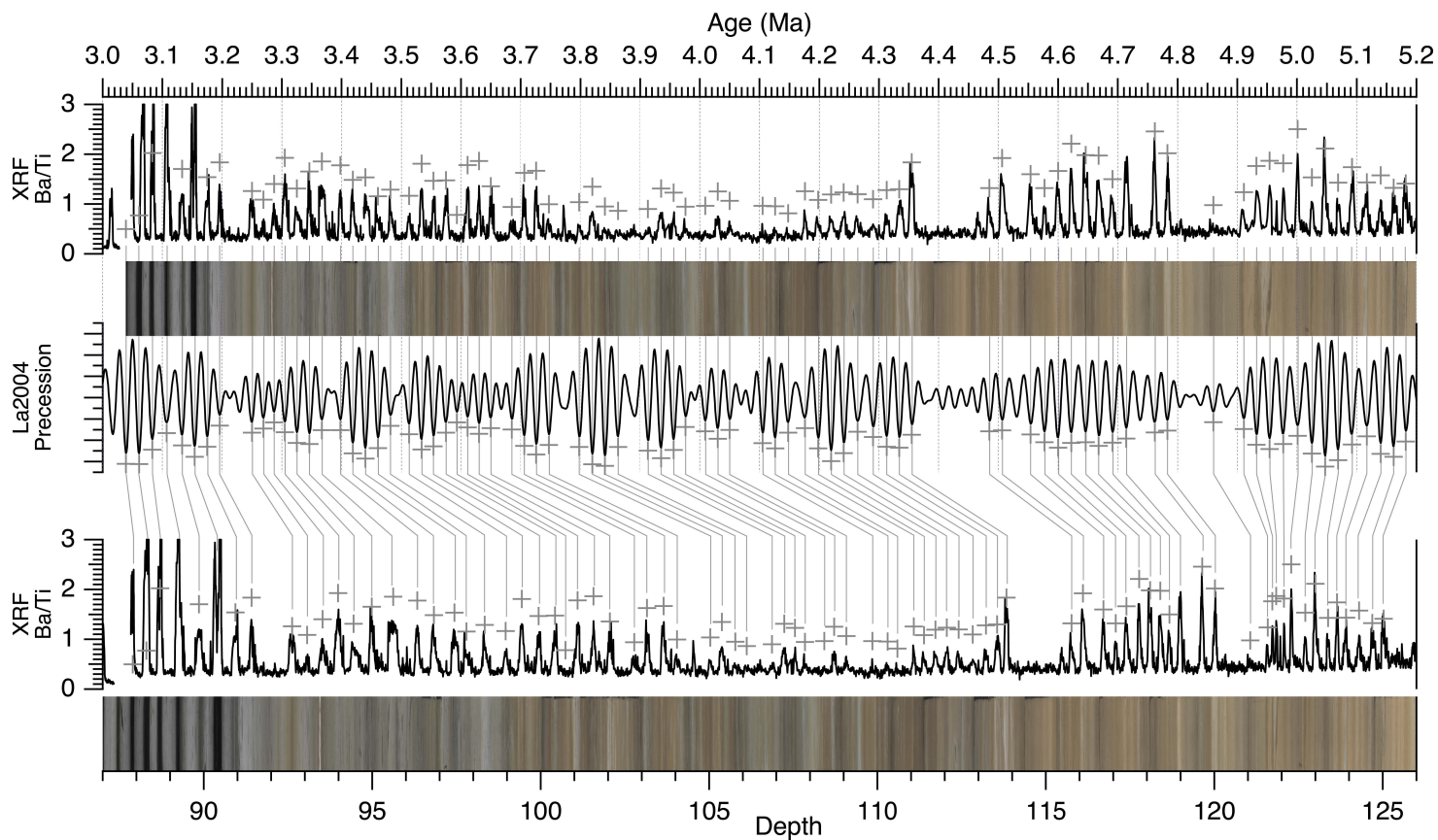
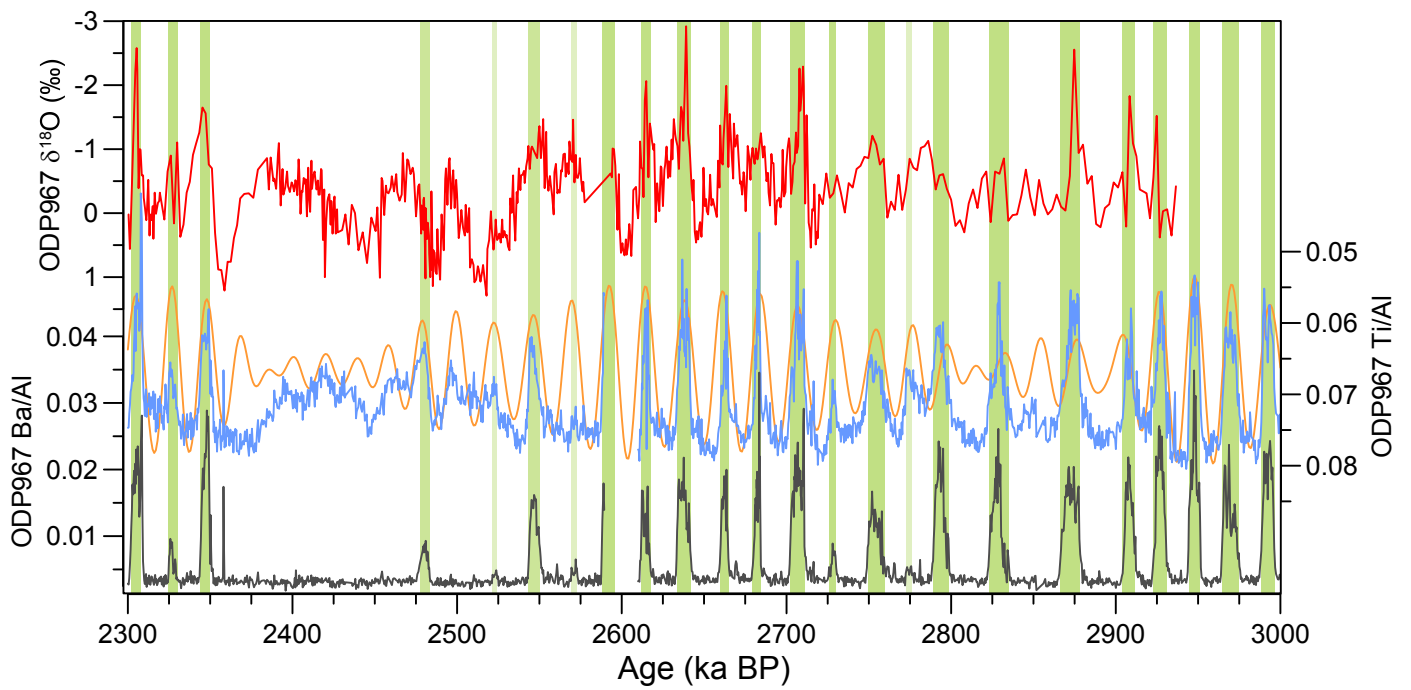
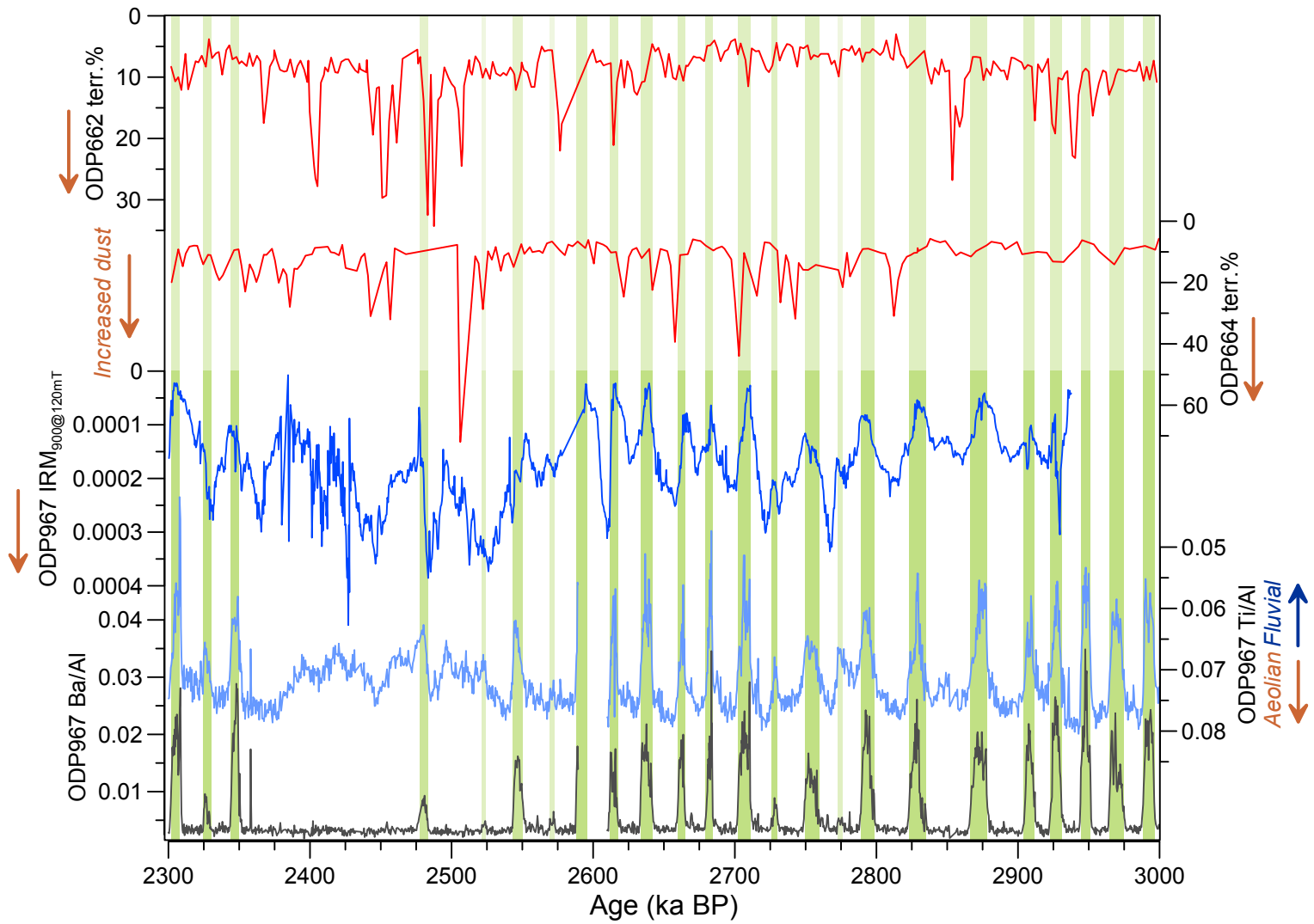




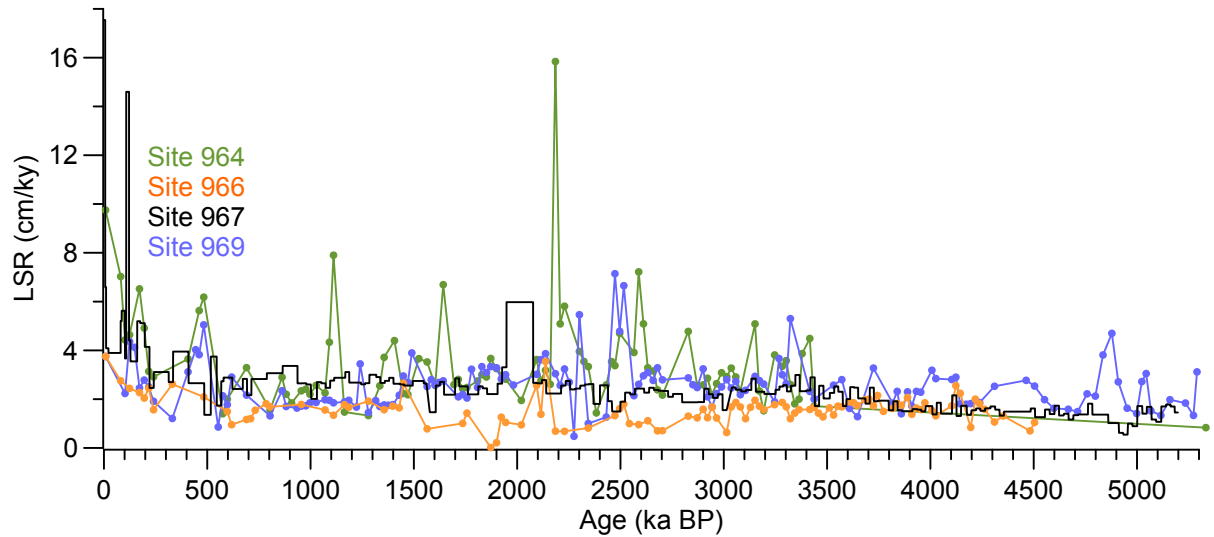
Supplementary Figure S1: Composite downcore image for ODP967 and astronomical