Relations between hydrological model parameters and catchment properties - a case study in western europe

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A methodology for estimating regional parameters for a conceptual rainfall-runoff model is presented. This study is a part of the WRINCLE project where the objective is to assess the influence of climate change in Europe and to produce maps for different climate projections. Our contribution to this project is to develop a methodology to estimate river discharge characteristics directly from meteorological inputs and catchment properties. The aim of the project is not to reproduce flood characteristics but rather water resources statistics, hydrological regimes and flow-duration-curves, which can be more easily determined for future climate scenarios. This is achieved within a theoretical framework relating first and second order moments of daily discharge to rainfall parameters and potential evapotranspiration as a function of basin parameters used in a conceptual lumped rainfall-runoff model. Moreover, flow-duration curves can be derived using the analytical output of the model and a theoretical statistical distribution. This analytical approach, which requires some assumptions but does not require simulations for discharge predictions, is more appropriate for producing maps at the European scale. The rainfall-runoff model has 5 parameters and uses a set of about 30 calibration catchments of about 500 km2 each, distributed throughout Western Europe. The model parameters were estimated via a search procedure that minimises the sum of squares of difference between observed and predicted daily discharge. Multivariate analysis techniques were applied to explain the variability of the parameters, using catchment data (soil, land cover, river network, topography), easily available for all Europe. The method performance (analytical model and parameter estimation) was tested for 20 catchments, which were not included in the calibration set.