

【Grant-in-Aid for Scientific Research (S)】

Humanities and Social Sciences (Humanities)



Title of Project : Reorganization of prehistorical structure of calendar age and evaluation of climate change effect in Japanese archipelago using tree ring oxygen isotope ratios

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Research Project Number : 17H06118 Researcher Number : 60242880

Research Area : Paleoclimatology, Dendrochronology, Isotope Geochemistry

Keyword : Tree ring, Oxygen isotope ratio, Cellulose, Japanese archipelago, Dendroarchaeology

【Purpose and Background of the Research】

Dendrochronology is one of the most accurate dating methods in archaeology. However, it has not been applied to most of excavated woods, consisting of hardwood, in Japan although master chronology of some conifers have been established during last three thousand years. Recently, we developed a new dendrochronological method using cellulose oxygen isotope ratios ($\delta^{18}\text{O}$) instead of tree-ring width. Because tree-ring $\delta^{18}\text{O}$ in a same region varies very consistently beyond tree species reflecting summer climate, its master chronology based on conifer (Fig.1) can be applied to all excavated hardwood, such as pillars, piles and boards with 30-50 rings, which have not been applied to dendrochronology.

In this research, we will promote utilization of this new technology by following research methods.

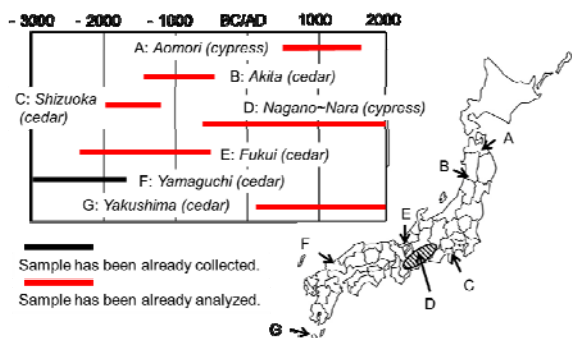


Fig.1 Established chronologies of tree-ring $\delta^{18}\text{O}$

【Research Methods】

Three research groups and one synthesis group will conduct the research in collaboration with many archaeological agencies belonging to local governments all over Japan. [Group 1] Extension of tree-ring $\delta^{18}\text{O}$ chronologies and climate reconstruction. [Group 2] Dating of numerous woods (Fig.2) excavated especially with typical earthenware. [Group 3] Reorganization of calendar age framework based on the earthenware typology. [Synthesis Group] Comparison of climate data with reorganized prehistorical calendar in Japan to understand impacts of climate variations on prehistorical human activities.

【Expected Research Achievements and Scientific Significance】

The $\delta^{18}\text{O}$ dendrochronology is an innovative method to date many excavated hardwoods in Asia which have never been dated previously using tree ring width. By reorganizing of the calendar age framework and transferring the $\delta^{18}\text{O}$ technologies to relevant investigators, this method can be a real universal one to contribute to many research fields including archaeology, history and climatology.

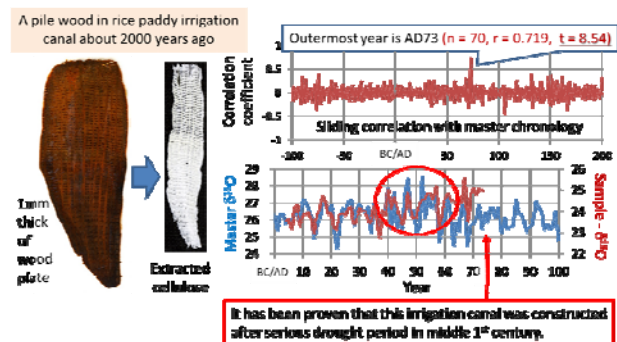


Fig.2 An example of pile wood dating

【Publications Relevant to the Project】

- Kagawa, A., M. Sano, T. Nakatsuka, T. Ikeda and S. Kubo (2015) An optimized method for stable isotope analysis of tree rings by extracting cellulose directly from cross-sectional laths, *Chemical Geology*, **393-394**, 16-25, 2015
- Li, Z., T. Nakatsuka and M. Sano (2015) Tree-ring cellulose $\delta^{18}\text{O}$ variability in pine and oak and its potential to reconstruct precipitation and relative humidity in central Japan, *Geochemical Journal*, **49**, 125-137.

【Term of Project】 FY2017-2021

【Budget Allocation】 160,000 Thousand Yen

【Homepage Address and Other Contact Information】

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