Geophysical Research Abstracts, Vol. 8, 01445, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01445

Sensitivity of snow-dominated hydrologic regimes to global warming

D.P. Lettenmaier (1), J.C. Adam(1), and T.P. Barnett(2)

(1) Hydrology Group, University of Washington, Seattle, Washington, USA (dennis@u.washington.edu, jenny@hydro.washington.edu), (2) Climate Research Division, Scripps Institution of Oceanography, La Jolla, California, USA (tbarnett-ul@ucsd.edu)

A substantial part of the world's population depends on snowmelt-dominated river runoff for its water supply. The availability of this resource depends strongly on the seasonal accumulation and melt of mountain snowpacks. One common trait of all climate change predictions to date (warming of the near surface air temperature) has a profound negative impact on the hydrology of these rivers as it affects water supply, particularly in snowmelt dominated environments. Specifically, warmer air temperatures cause reductions in maximum snow accumulations, and earlier melt, and hence earlier spring runoff. These impacts occur almost independently of changes in future precipitation. This change in the seasonality of runoff is generally detrimental to water supply, as water demand usually is highest in the summer, when runoff, aside from that derived from snowmelt, is lowest. While reservoir systems have been designed to buffer against seasonal and interannual variations in runoff, most reservoir systems globally are not large enough to effectively replace the natural snowpack storage that would be lost due to global warming. We show the locations of rivers where snowmelt accounts for a substantial amount of the annual runoff globally, and review past studies that show the extent of changes in mountain snowpack over the last century, and projected changes for the next century. We also review past studies that have evaluated the extent to which changes in reservoir operating policies could mitigate the effects of changes in snowmelt runoff in the Columbia River basin of the northwestern U.S.