

Effect of streamflow regulation on mean annual discharge variability of the Yenisei River

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Abstract The magnitude of natural and anthropogenic changes in hydrological systems is one of the major scientific questions yet to be addressed. Relative to climatic effects, dam impacts are much more direct and often cause abrupt changes in the water regimes of rivers. We expect these changes to be evident and detectable in the mean annual discharge (MAD) records and discharge–precipitation relationship of the Yenisei River, Siberia, Russian Federation. We use statistical analysis to compare three periods: (a) natural streamflow (1936–1956), (b) filling of reservoirs (1957–1980), and (c) operation of reservoirs (1981–2006). Comparison of reconstructed and observed MAD suggests that streamflow regulation affects the homogeneity of the MAD between filling of reservoirs and operation periods. We conclude that dam regulation in the Yenisei River is strong enough to modify the MAD response to annual precipitation, particularly during the 1980–2004 period.

Key words discharge; precipitation; Yenisei River; dam; reservoir; streamflow regulation; Arctic