

EGU2020-7335, updated on 05 Mar 2021

<https://doi.org/10.5194/egusphere-egu2020-7335>

EGU General Assembly 2020

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Climate change and Silk Road civilization in the arid central Asia

Fahu Chen^{1,2}, Jianhui Chen², Guanghui Dong², Wei Huang², Juzhi Hou¹, and Tao Wang¹

¹Key Laboratory of Alpine Ecology (LAE), CAS Center for Excellence in Tibetan Plateau Earth Sciences and Institute of Tibetan Plateau Research, Chinese Academy of Sciences, Beijing, China

²Key Laboratory of Western China's Environmental Systems (Ministry of Education), College of Earth and Environmental Sciences, Lanzhou University, Lanzhou, China

The arid central Asia composed of northwestern China and central Asia, is one of the most arid regions in the mid-latitudes and also the core area of the Silk Road civilization. Climate have dramatically changed during Holocene in the region. Prior to 6 ka, moisture conditions increased gradually, and then rapidly, with the most humid period occurring during the late Holocene. Over the last millennium, a dry climate during the Medieval Warm Period and a wet climate during the Little Ice Age is present on the centennial timescale. Instrumental observations showed that precipitation, moisture, and stream runoff all have gradually increased on the decadal scale under global warming. Comparing these results to those in the mid-latitude monsoonal Asia and Mediterranean, the moisture evolution since the Holocene over westerlies Asia featured unique characteristics on various timescales. We proposed the theoretical framework of a 'westerlies-dominated climatic regime' (WDCR) for hydroclimatic changes. Further studies of physical mechanisms showed that external factors e.g. orbital-induced insolation changes generated WDCR on the sub-orbital timescale, while a circum-global teleconnection/Silk Road pattern was the most important factor responsible for WDCR on the centennial and decadal timescales. Climate change has impacted on the civilization evolution along the Silk road in arid central Asia. The oasis route in this region played a significant role in the development of trans-Eurasia exchange since the late third Millennium BCE. Such route laid the foundation for the formation of ancient Silk Road during the second century BCE that accounted for the most important center for civilization evolution in the planet till the sixteenth century CE. Multi-discipline studies suggest that special warm-humid climate might have facilitated the rise and development of ancient empires, e.g. Tubo Empire (618-842 CE) in and around the high Tibetan Plateau. But climate deterioration, especially severe droughts lasting decades-centuries, triggered the expansion of deserts and shrinkage of oases along the Silk Road. Such land degradation led to the delayed onset of transcontinental exchange, the decline of ancient civilizations such as ancient Loulan Kingdom (176 BCE-630 CE), and the abandonment of Dunhuang area between 1539-1723 CE by Chinese central government that was ascribed as a landmark event for the end of the traditional Silk Road. Further analysis proposed that the evolution of ancient civilizations was likely influenced by precipitation variation in surrounding mountains instead of basins in arid areas of the Silk Road.