



## Climatic interpretation of tree ring stable isotopes in the southeast Tibetan Plateau: links with regional cloud cover

Chunming Shi (1,2), Valérie Daux (1), Valérie Masson-Delmotte (1), Camille Risi (3), Jing Gao (4), Xiaochun Wang (5), and Qi-Bin Zhang (2)

(1) LSCE, IPSL CEA-CNRS UMR 1572, Gif sur Yvette cedex, France (valerie.masson@cea.fr, +33-(0)6908-7716), (2) State Key Laboratory of Vegetation and Environmental Changes, Institute of Botany, CAS, China, (3) CIRES, U. Colorado, Boulder, USA, (4) Tibetan Plateau Research Institute, CAS, Beijing, China, (5) College of Forestry, NE Forestry University, Harbin, China

The potential of  $^{18}\text{O}$  and  $^{13}\text{C}$  of tree ring cellulose in southeast Tibetan Plateau is explored. The sampling strategy allows to investigate intra-tree, inter-tree variability and age effect.

Intra-tree variability is negligible, and inter-tree coherence is sufficient to build a robust chronology using a few trees. We found no evidence for age effect for  $^{18}\text{O}$ . The links between climate and  $^{13}\text{C}$  appear weak, which is attributed to the intermittency of photosynthesis using the ORCHIDEE land surface model. Significant correlations are observed between cellulose  $^{18}\text{O}$  and indicators of the local and regional water cycle: summer precipitation, relative humidity, and regional cloud cover (the latter explaining half of the variance). The observed link with relative humidity is expected from theoretical simulations with ORCHIDEE.

Therefore, we interpret our 226 year long and well-replicated tree ring cellulose  $^{18}\text{O}$  chronology in terms of past changes in regional summer cloud cover. Our reconstruction reveals that the recent increase in cloud cover (since the 1980s) is not unprecedented. The data depict a reduced and stable cloud cover in the 20th century compared to the previous century, consistent with ice core data depicting a parallel decrease in south Tibet accumulation rates. The driest conditions are depicted in the 1810s, where a decadal anomaly is likely caused by the 1809 and Tambora volcanic eruptions.