

Composition of sound producing sand in Japan

CHIAKI IGARASHI AND NAOTASTU SHIKAZONO

Keio University, 3-14-1 Hiyoshi, Kohoku-ku, Yokohama, Japan

The sound producing sand is well known as musical sand or booming sand. It has been reported for over the centuries how and why the sand makes sound from the physical point of view but still the mystery is surround. This study is performed to characterize samples geologically and mineralogically. About 150 samples, including both silent and sound producing sand, are collected from beaches in Japan. Both the sound producing sand and the silent sand are perfectly dried and are analyzed with XRD, XRF and ICP-MS.

The major and minor minerals are analyzed with XRD: quartz and feldspar as major, and clay and biotite as minor. XRF study has indicated that SiO₂ and CaO content negatively correlate with Al₂O₃, suggesting the beach sand is mostly composed of quartz and montmorillonite. The most major elements (Na and Ca) are positively correlated with SiO₂ content. Minor elements and REE are observed with a positive correlation of Al₂O₃. Heavy REE, particularly Er, are enriched in beach sand compared with averaged standard granitic rock of Geological survey in Japan. REE of beach sand are controlled by fine particles of clay minerals and other secondary minerals. The distinct difference between the major, minor and REE content of both sound producing sand and silent sand is not obvious. However, each area has its own characteristics of the sand and is controlled by the secondary particles.

Seasonal trace element and isotope variations in freshwater tufas: potentials and limitations for climate reconstruction

C. IHLENFELD¹, R. MAAS¹, M. K. GAGAN², M. D. NORMAN² AND G. M. HENDERSON³

¹ Dept. of Earth Sciences, La Trobe University, Melbourne, Vic. 3086, Australia (C.Ihlenfeld@latrobe.edu.au)

² Research School of Earth Sciences, The Australian National University, Canberra, A.C.T. 0200, Australia

³ Dept. of Earth Sciences, Oxford University, Parks Road, Oxford OX1 3PR, UK

Extracting useful climate information from annual trace element and isotope variations in terrestrial carbonates has proven to be difficult in most cases. Nevertheless, qualitative or even quantitative inter-pretation of the proxy data may be possible if the geochemical processes acting at a specific site are thoroughly understood.

To this end, we analysed trace element (e.g. Mg, Sr, Ba, U) concentrations and isotope ($\delta^{13}\text{C}$, $\delta^{18}\text{O}$, $^{87}\text{Sr}/^{86}\text{Sr}$, $^{234}\text{U}/^{238}\text{U}$) compositions along a continuous ~14-year-long (1985-1999) profile of a modern freshwater tufa from NE Australia (Ihlenfeld et al., 2001). An accurate chronology for the tufa profile was developed based on the temperature dependence of the $\delta^{18}\text{O}$ signal, which allowed us to compare the geochemical data sets with available meteorological observations. Temperatures calculated from Mg concentrations in the tufa provide close approximations of annual water temperature variations. Furthermore, temporal changes in $\text{Mg}/\text{Ca}_{\text{water}}$ can be estimated from $\text{Sr}/\text{Ba}_{\text{tufa}}$ using an empirically derived equation, which may improve the potential of Mg as a useful thermometer in fossil tufas from the area. Variations in Sr, Ba, $\delta^{13}\text{C}$ and U along the profile provide semi-quantitative measures of effective wet season rainfall. While sympathetic variations in Sr, Ba and $\delta^{13}\text{C}$ can be explained by variable amounts of calcite precipitation within the vadose zone of the karst aquifer, the pronounced variability of U records changes in the U flux from the soil to the water table.

Data will also be presented for a 52 ka tufa from the same river. However, despite our understanding of the modern system a straightforward interpretation of *some* of the proxy records from this fossil tufa is hampered because different geochemical processes appear to have dominated.

In summary, our work highlights both the potentials and limitations of seasonal trace element and isotope variations in freshwater tufas for high-resolution climate reconstruction.

References

Ihlenfeld et al., *Geochim. Cosmochim. Acta*, in review.