Geophysical Research Abstracts
Vol. 21, EGU2019-6245, 2019
EGU General Assembly 2019

Analysis of streamflow response to land cover changes using a distributed hydrological modelling framework in Savannas of Semi-Arid Australia

Ben Jarihani (1), Roy Sidle (2), Christian Roth (3), Rebecca Bartley (3), and Scott Wilkinson (4)

(1) University of the Sunshine Coast, Sustainability Research Centre, FABL, Sippy Downs, Australia (bjarihan@usc.edu.au), (2) Mountain Societies Research Institute, University of Central Asia, Khorog GBAO, Tajikistan 736000, (roy.sidle@ucentralasia.org), (3) CSIRO Land and Water, Brisbane, Queensland 4102, Australia, (Rebecca.Bartley@csiro.au; Christian.Roth@csiro.au), (4) CSIRO Land and Water, Canberra 2601, Australia, (Scott.Wilkinson@csiro.au)

Strong scientific evidence indicates increased quantities of sediment are entering the Great Barrier Reef lagoon and grazing lands are a key source. Understanding the effects of land cover changes caused by grazing management on surface hydrology is important for water resources, controlling erosion and assessing land management practices. A distributed hydrological modelling platform, wflow, (that was developed as part of Deltares's OpenStreams project) is used to assess the effect of ground cover on runoff generation processes. The model was applied to Weany Creek, a small catchment (13.6 km2) on Granodiorite soils in the Burdekin Basin, North Australia. Satellite and drone-based ground cover data, high resolution topography from LiDAR, soil properties, and distributed rainfall data were used to parameterise the model. Wflow was used to predict total runoff, peak runoff, time of rise, and lag time for several events of varying magnitudes and antecedent moisture conditions. We selected a series of hydrographs with different magnitudes from recorded runoff data (2000-2017) to calibrate the model., and another set of hydrographs were used to evaluate model performance by comparing observed and predicted stormflow hydrograph attributes using the Nash Sutcliffe efficiency metric. By using a distributed model, spatiotemporal patterns of overland flow occurrence across the catchment were also evaluated. The results show that a process-based distributed model can be calibrated to simulate spatial and temporal patterns of runoff generation processes, to help identify the relative influences of canopy interception, bare ground extent, soil surface condition and soil moisture storage on rainfall retention. This understanding of runoff generation helps to identify objectives for grazing management and to quantify links between vegetation cover and erosion rates which are influenced by runoff volumes. In particular, we conclude that increasing vegetation cover can reduce surface runoff, to significantly reduce annual gully erosion rates and gully extent in this dissected landscape.