Current and Future Vulnerability of U.S. Water Supply to Shortage

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Abstract. The statistical-dynamical annual water balance model of Eagleson (Eagleson 1978a-g) is a pioneering work in the analysis of climate, soil and vegetation interactions. In this framework we apply Eagleson model to investigate water fluxes at a 5x5 km grid of study covering the entire conterminous U.S. in order to determine the vulnerability of water supply to droughts under scenarios of current and future population, economy and climate.

The model has been calibrated at a basin scale in order to reproduce current conditions, by comparing predicted long term means of annual yield with averaged streamflow measurements at 655 gaged basins distributed over the U.S. Streamflow estimates at the 8-digit basins level as well as specific stations datasets have been also used based upon availability and reliability. Transpiration efficiency and vegetal canopy coverage have been selected as calibration knobs.

The model provided a rather good match with current observations of water availability all over the U.S. and has been used to estimate future yields for the period 2001-2100. Future data of precipitation and temperature were provided at 10x10 km resolution by 3 General CIrculation Models under 3 different future scenarios.

The simulation of the annual water budget has been performed by means of a network simulation program, MODSIM, and takes into account predicted yields, instreamflow requirements, transbasins diversions, water consumptive use and storage for the 98 Assessment Subregions (ASR) covering the whole conterminous U.S.

Vulnerability of water supply has been evaluated at the ASR level as the probability of shortage experienced by each given ASR over a certain period of time.

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