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東南アジア熱帯域の洞窟における現在の石筍生成と洞外気象の関係
Relationships between modern speleothem formation and surface weather in Southeast Asian equatorial cave

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To predict future climate change and prepare it is large scientific and social problem. For precise climate prediction, it is necessary to reconstruct high time and space resolution paleo-climate (especially past 2000 years) by paleo-climate proxies and reflect the result to climate model. Equatorial Southeast Asia, where include Indonesia, is well affected by El Nino Southern Oscillation (ENSO). ENSO do not only directly affect to precipitation in tropical Southeast Asia, but also significantly affect to middle and high latitude climate through heat transport (Hastenrath, 1991). However, continuous paleo-climate data in that area is few (IPCC, 2007), thus paleo-climate reconstruction is particular necessary.

Speleothems are useful as a paleo-climate proxy because they are grown continuously in cave (Fairchild et al., 2006). It is known that delta^{13}C and delta^{18}O values of speleothem and instulmental data of precipitation are inversely correlated (e.g. Zhang et al., 2008). However, relationship between modern speleothem formation and surface weather (e. g. recording mechanism of precipitation in stalagmites, how large or in which season precipitation is recorded in) is not revealed clearly.

Thus, in this study, cave monitoring, which included surface meteorological observation (air temperature, precipitation and delta^{18}O), cave meteorological observation (air temperature, airflow direction and speed and CO_2 concentration), chemical analysis of dripwaters (pH, calcium ion concentration, bicarbonate ion concentration, partial pressure of CO_2 ,calcite saturation index, delta^{13}C, and delta^{18}O) and speleothem growth experiment (growth rate, delta^{13}C and delta^{18}O), is started from October 2011 in Petruk Cave, Central Java, Indonesia.

Stable isotope value of speleothems is affected by temperature, humidity, driprate (Day et al., 2011), cave air CO_2 concentration and calcite saturation index of dripwater (Fairchild et al., 2006). As a result of past monitoring, it is revealed that cave air CO_2 concentration might be predominant factor of fluctuation of speleothems stable isotope value, because temperature, humidity and driprate in Petruk cave are nearly stable and calcite saturation index is function of cave air CO_2 concentration.

Partial pressure of air CO_2 is fluctuated intra-daily and seasonally in Petruk cave and surface rainfall cools outside air temperature and inverse airflow direction. Therefore, that is trigger of CO_2 concentration drop, which is driven by airflow direction inversion. It is considered that that CO_2 drop by rainfall is the key of inverse-correlationships between precipitation and delta^{13}C and delta^{18}O values of speleothems.

We will show the relationships between cave air CO_2 concentration fluctuation and stable isotope values of dripwaters in this poster.

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