



## **High environmental variability in the monsoon–westerlies transition area of Asia during the last 1200 years: lake sediment analyses from central Mongolia and supra–regional synthesis**

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A high resolution multi-proxy (pollen, grain size distribution, total organic carbon) record from a small mountain lake (Lake Khuisiin; 46.6°N, 101.8°E; 2270 m a.s.l.) in the south-eastern Khangai Mountains of central Mongolia has been used to explore changes in vegetation and climate over the last 1200 years. The pollen data indicates that the vegetation changed from dry steppe dominated by Poaceae and Artemisia (ca. AD 760–950), to Larix forest steppe (ca. AD 950–1170), Larix–Betula forest steppe (ca. AD 1170–1380), meadow dominated by Cyperaceae and Poaceae (ca. AD 1380–1830), and Larix–Betula forest steppe (after ~AD 1830). There was no consistent evidence of warming during the Medieval Warm Period, but the cold wet period between AD 1380 and 1830 may relate to the Little Ice Age. Environmental changes were generally subtle and climate change seems to have been the major driver of variations in vegetation until at least the early part of the 20th century, suggesting that either the level of human activity was generally low, or the relationship between human activity and vegetation did not alter substantially between AD 760 and 1830. A review of centennial-scale moisture records from China and Mongolia revealed that most areas experienced major changes at ca. AD 1500 and AD 1900. However, the moisture availability since AD 1500 varied between sites, with no clear regional pattern or relationship to present-day conditions. Both the reconstructions and the moisture levels simulation on the millennium scale performed in the MPI Earth System Model indicate that the monsoon-westerlies transition area shows a higher climate variability than the areas purely influenced by the westerlies or the summer monsoon.