



Hydrological changes over half century in the Blue Nile Basin, Ethiopia: A statistical approach

Solomon Gebreyohannis Gebrehiwot, Annemieke Gärdenas, Kevin Bishop, Woldeamlak Bewket, Jan Siebert, and Ulrik Ilstedt

Swedish University of Agricultural Sciences, Aquatic Sciences and Assessment, Uppsala, Sweden
(solomon.gebreyohannis@vatten.slu.se)

Hydrological changes over half century in the Blue Nile Basin, Ethiopia: A statistical approach

1Solomon Gebreyohannis Gebrehiwot, 2Annemieke Gärdenas, 1, 6Kevin Bishop, 3Woldeamlak Bewket, 4Jan Siebert and 5Ulrik Ilstedt

1Department of Aquatic Sciences and Assessment, SLU, Box 7050, 750 07 Uppsala;

2Department of Soil and Environment, SLU, Box 7014, 750 07 Uppsala;

3Department of Geography and Environmental Studies, Addis Ababa University, P.O.Box 1176, Addis Ababa, Ethiopia;

4Department of Geography, University of Zurich – Irchel, Winterthurestrasse 190, CH-8057 Zurich, Switzerland;

5Department of Forest Ecology and Management, Swedish University of Agricultural Sciences, SE-901 83 Umeå, Sweden

6 Department of Earth Sciences, Uppsala University, Villavägen 16, 752 36 Uppsala

Abstract

Changes over the last 50 years in low flow, high flow, low flow index, total flow, runoff coefficient and rainfall was analyzed for 12 rivers in the Blue Nile Basin of Ethiopia. The aim of the study is to characterize the changes happening in the hydrological regime of the Basin with special reference to low flows. Monthly meteorological and hydrological data were used for the analysis. Trend analysis was done using Spearman's rho correlation coefficient and Wilcoxon signed-rank was used to test for step-changes. The study period was also divided into three periods (1960-1975, 1976-1990, and 1991-2004) to test for changes in the hydrological regime, including linear fits of the flow duration curves. There were significant changes in the hydrological parameters in 10 of the 12 rivers. But what changed, and in which direction were different for different rivers. The number of rivers which have an inverse relationship between runoff coefficient and low flow index has increased by 50% from the earliest to the most recent period. But even this relationship (which was hypothesized to indicate soil degradation) is not statistically significant. Our conclusion is that hydrological changes in the Blue Nile Basin over this period cannot be generalized, despite strong pressures with respect to land use and soil degradation across the entire basin. Thus water management in the region needs to be designed with due attention to the specific characteristics of each catchment.

Mail: solomon.gebreyohannis@slu.se