Annual and vertical variation of strontium isotopic ratio in two forest catchment in Japan

*Tatsuyoshi Saito[1,2], Naoyuki Yamashita[1], Masayuki Morohashi[1], Yayoi Inomata[1], Shigeki Uchiyama[1], Makoto Nakata[2], Takanori Nakano[3], Ichiro Tayasu[3], Ki-Cheol Shin[3], Tsuyoshi Ohizumi[1], Hiroyuki Sase[1]

1.Asia Center for Air Pollution Research, 2.Niigata University, 3.Research Institute for Humanity and Nature

[Introduction]
In the case of light elements such as sulfur, when it is used by plants in the ecosystem, isotopic ratio is varied by isotopic fractionation. It is caused by that light isotope is easier taken up to plants than heavier isotopes. On the other hand, in the case of heavy elements such as strontium (Sr), isotopic fractionation is almost negligible level, and isotopic ratio is only varied by component mixture from different sources. Therefore, such as elements are more suitable to estimate the contribution of some sources in the ecosystem. In this study, we discuss about annual and vertical variation of Sr isotopic ratio in two forest catchment, Kajikawa catchment in Shibata city, Niigata Pref. and Ijira catchment in Yamagata city, Gifu Pref.
[Methods]
We collected rainfall, streamwater and soil solutions in the slope soil in each catchment and determined Sr isotopic ratio of samples which collected from Dec. 2013. Soil solutions were collected at the three plot, upper, middle and lower slope and two depth, 20 and 60 cm. Sr isotopic ratio was determined by thermal ionization mass spectrometry (TIMS) of Research Institute for Humanity and Nature (Kyoto city, Kyoto Pref.). Sr isotopic ratio is shown as $^{87}Sr/^{86}Sr$ calculated based on the standard substance NBS987.
[Results and discussion]
Figure shows analysis results of $^{87}Sr/^{86}Sr$ in both catchment. In the case of rainfall as input side, annual variation range is comparative larger than streamwater as output side. In Kajikawa catchment, the highest value was shown in spring season when the amount of yellow sand increased. Second highest season was winter when sea salt contribution and amount of Sr derived from the continent increased by monsoon. These variation of Sr isotopic ratio indicate the contribution from different sources. In winter season, sea salt contribution rate became high level, and $^{87}Sr/^{86}Sr$ value became close to seawater which value is about 0.709. In spring season, dust including soluble mineral ($^{87}Sr/^{86}Sr$: 0.711±0.001) derived from the continent made $^{87}Sr/^{86}Sr$ value higher than winter season. On the other hand, $^{87}Sr/^{86}Sr$ values of streamwater were stable throughout the year, and so far from rainfall value in both catchment. Sr concentration of streamwater was higher than rainfall over than one digit, and suggests correlation between calcium and magnesium. In addition, streamwater of Ijira catchment which geology include middle Paleozoic marine sedimentary rocks indicated higher $^{87}Sr/^{86}Sr$ value than Kajikawa catchment which include rich granite. These results suggests that major part of Sr which flowed out to stream in both catchment was not derived from atmospheric deposition, probably from geologic origin.
In this study, we also discuss about the vertical variation including soil solution value and comparison with sulfur (S) isotopic ratio.
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