age, several samples of this layer have been dated with our AMS facility. Preliminary results of 25,000–26,000 yr BP confirm the results of Machida and Arai (1996) and imply that eruptive history of the Sakurajima volcano started at this time.

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References

Faegri, K. and Iversen, J. 1989 *Textbook of Pollen Analysis*. 4th ed. New York, Wiley: 328 p.
Kretschmer, W. *et al.* 1996 The Erlangen AMS facility: Status report and research program. This conference.
Machida, H. and Arai, F. 1996 T. Nakamura, private communication and *Atlas of Tephra in and Around Japan*. Tokyo, University of Tokyo Press: 276 p.

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PRODUCTION RATES FOR EXPOSURE DATING: TO BE WITHIN THE RADIOCARBON CALIBRATION CURVE

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Sample preparation and the measurement of the cosmogenic nuclide concentration using ultrasensitive mass spectrometric methods such as accelerator mass spectrometry (AMS) are, under normal circumstances, not the limiting factors anymore for the accuracy of an exposure age or an erosion rate. The main contribution comes from the limited knowledge of the production rates of cosmogenic nuclides, both as a function of location and time. The uncertainty is estimated to be of the order of 10% for ages in the 10 kyr range (Nishiizumi *et al.* 1989) and quite unknown for time scales of the order of millions of years.

The production rates used today are generally based on radiocarbon ages of material found either on the rock surfaces (rock varnish) or somewhere nearby, and are associated with glacial events towards the end of the last glacial cycle (Nishiizumi *et al.* 1989), which are of course not dated in an absolute fashion. One can also expect an uncertain delay for the rock varnish to build on a fresh surface. In any case however, in principle ^{14}C ages can be converted to calendar ages using the ^{14}C calibration curve. This curve, however, extends undisputed only to *ca.* 10,000 BP. The difference between ^{14}C ages and calendar ages at *ca.* 10,000 BP is already *ca.* 1000 yr or *ca.* 10%. The samples used so far to determine production rates fall outside this range increasing the uncertainty. It would be very desirable to, as a first step, obtain production rates for events within the ^{14}C calibration curve.

We have identified such an event with known calendar age from calibrated ^{14}C dates, sampled rock surfaces and measured (so far only) ^{10}Be concentrations in them. This event was an enormous rock slide near Köfels (Austria) (Erismann *et al.* 1977), where *ca.* 2–3 km^3 of rock slid off a mountain and deposited material on the other side of the valley as high as 500m above the valley floor. The event has been dated to 8710 ^{14}C yr (Heuberger 1966) with tree material found in a exploratory mine shaft driven into the deposited material *ca.* 300 m above the valley floor. Additional tree material will be dated at the Zurich AMS facility to confirm the age. We have taken samples from the sliding surface (polished quartz planes) and samples from the crest of the toe of the landslide on the other side of the valley. Preliminary results are in the expected range. Shielding corrections for the surrounding mountains, estimates for shielding by forest vegetation and snow cover have still to be looked into