tuning of scanning XRF Ba/Ti counts to precession for the 3-5.2 Ma interval. The published chronology for 0-3 Ma is also based on tuning to precession¹⁵.



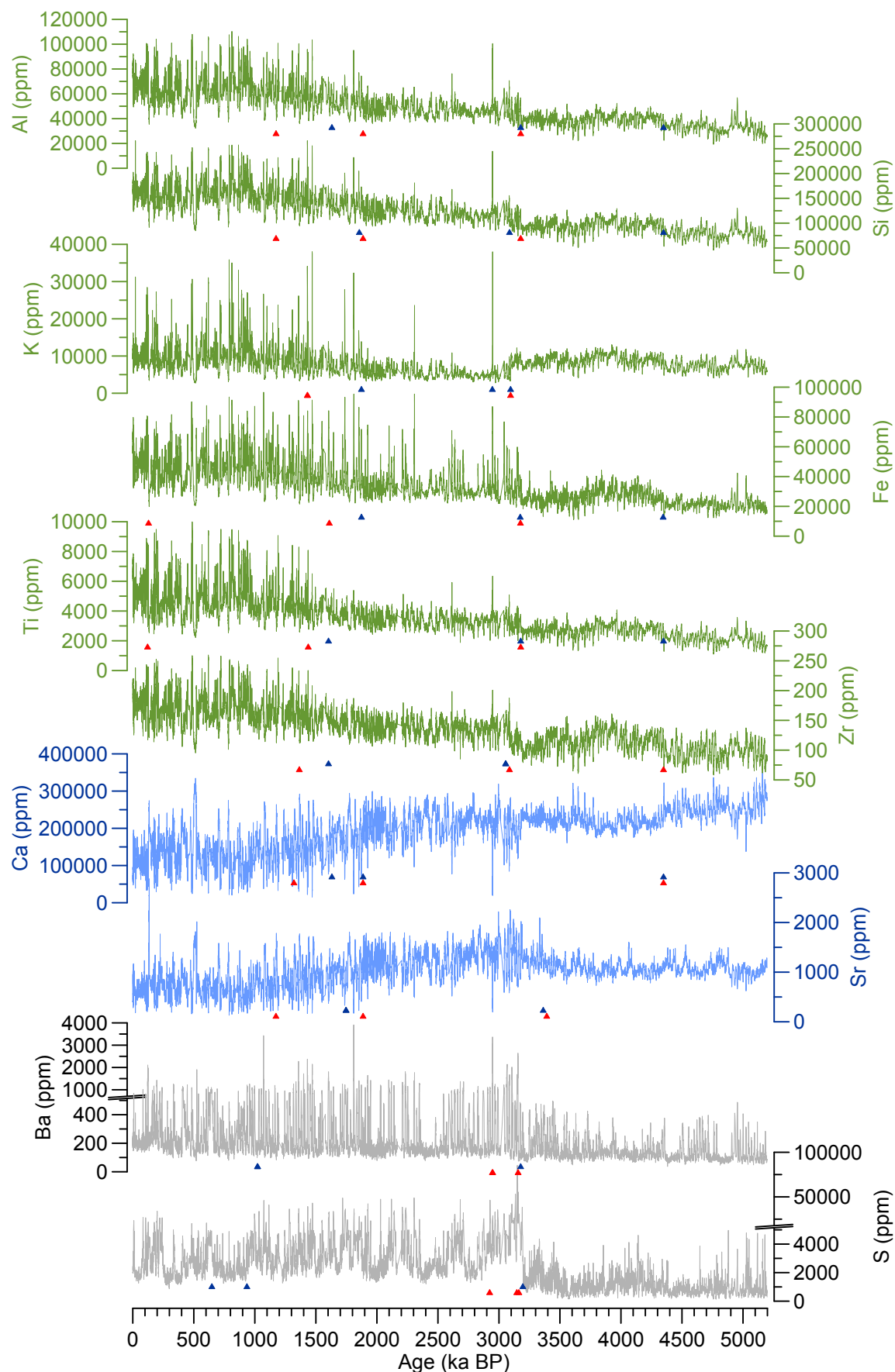
Supplementary Figure S2: Zoom-in of main-text Fig. 3 