The composition and characteristics of sound producing sand in Miyagi Prefecture, Japan

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The sound producing sand is well known as musical sand or booming sand. It occurs on the seacoast of every continent, island, and along lake shore. Japan is one of the islands surrounded by ocean, and the sound producing sand is more common and widespread in occurrence. There were many sound producing sand beaches in Japan, but are reported only 30 singing beaches in 1997 (National Trust of Japan, 1997) due to the environmental changes. There are 6 sound producing beaches in Miyagi prefecture, Northern Japan and they are well known for a long time. This study is performed to characterize the sound producing sand and silent sand samples geologically and mineralogically.

Miyagi locates in part of the granitic region and the geology of the locations where the sound occurs in 2 different types of geological age; *Mone* formation in Jurassic age is composed from the granitoid sandstone and *Ajiri* formation in Tertiary age is composed from tuff and agglomerate. Both the sound producing sand and silent sand are characterized by medium grain size, 1/2-1/4 mm. They show high concentration of SiO_2. The relatively high SiO_2, Al_2O_3 and Na_2O contents indicate that most of these composite are quartz and feldspar. A high quartz/feldspar ratio automatically suggests almost all the unstable minerals have been decomposed by chemical weathering and removed by erosion and transportation. The beaches are isolated each other and no rivers or drainage are present near the beach, but some how the sound producing sand is made to be silent sand. The sand grains of sound producing sand and silent sand are covered with wrapping minerals which is illite. The sound producing sand samples contain low concentrations of heavy minerals and the chemical elements associated with them. Instead, these sands are rich in SiO_2. The silent sands are covered with clay minerals but much higher amounts compared with the sound producing sand samples that have been brought the out side of the beaches. These sands contain abundant base metals like Co, Ni, Cu and Zn and many trace elements. The contaminations on grain surface have higher contents of clay, consequently, of elements associated with clay minerals, such as Al, K, and Na. Minor elements and REE are positively correlated with Al_2O_3. Heavy REEs are enriched in beach sand compared with averaged standard granitic rock of Geological Survey in Japan. REE of beach sand are controlled by the fine particles of clay minerals and other secondary minerals.

Elemental mobility during chemical weathering of volcanic soil profile in Kanto Area, Japan

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Compositianal variation of major, minor and rare earth element(REE) contents and mineralogical change in weathered basaltic ash soil (Andisol) and Kanto-loam mainly derived from Mt.Fuji since ca.10000 years ago were studied. These studies revealed that chemical composition, elemental mobility, and mineralogical variations with depth in Andisol and Kanto-loam are distinctly diffrent. Generally, elemental dissolution occurred in Andisol overlying Kanto-loam, while elemmental accumulation occurred in Kanto-loam underlying Andisol. Dissolution of primary materials (volcanic glass, silicates) caused the decreased tendency of the abundance of alkali, alkali earth and Si with depth in Andisol. The discontinuous changes in chemical contents, primary mineral abundance and elemental mobility are found at the Andisol/Kanto-loam boundary. The discontinuous change in chemical compositions of REE and base metals (Zn,Ni,Co,Cu) may be due to the different abundance of iron hydroxide. Due to the transformation of allophane to halloysite + iron hydroxide the abundance of iron hydroxide becomes large in Kanto-loam than in Andisol. This means that larger amounts of REE and base metals are adsorbed by ironhydrooxide in Kanto-loam than in Andisol. The mineralogical change and effective adsorption by iron hydroxide explain accumulation of base metals, and REE in Kanto-loam.