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Global review and synthesis of trends in observed terrestrial near-surface wind speeds: Implications for evaporation

Tim R. McVicar | Michael L. Redeker | Randell | Darshana | Ling Tao Li | Thomas G. Van Mieghem

In a globally warming climate, observed rates of atmospheric evaporative demand have declined over recent decades. Several recent studies have shown that declining rates of evaporative demand are primarily governed by trends in the aerodynamic component (primarily being the combination of the effects of wind speed (u) and atmospheric humidity) and secondarily by changes in the radiative component. A number of these studies also show that declining rates of observed near-surface u (formed ‘drying’) is the primary factor contributing to declining rates of evaporative demand. One objective of this paper was to review and synthesise the literature to assess whether drying is a globally widespread phenomenon. We analysed 248 studies reporting terrestrial u trends from across the globe (with uneven and incomplete spatial distribution and differing periods of measurement) and found that the average trend was -0.013±0.11 for studies with more than 10 sites observing data for more than 50 years, which confirmed that drying was widespread. Assuming a linear trend this constitutes a >10% decrease in u over 50 years. A second objective was to confirm the declining rates of

Distinguishing the relative impacts of climate change and human activities on variation of streamflow in the Poyang Lake catchment, China

Volume 424, Issue 1, June 2013, Pages 85-99

Xu Yan Yi | Qi Zhang | Jian Li | Xianghua Li | Chong Yv

Under the background of global climate change and local anthropogenic stresses, many regions of the world have suffered from frequent droughts and floods in recent decades. Assessing the relative effect of climate change and human activities is essential not only for understanding the mechanism of hydrological response in the catchment, but also for local water resources management as well as floods and droughts protection. The Poyang Lake catchment in the middle reaches of the Yangtze River has experienced significant changes in hydro-climatic variables and human activities during the past decades and therefore provides an excellent site for studying the hydrological impact of climate change and human activities. In this study, the characteristics of hydro-climatic changes of the Poyang Lake catchment were analyzed based on the observed data for the period 1960-2007. The relative effect of climate change and human activities was first empirically distinguished by a coupled water and energy budgets analysis, and then the
Assessing the effects of urbanization on annual runoff and flood events using an integrated hydrological modeling system for Qinhuai River basin, China

Volume 246, Issue 6, September 2012, Pages 527-539
Jinkang Du | Li Qian | Hao Rui | Tianhui Zuo | Depeng Zheng | Youpeng Cui | C.Y. Xu

This study developed and used an integrated modeling system, coupling a distributed hydrologic and a dynamic land-use change model, to examine effects of urbanization on annual runoff and flood events of the Qinhuai River watershed in Jiangsu Province, China. The Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) was used to calculate runoff generation and the Integrated Markov Chain and Cellular Automata model (CA-Markov model) was used to develop future land use maps. The model was calibrated and validated using observed daily streamflow data collected at the two outlets of the watershed. Landsat Thematic Mapper (TM) images from 1988, 1992, 2000, Enhanced Thematic Mapper Plus (ETM+) images from 2001.

Suitability of the TRMM satellite rainfalls in driving a distributed hydrological model for water balance computations in Xinjiang catchment, Poyang lake basin

Volume 246, Issue 6, March 2012, Pages 52-18
Xiang Hu | Li Q | Zhang | Chong Yu Xing

Spatial rainfall is a key input to distributed hydrological models, and its accuracy heavily affects the reliability of simulation results. Most traditional interpolation techniques which obtain the spatial rainfall distribution from rain gauge data have some limitations caused by data scarcity and bad quality, especially in developing countries or remote locations. Satellite-based precipitation products are expected to offer an alternative to ground-based rainfall estimates in the present and foreseeable future. For this purpose, the quality and usefulness of satellite-based precipitation products need to be evaluated. The present study compares the difference of Tropical Rainfall Measuring Mission (TRMM) rainfall with rain gauges data at different space scales and evaluates the usefulness of the TRMM rainfall for hydrological processes simulation and water balance analysis at the Xinjiang catchment, located in the lower reaches of the Yangtze River in China. The results show at daily time step TRMM rainfall data are better at determining rain occurrence and mean values than at determining the rainfall extremes, and larger difference exists for the monthly and annual rainfall data. At monthly time scale, good linear relationships between TRMM rainfall and rain gauges rainfall data are rederived with the determination coefficient (R²) ranging between 0.81 and 0.85 for individual stations and 0.88 for annual average rainfall data, respectively. But the slope of regression line ranges between 0.93 for Yingtan and 0.64 for Youshu, indicating that the TRMM satellite is inclined to underestimate the monthly rainfall in this area. The simulation of daily hydrological processes shows that the Water Flow Model for Lake Catchment (WATLAC) model using conventional rain gauge data produces an overall good fit, but the simulation results using TRMM rainfall data are...