Climate response of oxygen isotopic compositions in tree-ring cellulose from Java, Indonesia: consideration based on proxy system model

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Oxygen isotopic composition in tree-ring cellulose has been used as paleoclimate proxy. Although Indonesian region plays a key role in global climate system, there are only a few dendroclimatic research using oxygen isotopic composition in tree-ring cellulose. In this study, we investigated climate response of oxygen isotopic compositions in tree-ring cellulose from Java, Indonesia. We checked correlation coefficient between oxygen isotopic compositions in tree-ring cellulose and climate parameter (temperature, precipitation, etc.). In addition, we investigated the dominant factor of oxygen isotopic compositions in tree-ring cellulose from Java by means of tree-ring cellulose oxygen isotope model (proxy system model) in order to improve the interpretation of oxygen isotopic compositions in tree-ring cellulose as proxy.

Teak (*Tectona Grandis*) was used for tree-ring sample in this study. Teak has clear annual ring related to seasonal precipitation change (rainy season and dry season). As for Indonesia, teak is an only species that cross dated tree-ring chronology was established. We collected ten teak disk samples from four plantation area in Java. We measured ring width and cellulose oxygen isotopic composition. All samples were dated by cross dating using ring width and cellulose oxygen isotopic composition.

Oxygen isotopic compositions in tree-ring cellulose have similar inter-annual variation all over Java. This indicate that common climate signals preserved in teak tree-ring cellulose oxygen isotope in Java. Oxygen isotopic compositions in tree-ring cellulose shows positive correlation with precipitation and relative humidity in the last dry season and negative correlation with precipitation in rainy season (growing season). Next, we did analysis using proxy system model. According to the model, oxygen isotopic compositions in tree-ring cellulose is controlled by isotopic composition of source water (the water taken up by roots), relative humidity and isotopic composition of atmospheric water vapor. Our result shows dominant factor of oxygen isotopic compositions in tree-ring cellulose is isotopic composition of source water. In addition, comparison of source water oxygen isotopic composition and rainfall oxygen isotopic composition indicates source water consists of rainfall not only during growing season but also during the several months before growing season.

Keywords: tree-ring, proxy system model, oxygen isotope

