multiple climatological and hydrological parameters. An understanding of the relationships between these two sets of parameters is necessary to develop measures for mitigating the impacts of droughts. Beginning with a discussion of drought definitions, this paper attempts to provide a review of fundamental concepts of drought, classification of droughts, drought indices, historical droughts using paleoclimatic studies, and the relation between droughts and large scale climate indices. Conclusions are drawn where gaps exist and more research needs to be focussed. © 2010 Elsevier B.V.

Uncertainty of the impact of climate change on the hydrology of a nordic watershed

Volume 358, Issues 1-2, August 2008, Pages 70-83
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The impact of climate change on the hydrology of the Chute-du-Diable watershed (Quebec, Canada) is studied by comparing statistics on current and projected future discharge resulting from a wide range of climate change scenarios. The use of 10 equally weighted climate projections from a combination of 5 general circulation models (GCMs) and 2 greenhouse gas emission scenarios (GHGES) allows for the definition of an uncertainty envelope of future hydrologic variables. GCM data is downscaled using the change factor approach for 30-year time slices centered around years 2020, 2050 and 2080. To estimate natural variability, synthetic time series are then computed for each horizon and for each climate change scenario, using a stochastic weather generator (30 series of 30 years), and are entered into a hydrology model. Future hydrological regimes are then compared to the control period (1961-1990) using the annual and seasonal mean discharge, peak discharge and timing of peak discharge criteria. Results indicate a 1-14 °C increase in seasonal temperature and a -9 to +55% change in seasonal precipitation. The largest increases in both temperature and precipitation are observed in the winter and spring seasons. The main hydrologic impact observed is a spring flood appearing 1-5 weeks earlier than usual and a modification of its amplitude from -40 to +25%. Most scenarios suggest increases in the winter, spring and fall discharge, whereas summer is expected to see a decrease in discharge. While there is still a large scatter in projected values, the uncertainty analysis projects a better view of the most probable future hydrologic behaviour of the watershed. Of all sources of uncertainty considered in this study, the largest comes from the choice of a GCM. Accordingly, all impact studies based on results from only one GCM should be interpreted with caution. © 2008 Elsevier B.V. All rights reserved.

Spatial and temporal variability of precipitation maxima during 1960-2005 in the Yangtze River basin and possible association with large-scale circulation

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This study investigated spatial and temporal patterns of trends of the precipitation maxima (defined as the annual/seasonal maximum precipitation) in the Yangtze River basin for 1960-2005 using Mann-Kendall trend test, and explored association of changing patterns of the precipitation maxima with large-scale circulation using NCEP/NCAR reanalysis data. The research results indicate changes of precipitation maxima from relative stable patterns to the significant increasing/decreasing trend in the middle 1970s. With respect to annual variability, the rainy days are decreasing and precipitation intensity is increasing, and significant increasing trend of precipitation intensity was detected in the middle and lower Yangtze River basin. Number of rain days with daily precipitation exceeding 95th and 99th percentiles and related precipitation intensities are in increasing tendency in summer. Large-scale atmospheric circulation analysis indicates decreasing strength of East Asian summer monsoon during 1975-2005 as compared to that during 1961-1974 and increasing geopotential height in the north China, South China Sea and west Pacific regions, all of which combine to negatively impact the northward propagation of the vapor flux. This circulation pattern will be beneficial for the longer stay of the Meiyu front in the Yangtze River basin, leading to more precipitation in the middle and lower Yangtze River basin in summer months.