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Oral presentation:

“Suigetsu Varves 2006” Project and High Precision Tephrochronology in and Around Japan

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Tephra is an almost perfect tool for the correlation of chronologies between remote sites. However, the absolute age of tephra needs to be determined independently. Radiometric methods (such as ^{14}C or $^{40}\text{Ar}/^{39}\text{Ar}$) are commonly used for such independent age determination, but these methods have errors typically of the order of 10^2 to 10^3 years, which need to be further improved by more advanced methods.

The tree-ring based radiocarbon calibration model now extends back to 12,550 cal. BP (IntCal09; [Reimer et al. 2009](#)). If terrestrial radiocarbon ages are available from a number of sedimentary levels near the tephra in question, the calendar age of the tephra can be ascertained considerably more precisely (down to orders of 10^0 to 10^1 years). The annually laminated (varved) lacustrine sediment core recovered from Lake Suigetsu (central Japan) in summer 2006 (SG06) is ideal for this purpose, for it is essentially undisturbed, perfectly continuous (recovery rate = 100.0%), and yields a large number of terrestrial tree leaf remains that can be ^{14}C dated using AMS. The international and multidisciplinary “Suigetsu Varves 2006” research project (www.suigetsu.org) is primarily aiming at extending the radiocarbon calibration curve beyond the tree-ring limit. However, the team is also generating more than 150 radiocarbon dates for the Late Glacial and Holocene section of the core, which can be

wiggle-matched to the tree-ring data of IntCal09. Furthermore, our varve counting, using a novel combined approach ([Francus *et al.* 2009](#)), provides very rigid constraints for this wiggle-matching ([Bronk Ramsey 2008](#)). Based on our new data from Lake Suigetsu, we will report calibrated ages of the K-Ah and U-Oki tephras (which are both very widespread in and around Japan and are commonly used for stratigraphic correlation) with considerably reduced errors.

We are also generating more than 400 radiocarbon dates between 12,550 cal. BP and *circa* 50,000 cal. BP (the limit of the radiocarbon method). This dataset is expected to become a radiocarbon calibration model (from purely terrestrial material), once the varve counting of the core has been completed. While we are awaiting the completion of this varve counting, however, we can already wiggle-match the dataset on to IntCal09, and thus derive an IntCal09-based chronology for the SG06 core. Since the IntCal09 chronology beyond the tree-ring limit assumes a constant marine reservoir age, which almost certainly varies with an amplitude of the order of 10^2 years, we will be updating the ages of those tephras beyond the tree-ring limit once we have our completed varve-counted record. In this paper, ages will be reported in “IntCal09 cal. BP”, which, in future, will be replaced by updated ages expressed in “SG06 years BP” (the independent chronology of the SG06 core based on varve counting).

References

- [Bronk Ramsey C \(2008\)](#) *Quaternary Science Reviews* **27**, 42-60.
[Francus P *et al.* \(2009\)](#) *PAGES Newsletter* **17** (3), 93-96.
Reimer PJ *et al.* (2009) *Radiocarbon* **51** (4), 1111-1150.