

Pioneer dendroclimatological research in the Western Turkmenistan

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Turkmenistan is a very special region in Central Asia where the desert covers 80% of the territory. Water supply is a subject of state importance in Turkmenistan. To understand the mechanisms that affect the amount of precipitation in the region on decadal and centennial time scales long records of atmospheric precipitation are necessary. Unfortunately such records are sparse and short in the region.

Tree rings are natural archive that store information about environmental conditions of the past. Previously tree rings have been successfully used for hydroclimate reconstructions covering the last millennium. Such reconstructions uncovered possible climatic causes of many social cataclysms in human history. In arid regions tree rings are especially useful for hydroclimate reconstructions, explaining around 60-80% of variability of instrumental records.

Paleogeographic reconstructions for the Late Holocene based on dendroclimatology can reveal the climatic characteristics of periods when Aral Sea basin was connected with the Caspian sea. The other possible perspective of our research is revealing the paleoclimate characteristics for Western Turkmenistan describing evaporation and precipitation – the basic indicators for understanding Caspian sea-level change.

The aim of this study was to assess the potential of dendroclimatological method in Turkmenistan for the purpose of hydroclimatological reconstructions. These reconstructions may significantly extend the existing instrumental records of atmospheric precipitation in the region.

Study region is situated along the southwestern border of the Turkmenistan, in northern piedmont of the Kopetdag range. We sampled several species: turkman juniper (*Juniperus turcomanica*), black pine (*Pinus nigra*), oriental plane (*Platanus orientalis*), paper mulberry (*Broussonetia papyrifera*) and osage orange (*Maclura pomifera*), but only juniper chronology has been constructed and analyzed so far. Although old trees are rare in Turkmenistan, we have found a site with junipers old enough to extend the existing climatic records. Twenty juniper trees (two cores from each tree) were sampled at the altitude of 2000 m a.s.l.

The resulting chronology covers the last 150 years and has clear climatic signal. Our study has shown that dendroclimatological method is promising for hydroclimate reconstructions in Turkmenistan. Moreover, there are evidences that junipers older than 500-700 years may be found higher in the mountains.