Detection and attribution of hydrological regime changes in the Elbe river basin

Thomas Recknagel (1), Roman Kožín (2), Petr Pavlík (2), Jörg-Uwe Belz (1), Enno Nilson (1), and Adam Vizina (2)

(1) Federal Institute of Hydrology, Koblenz, Germany, (2) T. G. Masaryk Water Research Institute, Prague, Czech Republic

The detection and attribution of change in hydrological time series is a demanding task, as the runoff process is subject to natural variability on different scales as well as anthropogenic forcings. In a cross-bordering Czech-German project maintained by two public research authorities, we examine and compare gauged subcatchments of the international Elbe river basin. Some show only minor anthropogenic influence (gauges Otava, Elbersdorf). Others are heavily impacted by mining (Bilina, Cottbus), reservoir management (Skalka, Hadmersleben) or land use change (Botic, Rokytka). We aim to decipher the footprints of natural and anthropogenic changes using statistical analysis of the runoff time series. For example, significant breakpoints may reflect anthropogenic change while trends may be associated with continuous climate change. We follow a hypothesis testing framework for attribution proposed by other authors, which means hypothesizing possible drivers of change and giving evidence of consistency with observed trends together with evidence of inconsistency regarding other drivers of change. Particularly in international river basins, the data availability is a limiting factor for attribution studies. Within the project, we aim for an exemplary use of modern collaboration tools for data collection and model setup to achieve a data stock of river basin impacts which is as complete as possible. Our tools of research are two water balance models, the catchment based conceptual model BILAN and the physically-based distributed raster model LARSIM-ME. We compare the capabilities of each modelling approach to reproduce the natural flows and the observed footprints of change.