Transport and deposit of harmuful substance through "Kosa" in Pan-Japan Sea area

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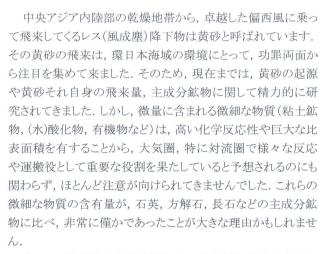
環日本海域での黄砂による有害物質の運搬と堆積 Transport and deposit of harmful substances through "Kosa" in Pan-Japan Sea area

事業推進担当者

自然科学研究科 環境科学専攻 環境動態講座 (自然計測応用研究センター)

助教授 佐藤 努 Tsutomu Sato, Ph. D., Associate Professor

[tomsato@earth.s.kanazawa-u.ac.jp]



我々は、放射性廃棄物地層処分の安全評価や鉱山廃水処理の観点から、地層中や廃水中でのウランやヒ素などの有害元素の物質移行を精力的に研究してきました。その多くの研究事例で、有害元素の移行挙動が、粘土鉱物や鉄を中心とした(水)酸化物などの微細鉱物との相互作用によって決定されていることを示してきました。また、それら微細鉱物の表面反応特性を室内実験により定量的に理解することを通して、極少量含まれる場合であっても、全体の移行挙動を決定しうる重要な媒体であることも示してきました。

以上のことから、石炭火力発電所やディーゼルエンジン車から放出され、発がん性や内分泌かく乱作用を有すると考えられている多環芳香族炭化水素と有害重金属元素に対象をしばり、エアロゾルや湖沼堆積物中の分布や含有量、黄砂含有物質との相互作用の解明を通して、運搬・堆積を担う物質の特定や環日本海域における環境動態の把握に努めています。



Yellow sand or kosa as it is known in Japan, are airborne particles (dust) from the arid inland parts of central Asia carried by the prevailing westerlies. The flight of these airborne particles has received wider attention due to its environmental consequences, both positive (i.e. cool the atmosphere and nutrient contribution in oceans) and negative (i.e health effects and air navigation disturbances), on the Pan-Japan Sea area. Although numerous studies have been conducted on its provenance, distribution and composition, a few more issues have not been dealt with. Yellow sands have a significant amount of loess-derived materials, which comprises clay minerals, oxyhydroxides and organic matter that have not been given an in-depth study. These materials may play an important role in the transport of toxic contaminants through the troposphere due to their high reactivity and enormous surface area favorable as reaction media.

Our previous studies deal with the migration of harmful elements such as uranium and arsenic in geologic materials, and their impacts in mining drainage areas and radioactive waste disposal sites for safety assessments. Our studies have shown that the migration behaviors of toxic elements are governed by their interactions with clay minerals and Fe-oxyhydroxides, which are ubiquitous in the natural environment. The concentrations of toxic contaminants in these geologic materials are relatively minor, but may contribute greatly to contaminant cycling in the natural environment. Similar geologic materials abound in the loess-derived component of airborne yellow sands. It can be predicted that contaminant cycling through the movement and distribution of yellow sands will be governed by similar contributions observed in our previous studies.

In this study, we would focus on the migration and deposit of toxic heavy metals and polycyclic aromatic hydrocarbons (PAHs; considered being carcinogenic and endocrine-disrupting chemicals) through the movement of the yellow sands in the Pan-Japan Sea area and understand their environmental consequences in the Pan Japan Sea area.

