Interpretation of speleothem calcite ^{14}C variations from monitoring drip water ^{14}C in the Rygashi Cave in Shizuoka, central Japan

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Speleothem is a cave calcite deposit precipitated from drip water. Drip water consists mainly of carbon derived from soil CO_2, which has atmospheric ^{14}C values in isotopic equilibrium with atmosphere, and carbonate-dissolved CO_2, which has ^{14}C-free (dead) carbon through interaction with cave host bedrock. As a result, drip water and ultimately speleothem contain dead carbon fraction (DCF). Some recent studies show that ^{14}C in speleothem can be used as a proxy for hydrology changes by comparison with ^{14}C calibration curve (e.g. Noronha *et al.*, 2014 [1]). In this study, therefore, we measured ^{14}C in drip waters in the Ryugashi Cave in Shizuoka, central Japan, coupled with soil CO_2, atmospheric CO_2, and host limestone, and investigated the relationship between DCF in drip water and rainfall amount in order to interpret speleothem calcite ^{14}C variations.

The ^{14}C of drip water showed seasonal variations: lower in fall and winter, while higher in spring and summer. The annual mean of ^{14}C in drip water was 87.8±2.1 pMC, which was matched with the ^{14}C of 88.5±0.3 pMC on the surface part of a speleothem sampled at the dripping site of the drip water, indicating that the ^{14}C fractionation between the drip water and the speleothem could be almost negligible. The ^{14}C of drip waters was roughly correlated with the drip rate, that is, the ^{14}C (or DCF) of drip water with lower drip rate tended to be higher (or lower), and also correlated with rainfall amount around the Ryugashi Cave. The increase in rainfall amount could bring the increase in drip rate of drip water, and then the increase in soil-derived carbon fraction in drip water, resulting in ^{14}C increase (or DCF decrease) in drip water. Based on the scenario, the reconstruction of precipitation could be performed by DCF variations in a stalagmite in the Ryugashi Cave. In the presentation, we will also show the result of reconstruction of precipitation in central Japan using two speleothems from the Ryugashi Cave.