to show detail. ODP Site 967 records of planktic foraminifera (*G. ruber*) $\delta^{18}\text{O}$ (red), Ti/Al (blue), Ba/Al (grey). Upward peaks correspond to precession minima (orange) and inferred Green Sahara Periods (green shading).



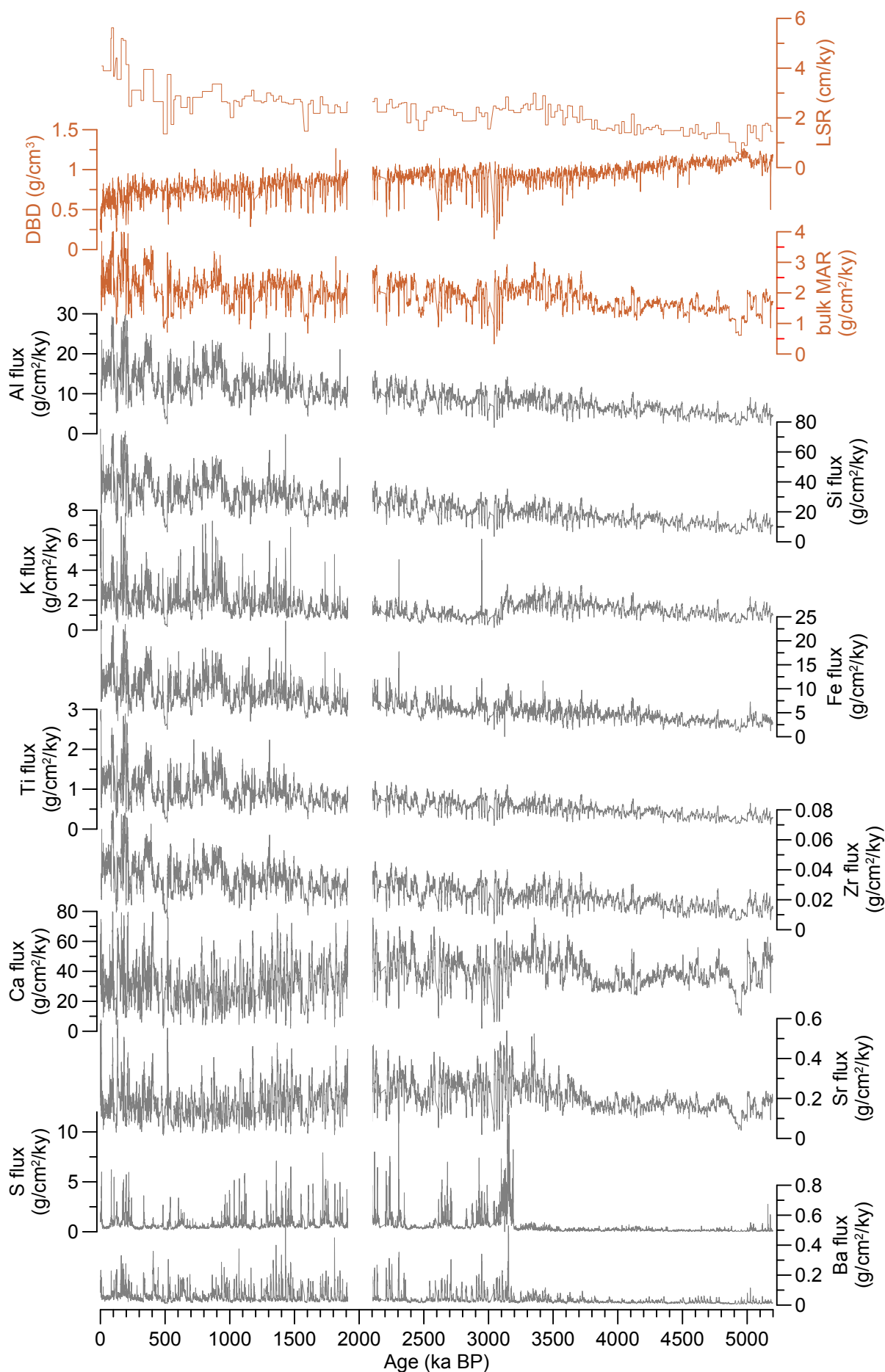
Supplementary Figure S3: Detail of dust records over Green Sahara Periods (GSPs). Terrigenous (aeolian dust) records from offshore West Africa (ODP Sites 662 and 664; red) on their original chronology^{24,25} and ODP967 