Supplement of

Simulating the mid-Holocene, Last Interglacial and mid-Pliocene climate with EC-Earth3-LR

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Figure S1. The evolution during the 200 years spin-up period for the *midHolocene* simulation using annual mean data. (a) global mean energy balance at the top of the atmosphere (W m^{-2}), (b) global mean energy balance at the surface (W m^{-2}), (c) NH and SH average surface air temperature (°C), (d) NH and SH average sea ice extent (10^6 km^2), (e) global mean deep ocean temperature averaged below 2500 m (°C), and (f) global mean deep ocean salinity averaged below 2500 m (PSU). The 200 years mean value is indicated with a red dash line.

Figure S2. The evolution during the 200 years spin-up period for the *lig127k* simulation using annual mean data. (a) global mean energy balance at the top of the atmosphere (W m^{-2}), (b) global mean energy balance at the surface (W m^{-2}), (c) NH and SH average surface air temperature (°C), (d) NH and SH average sea ice extent (10^6 km^2), (e) global mean deep ocean temperature averaged below 2500 m (°C), and (f) global mean deep ocean salinity averaged below 2500 m (PSU). The 200 years mean value is indicated with a red dash line.

Figure S3. The evolution during the 200 years spin-up period for the *midPliocene* simulation using annual mean data. (a) global mean energy balance at the top of the atmosphere (W m^{-2}), (b) global mean energy balance at the surface (W m^{-2}), (c) NH and SH average surface air temperature (°C), (d) NH and SH average sea ice extent (10^6 km^2), (e) global mean deep ocean temperature averaged below 2500 m (°C), and (f) global mean deep ocean salinity averaged below 2500 m (PSU). The 200 years mean value is indicated with a red dash line.

Figure S4. Boreal (MJJAS, left panel) and austral (NDJFM, right panel) summer precipitation anomalies in the *midHolocene* (a, b), the *lig127k* (c, d) and the *midPliocene* (e, f) compared to the *piControl*.

Figure S5. Boreal (MJJAS, left panel) and austral (NDJFM, right panel) summer SAT (shading) and mean sea level pressure (contours, the negative anomalies are shown as dashed and the positive are shown as solid) anomalies in the *midHolocene* (a, b), the *lig127k* (c, d) and the *midPliocene* (e, f) respect to the *piControl*.

Figure S6. Power spectra (normalized) of simulated climate variability using EOF PC1 time series of ENSO (black), PDO (blue) and AMO (red) in the four simulations.