Geophysical Research Abstracts,
Vol. 11, EGU2009-1047-4, 2009
EGU General Assembly 2009

Teberda valley runoff variability (AD 1797–2003) based on tree-ring reconstruction (Northern Caucasus, Russia)

V.V. Matskovskiy, E.A. Dolgova, and O.N. Solomina
Institute of Geography RAS, Staromonetny-29, Moscow, Russia, 119017

In this paper we provide a new tree-ring based runoff reconstruction for Teberda river for 1797–2003. Teberda river is a tributary of Kuban' (Azov Sea basin), 60 km long with the watershed surface equal to 1080 km^2. 60% of runoff occurs in summer, 17% – in the fall, 5% – in winter, 18% – in spring. $55,8\%$ of runoff (at Teberda hydrological station) is provided by snow and ice melt (Lurye 2000). No statistically significant trend is identified in the Teberda runoff records in 1930–2000 despite of some important climatic and environmental changes occurred in this period in the Northern Caucasus, namely a general warming in winter, increase in solid precipitation and recession of glaciers.

Tree-ring properties were successfully used previously to reconstruct streamflow (Stockton and Jacoby, 1976, Woodhouse et al., 2006) in the regions where drought influence both tree growth and river runoff regime. In the Northern Caucasus, even at the upper tree limit pine and spruce growth is largely limited by the availability of water (Dologva et al., 2007). The correlation between Pinus silvestris ring width and June-July Teberda river runoff is 0.4, while it increases up to 0.69 for 11-years running mean. We used linear regression of instrumental records of Teberda runoff (1927–2000) and first principal component of the pine ring width chronologies from the same valley to reconstruct the June-July runoff for the period 1797–2003. Our chronology is two centuries longer, but its reliable portion ($EPS > 0.8$) begin in the late 18^{th} century. We used cross-validation to verify the reconstruction, so the correlation coefficient is 0.72 and mean difference is 23.13 (52% of interquartile range) between reconstruction and instrumental record for the verification period. The reconstruction reproduces well the general trends in runoff variability, but slightly underestimates the amplitude of the runoff positive anomalies in 1940s. The positive peaks of reconstructed runoff are centered around 1825, 1848, 1876, 1898, and 1915; the negative anomalies occurred around 1815, 1835, 1859, 1891, and 1907. The reconstructed anomalies exceeding two standard deviations are more numerous in 19^{th} century, especially in its first half, in comparison with the 20^{th} century. However in general the amplitude of variability of reconstructed runoff in 19^{th} and 20^{th} centuries is similar. Supported by RFBR research grant 07-05-00410.