Dear J. Gombiner,

Many thanks for the constructive comments. Below I have made a point-to-point response to the comments. The comments are in black, and our response is in blue. I hope that the response can be acceptable.

Sincerely yours,

Hou Shugui

This is an interesting paper that should eventually be published.

However, the authors could give more thought to the calculation of dose rate and the meaning of the optical age for basal sediment.

The OSL age is the equivalent dose divided by the dose rate. In calculating the OSL age, the authors calculated a lower limit age for dehydrated sediment, containing air in the pore space, and an upper limit age, for hydrated sediment containing water in the pore space. The dose rate is lower for hydrated sediment because water attenuates radiation transfer from grain to grain. The actual sample came from sediment embedded within ice. The authors should calculate a dose rate for the real situation of sediment in ice.

There are potentially two additional sources of radiation that are not included in the dose rate calculation.

(1) Radiation from the bedrock or subglacial sediment.

(2) Radiation from dust layers in the core.

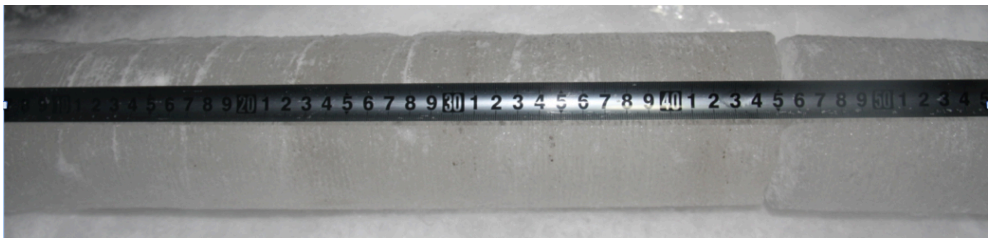
The authors should add these sources of radiation to the dose rate, or show that they are insignificant. If these other sources are included, the higher radiation dose rate would lower the calculated age.

Yes we fully agree that the dose rate is determined by many factors, including the potentially two additional sources of radiation as indicated above.

Willerslev et al. (2007) provided the first luminescence measurements on the single grains of quartz and feldspar extracted from a sample cut out of an opaque part of the Greenland Dye 3 basal ice containing dispersed sandy and silty particles. They found that the dose rate contribution from the underlying bedrock was negligible following calculations based on

radiation transport modelling software (MCNP5). Because no literature values are available to calculate the dose rate contribution from the underlying bedrock at our drilling site, we, for the moment, assume that its contribution to the dose rate was insignificant.

The sediment sample was collected from the very bottom several centimeters of Core 4. Its high particle content (~70%) suggests a similar condition as shown by the inset photo of Figure S1. Though dust layers are frequently observed along the Core 4, they are much weaker than the bottom section, as shown by the photo below with typical dust layers along the core.



A 18. 7 m ice core drilled at the summit (6530 m a.s.l.) of the Chongce ice cap in 1992 gives a maximum dust mass concentration of 955 mg kg-1 (Li et al., 2006). This provides a general impression of dust layers along the Chongce ice cores, which is ~3 orders of magnitude lower than the bottom sediment, suggesting insignificant influence of radiation from dust layers in the core, given a similar radiation intensity of the dust layers in the core and the bottom sediment.

As discussed above, slightly increased dose rate would be expected if these additional sources of radiation were included, thus resulting in a slightly younger age. Therefore, our upper limit age may be over estimated.

Li Y., Yang Y., Han J., Xie Z., M. Nakawo, K. Goto-Azuma. Persistent decrease of dust burden for about 100 years over middle-upper Troposphere of the southern Taklimakan Desert , China. J. Glaciol. Geocryol., 28, 873-878, 2006. (in Chinese with English abstract)

Willerslev, E., Cappellini, E., Boomsma, W., Nielsen, R., Hebsgaard, M. B., Brand, T. B., Hofreiter, M., Bunce, M., Poinar, H. N., Dahl-Jensen, D., Johnsen, S., Steffensen, J. P., Bennike, O., Schwenninger, J.-L., Nathan, R., Armitage, S., de Hoog, C.-J., Alfimov, V., Christl, M., Beer, J., Muscheler, R., Barker, J., Sharp, M., Penkman, K. E. H., Haile,

J., Taberlet, P., Gilbert, M. T. P., Casoli, A., Campani, E., and Collins, M. J.: Ancient biomolecules from deep ice cores reveal a forested southern Greenland, Science, 317, 111-114, doi: 10.1126/science.1141758, 2007.

Finally, I am not sure that the OSL age of the basal sediment directly relates to the age of the ice cap. The authors suggest that the sand-sized quartz grains are sourced from subglacial erosion. If true, it seems likely that some of the silt-sized quartz is also derived from subglacial erosion. Thus, it is conceivable that the dated aliquots are a mixture of eolian quartz and subglacially derived quartz.

Yes the dated aliquots are a mixture of eolian quartz and subglacially derived quartz. But because the distance from the summit of the Chonce ice cap to the drilling site is only several kilometers, and the ice cap is much shallower in comparison to the ice sheets, the scoured sediment experienced weak grinding. This suggests that even some of the silt-sized quartz is also derived from subglacial erosion, its portion might be very small. Thus the dated aliquots are mostly an eolian origin.

If the ice flow at the core site is dominated by downward vertical motion, then the OSL age of the eolian component of the dated aliquots would represent the time for the ice to move from the surface to the bed, not the age of the ice cap itself.

Yes we agree with the comment, and this will be clarified in the revision.