Geophysical Research Abstracts
Vol. 12, EGU2010-7527, 2010
EGU General Assembly 2010

Global investigation of vegetation impact on mean annual catchment evapotranspiration

Murray C. Peel (1), Thomas A. McMahon (1), and Brian L. Finlayson (2)

(1) Department of Civil & Environmental Engineering, University of Melbourne, Victoria, Australia (mpeel@unimelb.edu.au),
(2) Department of Resource Management and Geography, The University of Melbourne, Victoria, Australia.

Historically, relationships between catchment vegetation type, evapotranspiration and runoff have been assessed primarily through paired catchment studies. The literature contains results from over 200 of these studies from around the world but two factors limit the applicability of the results to the wider domain. Firstly, catchment areas are generally small (<10 km2). Secondly, the range of climate types is narrow, with temperate (Köppen C) and cold (Köppen D) climate types in the majority. Here we present results from a global assessment of the impact of vegetation type on mean annual catchment evapotranspiration for a large, spatially and climatically diverse dataset of 699 catchments. This assessment is based on analysis of areal precipitation, temperature, runoff, and land cover information from each catchment, which differs from the paired catchment methodology where streamflow responses to a controlled land cover change are assessed. When catchments are grouped by vegetation type, any evidence of differing vegetation impact on actual evapotranspiration will be observed through differences in mean annual actual evapotranspiration, defined as precipitation minus runoff.

Stratifying catchments by climate type was observed to be important when assessing the vegetation impact on evapotranspiration. Tropical and temperate forested catchments had significantly higher median evapotranspiration ($\sim$170mm and $\sim$130mm, respectively) than non-forested catchments. Cold forested catchments unexpectedly had significantly lower median evapotranspiration ($\sim$90mm) than non-forested catchments. No significant difference in median evapotranspiration was found between temperate evergreen and deciduous forested catchments, though sample sizes were small. Temperate evergreen needleleaf forested catchments had significantly higher median evapotranspiration than evergreen broadleaf forested catchments, though again sample sizes were small. The significant difference in median evapotranspiration between temperate forested and non-forested catchments persisted for catchments with area <1,000km2, but not for catchments with area $\geq$1,000km2, which is consistent with the expectation that the impact of differing vegetation types on evapotranspiration diminishes as catchment area increases. The results presented here are consistent with those from reviews of paired catchment studies. However, the value of a diverse hydroclimatic dataset for assessing the vegetation impact on evapotranspiration is demonstrated.