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Evaluation of clumped-isotopes of land snail's shells as a paleo-environmental indicator

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Oxygen and carbon isotopic composition of land snail shells (carbonates) have been used as an indicator of terrestrial paleo-environmental variables such as plant vegetation, precipitation and temperature. The oxygen isotope ratio (δ^{18}O) of snail's shells is expressed as a function of temperature and δ^{18}O of environmental water (precipitation). Evaluated temperature of carbonates in environment may give us information about oxygen isotopic ration in precipitated water. Clumped-isotopes analysis of carbonates (^{13}C-^{18}O bond in crystal lattice of carbonate minerals) is only sensitive to their growth temperature. Therefore, the clumped-isotopes and δ^{18}O analyses in the shells potentially provide information on the paleo-temperature and allow making estimation of the oxygen isotope ration in water independently. Here we analyzed different types of modern land snails collected at several sampling sites in Japan and evaluated the applicability of clumped-isotopes and δ^{18}O of land snail's shells as paleo-environmental indicators.