**SUPPLEMENTARY MATERIALS**

**East Asian winter monsoon evolution since the late Pliocene based on a pollen record from Lake Xingkai, northeast Asia**

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**The supplementary materials include three excel tables and two figures**.

**Table S1**. Valid demagnetization results for core XK12.

**Table S2**. Initial and final age control points for core XK12.

**Table S3**. Data of the integrated pollen index with astronomically-tuned ages from core XK12.

**Fig. S1**. Pollen percentage diagram and zonation of core XK12. From left to right: astronomical tuning timescale (ka), core depth scale (m), red crosses indicating stratigraphic paraconformities; percentages of the selected pollen taxa and genera, pollen concentration, stratigraphic zonation based on the CONISS dendrogram of the pollen record.

**Fig. S2**. Orthogonal demagnetization diagram (upper) and natural remanent magnetization (NRM) decay curves (lower) during alternating-field demagnetization of representative samples of core XK12. The solid (open) circles in the orthogonal demagnetization diagram represent projections on the horizontal (vertical) plane.