



Impact of the centennial changes in ENSO on the rise of the Chinese Qing empire



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The demise of the Ming Dynasty (1368–1644) and the rise of the Qing Dynasty (1644–1912) marked an epochal moment in Chinese and world history. Attention has been given to the North China droughts during 1627–1643 that destabilized the Ming Dynasty. However, there is little attention paid to how climate influenced the rise of a minority Manchu state in Northeast China and its conquest of the Ming. Here, we find that contrasting climate conditions between North and Northeast China persisted over a six-decade period (1581–1644), which diversely affected economic, societal, and political changes at the regional level. Five successive megadroughts ravaged North China, while relatively wet and mild climate conditions prevailed in the Manchu homeland of Northeast China. Furthermore, in the early decades of Manchu rule in North China (1645–1680), increased precipitation facilitated the Qing Dynasty's consolidation. Reconstructions and climate model simulations revealed that these unusual climatic patterns were influenced by the centennial variation of clustering El Niño–Southern Oscillation (ENSO) events and were amplified by the Little Ice Age cooling. These findings shed light on how long-term contrasting future climate changes could lead to divergent socioeconomic responses, potentially increasing the risk of conflict between neighboring states.

The demise of the Ming Dynasty (1368–1644) at the hands of the Qing Dynasty (1644–1912) allowed indigenous people of Northeast China to form a “Manchu” conquest state that would gain power over the social, economic, and cultural life of about 35 percent of the earth's population, most of whom were “Han” Chinese¹. More than 20 million people died in the Ming–Qing transition. Existing historical literature on the conquest has only begun to take climate into account². Several theories have considered the effects of the severe droughts in northern China as contributing factors to the crisis and final collapse of the Ming Dynasty^{3–7}. Notably, these theories recognized the late Ming megadrought from 1627 to 1644 as the primary cause of widespread famines and peasant uprisings that left the Ming Dynasty vulnerable to a final Qing conquest^{8,9}. It is still unclear whether a megadrought could bring down a mighty Ming dynasty. More importantly, the influence of climate change on the rise of the minority Manchus and their eventual conquest of the Ming is still not well understood.

It took six decades for the Manchu state to consolidate itself before the 1644 conquest. A local chieftain, Nurhaci (1559–1626), initiated the political unification of ethnic Manchurian peoples around 1583. His Later Jin regime, established in 1616, steadily expanded, notably into the Liaodong Peninsula, in the 1620 s. Resources from southern Mongolia were also critical for Manchu state development. In 1636, Hong Taiji, Nurhaci's successor, formally proclaimed the Qing Dynasty, a multi-ethnic regime that had developed into a major rival of the Ming¹⁰. The Qing captured the Ming capital of Beijing in 1644, but it took until the 1680 s to solidify their control fully. However, the climate conditions that prevailed in Northeast and North China during this period have received scant attention in the existing literature. Some studies assumed a questionable degree of uniformity of Little Ice Age (LIA) conditions throughout North China, Mongolia, and Northeast China, suggesting that Northeast China may have experienced moderate changes in temperature and precipitation^{10,11}.

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