The Potential of Sungkai (Peronema canescens) in Climate Reconstruction

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Indonesia, which stands between Pacific and Indian Ocean, is influenced by Southeast Asian monsoon, ENSO, and IOD, accordingly the region is suitable for solving their relations. However instrumental meteorological data is very limited. In order to decipher long-term paleoclimate change, paleoclimate reconstruction is indispensable.

Paleoclimate reconstruction based on tree-ring is very limited in Indonesia though tree-ring has such a great advantage that exact dating of each ring is possible. Only ring width is established as a effective proxy for precipitation and ENSO of dry monsoon season prior to the period of growth (e.g. D'Arrigo et al., 1994). Other features in tree-ring can provide better climate reconstruction in this area because each feature reflects different climate elements in different season.

This study aim to establish other proxies in Java, Indonesia. In this study, I measured ring width, mean vessel area of earlywood, d13C and d18O of cellulose and compared with meteorological data. The analysed disk sample is sungkai (Peronema canescens Jack), which is very intimate with teak (Tectona grandis Linn f.), collected in Serang, eastern end of Java Island. In Java, rainy season comes in boreal winter and dry season comes in boreal summer. Annual cycle of precipitation forms annual growth rings.

In this study, ring width showed positive correlation with precipitation in the last dry season, just like teak (e.g. D'Arrigo et al., 1994). Ring width also correlated with relative humidity and hours of sunlight in last dry season. Mean vessel area of earlywood did not correlate with precipitation of rainy season of growth period but showed correlations with relative humidity and hours of sunlight in the same season. D18O correlated negatively with relative humidity in rainy season of growth period. This result accords with negative correlation between d18O and relative humidity in summer in middle-latitude region (e.g. Nakatsuka at al., 2008). D18O also correlated with hours of sunlight in rainy season. Correlations between d13C and elements of climate were not consistently interpreted. I divided each ring into three parts (earlywood, inner latewood and outer latewood) when I measure isotopic ratios. This method may be problematic because exact profile of isotopic ratios in annual rings is unknown. It is necessary to measure isotopic ratios of each whole ring in order to verify the result in this study.

From this above, sungkai also shows similar correlations to those of teak. It is highly likely that sungkai is also useful for reconstruction of paleoclimate. It is necessary to confirm correlation between tree-ring of sungkai and elements of climate in other disk sample because only one sample is measured in this study.