Geophysical Research Abstracts
Vol. 14, EGU2012-6783, 2012
EGU General Assembly 2012

An Uncalibrated Global Model of Monthly River Flow Regimes using Similarity Methods

R.A. Woods
NIWA, Hydrological Processes, Christchurch, New Zealand (r.woods@niwa.co.nz, +64 3 348-5548)

The monthly river flow regime is one of the fundamental indicators of hydrological response; it summarises the seasonality of stream flow. It is commonly described using a set of 12 coefficients, each one being the ratio of monthly mean flow to the annual mean flow. Stream [U+FB02]ow seasonality varies regionally and globally, depending on factors such as the timing of seasonal precipitation, evapotranspiration, and contributions from snow and ice. The interpretation of observed monthly flow regimes in terms of hydrological processes is usually achieved either by classification of flow regimes into types (e.g. Haines et al, 1988), or by time-stepping numerical simulation of runoff generation processes (e.g. Döll et al, 2003).

Here we develop and test an uncalibrated prediction of the monthly flow regimes of several hundred catchments around the world, using low-dimensional similarity-based analytical models. These methods are intended for estimating the hydrological responses of locations which are dominated either by pore-water-controlled runoff processes (infiltration excess, drainage from sub-surface water storage), or by snowmelt runoff. A simple flow routing algorithm is used to model transport in river networks. All data used for the predictions of flow regime are taken from freely-available global data sets.

We will present an analysis of the sensitivity of the predictions to input uncertainties, as well as diagnosing the errors in predictions. Two of the model structural elements missing from the above methodology are the effects of frozen soils (so that in cold regions, the capacity of soils to store meltwater may be overestimated by this model), and the effects of storage of water in open water bodies such as ponds, wetlands and lakes (so that in regions with many surface depressions, the ability of the landscape to delay water may be underestimated by this model). We will assess the extent to which these missing structural elements manifest in the global distribution of prediction errors.