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Temperature reconstruction and volcanic eruption signal from tree-ring width and maximum latewood density over the past 304 years in the southeastern Tibetan Plateau

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This study presents a 304-year average July-October maximum temperature reconstruction for the Northwest Yunnan Province, southeastern Tibetan Plateau, based on both tree-ring width (TRW) and maximum latewood density (MXD) data from Picea asperata. For the calibration (1958-2005), the MXD and TRW chronologies explained 58% of the variance in July-October maximum temperature. On the decadal scale, two major cold periods occurred during AD 1801-1833 and 1961-2003; and two evident warm periods occurred in AD 1730-1800 and 1928-1960. Comparisons with other reconstructions from the region revealed similar variability patterns on the decadal to longer-term timescales. Based on the reconstructed temperature series and volcanic eruption chronology, we found that most extreme cold years were in good agreement with major volcanic eruptions, such as 1816 after the Tambora eruption in 1815. Also, clusters of volcanic eruptions probably made the 1810s and 1990s the coldest two decades in the past 300 years. Our results indicated that fingerprints of major volcanic eruptions can be found in the reconstructed temperature records in this region, while the responses of regional climate to these eruption events varied in space and time. Moreover, significant periodicities were found in the reconstructed temperature series, including those of 2-7, 10-11 and 16-50 years. Further analysis indicated that sunspot cycle, atmospheric-oceanographic teleconnections such as ENSO and AMO, and volcanic eruptions are all possible factors that influenced the temperature variations in the southeast Tibetan Plateau.

Key-words: dendroclimatology, tree-ring, Maximum latewood density, temperature reconstruction, volcanic eruption, Tibetan Plateau