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A synchronous change of mid- to late- Holocene hydroclimate and prehistoric population in coastal East Asia indicated by pollen, XRF and grain size data

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A relationship between climate change and prehistoric civilizations is a topic of growing interest. Here, we present a 6,000-year-long pollen, X-ray fluorescence (XRF), and grain size data of the core STP18-03 from the southern Korean peninsula, spanning the mid- to late- Holocene. The proxies generally show a synchronous change throughout the core. During dry periods, reduced precipitation indicated by lower sand proportion (river discharge) would have hindered tree growth, which then resulted in increased titanium erosion from nearby hills, and vice versa. The drying trend is remarkable during ca. 4.8, 4.3, 4.0, 3.3, 2.7-2.3 ka BP and corresponds with sudden dropping points of a summed probability distribution (SPD) of archaeological records found in the Korean Peninsula. This implies that ancient civilizations of Korea responded highly sensitively to abrupt climate deterioration. As an underlying mechanism of the change, we suggest a role of the equatorial Pacific Ocean. The temporal pattern of our arboreal pollen proportion closely follows that of sea surface temperature (SST) data from the Western Pacific Warm Pool (WPWP) region. Furthermore, the dry periods indicated by our multiple proxies coincide with strong El Niño–Southern Oscillation (ENSO) activity, when the core region of the warm seawater pool deviated eastward than usual. This supports that the equatorial Pacific Ocean has served as an important factor for modulating mid- to late- Holocene hydroclimate of the Korean Peninsula, where the East Asian Summer Monsoon (EASM) accounts for nearly 70 percent of the total annual precipitation amount.