Global modelling of fresh water resources on a seasonal scale

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Assessments of global water availability have shown that around 2 billion people live in river basins with high water stress, and this number is likely to be increasing. Most of these assessments have constructed a water scarcity index based on annual values of water availability's and water use or demand. The most common scale of this index is river basins or countries. This study is focused on the seasonal differences of water resources, aiming to point out areas of water shortages which are not fairly represented in annual evaluations. Available water resources are modelled using the Hydrological Discharge model (HD-model) developed at the Max Planck Institute in Hamburg and coupled to a simple land-surface scheme which generates the surface runoff and base-flow drainage, which are the inputs to the hydrological model. The HD-model is a river routing scheme with a resolution of 0.5 degrees. A routine for removal of given amounts of water use is included with the aim to calculate a water scarcity index as being the water available divided by the water used. First results show the difference between global assessments on annual scale compared to seasonal scale. The ERA40 data has been used as climatic input and routed into rivers, from where water has been withdrawn according to water demand given on country scale. It is shown that seasonal differences may, especially for countries in dry regions, be important to give a fair view of the availability of water resources. On a global average, however, the interannual changes of water scarcity are larger than the seasonal. The aim of this study is to produce more realistic scenarios of the global water stress situation at present and in the future. The environment and the human society will therefore later be better integrated and include different water sources, e.g. desalinated water, and population density.