magnetic dust proxy ($IRM_{900@120mT}$; deep blue) are shown with ODP967 Ti/Al and Ba/Al for comparison. GSPs (green bars) are based on this study.



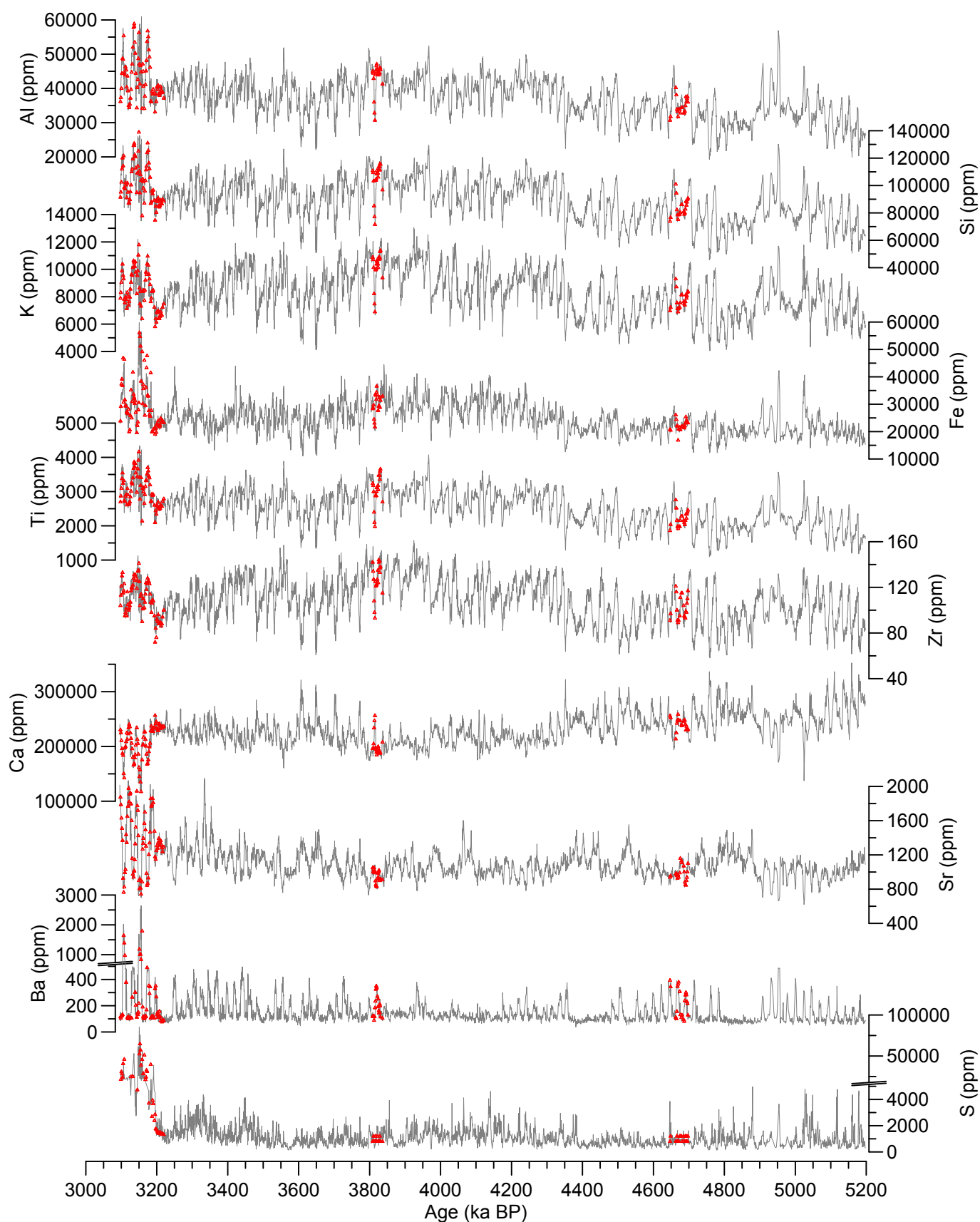
Supplementary Figure S4: Linear sedimentation rates (LSR) for ODP Site 967 (this study) and other Eastern Mediterranean ODP sites²⁹. There are no published depth-age data for Site 964 beyond 3.4 Ma, so we interpolate LSR for 3.4-5.3 Ma by assuming the basal composite down-hole depth (133 m) corresponds to the Zanclean Flooding at 5.33 Ma^{ref78} (this is the case for Sites 967 and 969 where more depth-age data are available). Elevated rates at Site 967 at ~100 and 2000 ka BP are due to slumps; spikes in Site 964 LSR are likely due to turbidites.



