

# Geographical properties of oxygen isotope composition of meteoric water in Japan and implication to stalagmite paleoclimatology

\*Akihiro Kano<sup>1</sup>

1. Graduate School of Science, The University of Tokyo

Stalagmite paleoclimatology has great potential for reconstruction of terrestrial climate and future prediction of climate changes. Many studies using oxygen isotope ratios have been reported from Europe, USA, and China, and have provided knowledge about monsoon intensity and temperature changes since the late Pleistocene. Stalagmite oxygen isotope ratios are related to temperature and meteoric water oxygen isotope ratios, and many studies suggest that the latter is more important factor. However, the interpretation of the meteoric water oxygen isotope ratios is not that simple. The inverse correlation with precipitation (amount effect) that has been shown in China does not appear clearly in the adjacent Japanese records.

In this study, the effects of annual amount and seasonality of rainfall to the oxygen isotope ratios were investigated using the analytical results of rainwater samples collected from four locations in the Japanese Islands (Itoigawa, Ohgaki, Fukuoka, and Taiki Town in Mie Prefecture). This study adopted a Monte Carlo type analysis. In the analysis, rainwater samples are randomly selected until the total amount of rainfall is close to the value at the location, and the weighted average of the oxygen isotope ratio is calculated as the value for a hypothetical year. This calculation is performed several hundred times for each location, and the correlation between the weighted average value of the oxygen isotope ratio, the total rainfall, and the winter precipitation rate (proportion of precipitation from November to February to annual precipitation) is examined.

The results show a significant amount effect only from Itoigawa City. The correlation with seasonality of oxygen isotope ratio was also highest in Itoigawa city. Here, heavy snowfall in winter is considered to be an important controlling factor for rainfall oxygen isotope ratios. Conversely, the oxygen isotope ratio in Taiki Town did not correlate with total precipitation and precipitation seasonality. In Taiki Town, which is adjacent to the vapor source of the Pacific Ocean, the fractionation effect that occurs in the vapor trajectory is small, and the oxygen isotope ratio seems to be less affected by the amount of rainfall.

Keywords: oxygen isotope of meteoric water, amount effect, stalagmite paleoclimatology