**Additional file**

KBT4 core shows slightly different lithology, but the older sand layer (=event layer 3) is thick and representative (Fig. 2). Herein, we summarize the sedimentary features and grain size of KBT4 core separately.

As for sedimentary facies, black mud layers lie at depths of 0–130 cm and 178–219 cm from the pond floor and the fine to medium sand layer is interbedded within the mud at depth of 53–62 cm. Lower contact of this sand layer is unclear. At depths of 130–178 cm and 241–254 cm, there is a black humic peat with abundant plant fragments. Fine to medium sand layers are interbedded within the peat and mud at depth of 175–178 cm and 219–241 cm. These sand layers have sharp lower contacts. Normal grading was visually observed in the sand layer at 219–241 cm depth.

Grain size analysis was performed to investigate the grading trend at 219–214 cm depth (=event layer 3). Samples for the analysis were taken at 1 cm vertical intervals from 219 cm depth to 241 cm depth. Samples were cut into halves to use analyses of grain size and sand content. Samples for both analyses were dried; then 10% hydrogen peroxide was added to remove organic material. Subsequently, they were immersed in a dispersion solution (0.01 mol/L aqueous solution of sodium diphosphate) and stirred to disperse mud particles. Grain size was then measured using a laser granulometer (SALD-2300; Shimadzu Corp.). The results are shown as the volume percentage of the grain size distribution. However, for the analysis of sand content, the mud component was removed using 63-µm sieve. Then, samples were dried and weighed.

The basal sample shows poor sorting and low sand content: about 30% (Fig. S1). This may reflect that tsunamigenic sand and original pond floor sediment were deposited as a mixture of various grain sizes because pond floor sediments are sometimes eroded and stirred up with other reworking sediments by tsunami waves in coastal lakes or lagoons (e.g., Shinozaki et al. 2015). However, the remainder of the sand layer is generally well sorted. It consists mainly of fine to medium sand (2–3 phi). From bottom to top, grain size distribution shows upward coarsening. Then the grain size distribution changes to the upward fining trend (Fig. S1). Sand contents shift synchronously higher up in the upward coarsening part. The mud layer above the sand layer (214–219 cm depth) also includes some sands together with silt or clay size particles (Fig. S1).

The ITRAX analysis was also performed. Elemental profiles for Si, K, Ti, Ca, Sr, and S exhibit subtle variations with the mud and peat layer in the KBT4 core as similarly to the P-14 core (Fig. S2). However, the mud layer at 82–130 cm depth shows a lower Mo inc/Coh ratio. Actually, Mo inc/Coh becomes higher as the mud layer changes in the peat layer at 130 cm depth. Mn and Fe profiles exhibit greater fluctuations than other elements, but also tend to be slightly low with the mud and peat layer in the KBT4 core (Fig. S2).

The elemental profiles respectively portray different distributions in two sand layers at depths of 175–178 cm and 219–241 cm. The obtained Mn, Fe and Ti profiles exhibit a distinct increase in counts/kcps between 175 and 178 cm (Fig. S2). In addition, for Si, K and Ca, minor peaks in counts/kcps occur at 175–178 cm depth. At depths of 219–241 cm, Si, K, Mn, Ti, Ca, Sr and S profiles exhibit a distinct increase, whereas the Fe profile also shows a slight increase in counts/kcps (Fig. S2). By contrast, a profile of the Mo inc/Coh ratio exhibits a distinct decrease at depths of 175–178 cm and 219–241 cm. Furthermore, for Ca and S, peaks in counts/kcps occur around the mud–peat boundary at 130 cm depth as they do for the P-14 core (Fig. S2).

In this way, unlike the other cores, KBT4 core has three distinct sand layers (Fig. 2). Among the three sand layers, top (=event layer 1) and bottom (=event layer 3) layers are also observed in the other cores at stable depths from the pond floor. The middle sand layer at depth of 175–178 cm in KBT4 core was not observed in the other cores. ITRAX analysis of KBT4 core reveals that profiles of Ca and Sr (indicators of seawater), and Si and K (rock-forming minerals) exhibit a distinct increase in this sand layer. Profiles of other elements also show a similar trend to that of event layer 3 (Fig. S2).

Two hypotheses for this sand layer can be considered. One possibility is that this sand layer is an independent event from event layers 1–3. This possibility is nevertheless unlikely because no event layer that can be compared with this sand layer was identified in other cores. Another possibility is that the sand layer was also formed by event 3. Tsunami waves bearing coastal sands invaded into the pond and stirred up muddy sediments to form a thick sand layer (event layer 3). Subsequently, the deposited sand was raised again by the wave, which was reflected in the pond edge and which was deposited again with original pond sediment. Although it remains uncertain why such phenomena occurred only at this site, this possibility is the more likely. Therefore, we do not treat the middle sand layer in KBT4 core as an independent event. We inferred that this sand layer was formed locally in association with event 3.

**Figure legends**

Figure S1. Columnar section of KBT4 core: a close-up photograph at 154–254 cm depth, CT images, columnar section, grain size, and sand content are also shown. In the CT image, white parts denote sand layers with higher density, whereas grey parts denote mud or peat. White parts represent the apparent direct top of the sand layer (green arrowheads show) in the CT image, indicating that sands were contaminated into the mud layer. For the grain size diagram, the horizontal axis is grain size (phi). The volume percent (%) of each grain size is indicated by the color scale.

Figure S2. Normalized ITRAX XRF data of KBT4 core (82–254 cm depth). Grey-shaded bars represent depths of the respective sand layers.

Figure S3. CT image of Core KBT1.

Figure S4. CT image of Core KBT2.

Figure S5. CT image of Core KBT4.

Figure S6. CT image of Core KBT6.

Figure S7. CT image of Core KBT8.

Figure S8. CT image of Core KBT10.

Figure S9. CT image of Core KBT11.

Figure S10. CT image of Core P-14.

Figure S11. Grain size distribution of Core KBT4 (214-217 cm depth).

Figure S12. Grain size distribution of Core KBT4 (217-229 cm depth).

Figure S13. Grain size distribution of Core KBT4 (229-241 cm depth).

**Tables**

Table S1. Result of diatom assemblage analysis