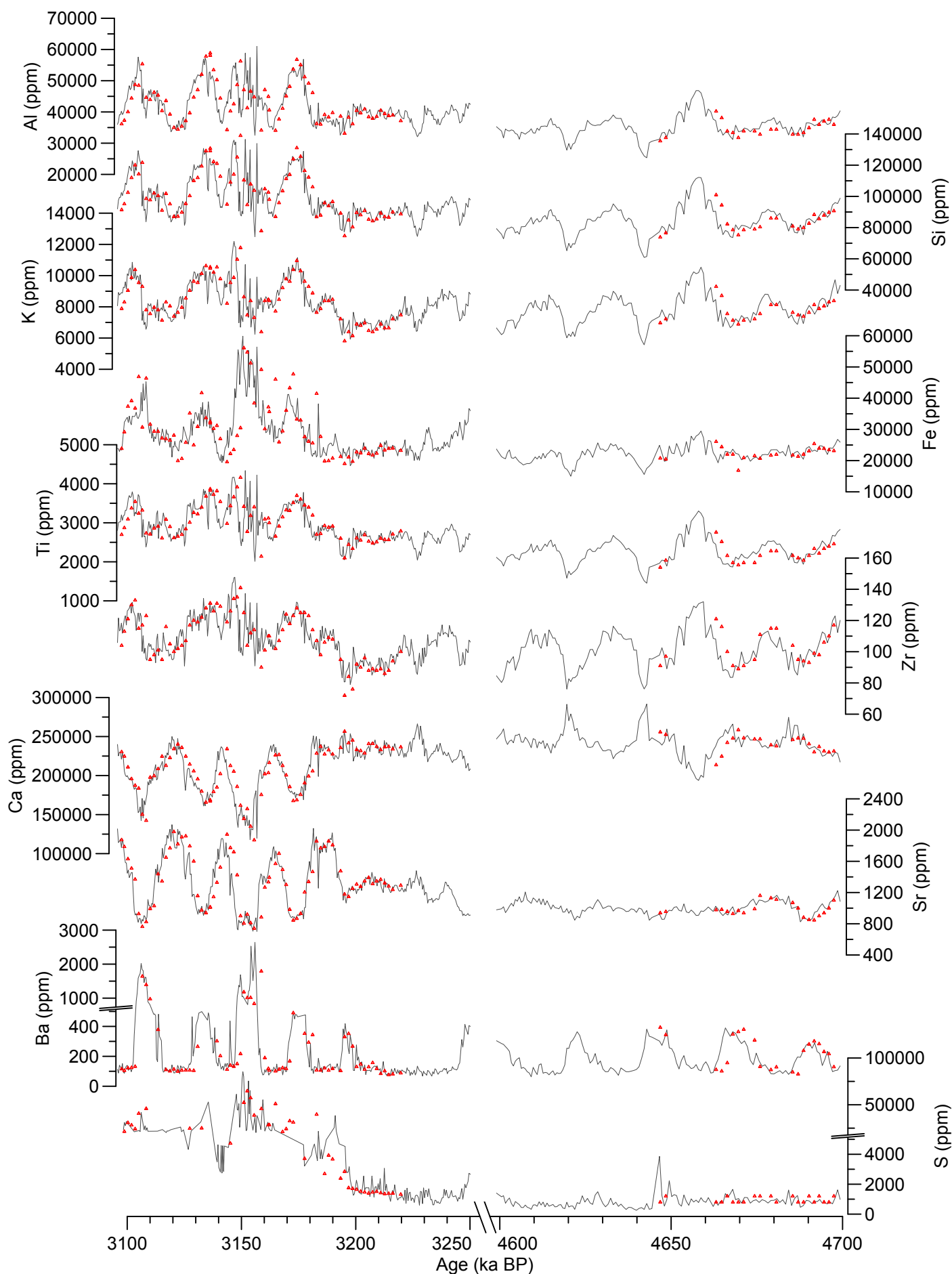
Supplementary Figure S5: ODP967 element concentrations (green = terrigenous; blue = biogenic) and change-points based on the mean (red triangles) and standard deviation (blue triangles).



Supplementary Figure S6: ODP967 linear sedimentation rates (LSR), dry bulk density (DBD), bulk sediment mass accumulation rates (MAR) and element fluxes (grey). A sediment slump ca 2 Ma is blanked out. Element fluxes and bulk MAR reflect DBD changes (especially after 3.2 Ma when sapropels dominate) and a long-term increase in LSR.



Supplementary Figure S7: ODP967 element concentrations from WD-XRF (red symbols) and scanning XRF results converted into element concentrations (grey lines) based on a multivariate log-ratio calibration⁷⁵ (MLC; see Methods). A similar MLC was previously applied to scanning XRF results from ODP967 for 0-3 Ma^{ref.15}.



Supplementary Figure S8: The same as Figure S7 but zoomed into two intervals to show detailed comparison of reference (red) and predicted (grey) concentrations.