



Interannual to centennial climate variability in east China during later little ice age

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The East China is a highly populated and civilized region but is vulnerable from many weather and climate hazards with different recurrent intervals. The reason for the variations of the natural hazards is still unclear due to complex regional atmospheric circulations, such as Indian Monsoon, East Asian Monsoon, TC, ITCZ, subtropical high, ENSO, and geophysical conditions, e.g. maritime continents and Pacific Ocean. The difficulties for understanding the mechanisms usually and largely derive from limited information especially in the paleoclimate reconstruction. High spatiotemporal resolution data with multi-environmental-weather indexes could provide many details to understand the related atmospheric conditions. This study uses Chinese documentary records compiled in a Compendium of Chinese Meteorological Records of the Last 3,000 Years (Zhang ed. 2004). In the latest Qing dynasty (1644-1911 AD), there are in total 99,237 records distributed in 1,435 geographical sites across East (monsoon) China. Those records are mainly abnormal or unusual weather events, from which a set of time series of anomalous hydroclimate events could be reconstructed for temporal variations. The grading method for reconstructing annually and seasonally resolved regional temperature and precipitation anomalies was also conducted, adjusted from classical coldness-warmth and drought-flood indexes. The research result (wavelet analysis) shows significant interannual (2-4 years), decadal (8-12 years), and multidecadal temp/precip variabilities with different regional signatures in 1644-1911. Lower temperature generally occurred in the mid-1600s and in the 1800s with different expressions in north, central and south China. Lower temperature was often accompanied with higher moisture condition. Trend comparison with ENSO and PJ (Pacific Japan Index) also beautifully matched in reverse phase especially for north and central China. Spatiotemporal analysis of the hydroclimate events (flood, drought, snow storm, and locust) illustrates much more intensive flood-drought-locust frequency with higher snow records in the 1600s and 1800s (active period) while less frequency is found in the 1700s (less active), indicating centennial scale climate variations and some likely climate regime shift.