, HClO₄ and HF. Anion exchange column separation was done to separate Pb from matrix. Pb isotope ratios were determined by Nu Plasma II MC-ICP-MS (Nu, U.K.) equipped with DSN-100 desolvating system. Mass bias correction was done by NIST997 Tl solution spiked into samples.

Result and discussion

Pb isotope ratios determined in this study were 2.0654~2.1048 for ²⁰⁸Pb/²⁰⁶Pb and 0.8457~0.8657 for ²⁰⁷Pb/²⁰⁶Pb. Seasonal variations of Pb isotope ratios were not found. During fall, Pb isotope ratios were quite constant compared with the other period. The atmospheric dust collected during Asian dust period showed exceptional highest ²⁰⁸Pb/²⁰⁶Pb and ²⁰⁷Pb/²⁰⁶Pb ratios. This represents the influence from atmospheric Pb of which isotopic composition was characterized by high ²⁰⁸Pb/²⁰⁶Pb and ²⁰⁷Pb/²⁰⁶Pb. According to Biscaye *et al.* [2], the ²⁰⁸Pb/²⁰⁶Pb and ²⁰⁷Pb/²⁰⁶Pb ratios of soil in Gobi dessert ranged 2.036~2.059 and 0.8258~0.8333, respectively. Therefore the increase in ²⁰⁷Pb/²⁰⁶Pb and ²⁰⁸Pb/²⁰⁶Pb ratios during Asian dust period was not resulted from input of natural Pb from Gobi dessert. The three isotope plot for ²⁰⁸Pb/²⁰⁶Pb vs. ²⁰⁷Pb/²⁰⁶Pb revealed that Pb emitted from coal combustion and refining of Pb in China were most likely the sources for atmospheric Pb in Korea during Asian dust period.

[1] Ewing *et al.* (2010) *Environ. Sci. Technol.* 44, 8911-8916.

[2] Biscaye *et al.* (1997) *J. Geophys. Res.* 102 (12), 26765-26781.