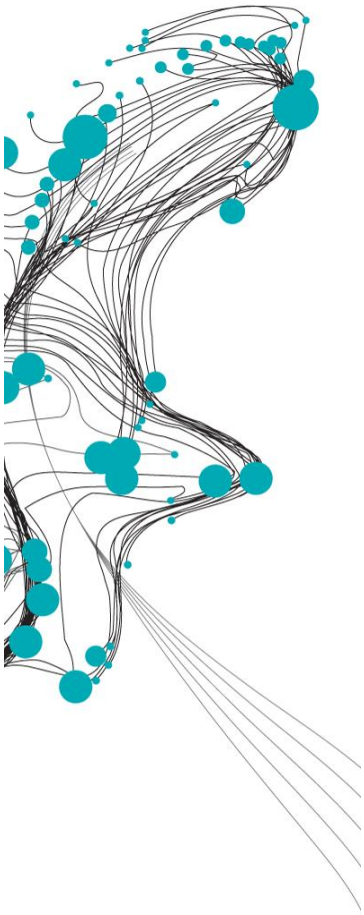
THE ATTRIBUTION OF CHANGES IN STREAMFLOW TO CLIMATE AND LAND USE CHANGE FOR 472 CATCHMENTS IN THE UNITED STATES AND AUSTRALIA



Climate change and land use change are ongoing features which affect the hydrological regime by changing the rainfall partitioning into actual evapotranspiration and runoff. A data-based method has been previously developed to attribute changes in streamflow to climate and land use change. Since this method has not been often applied, a large sample attribution study by applying this method to catchments in different parts of the world will provide more insight in the water partitioning and will evaluate the attribution method. The results can be used by water managers of the 472 studied catchments to expand their understanding of the system.

The attribution method calculates the water and energy budget of a catchment which could be translated to climate and land use induced changes in streamflow between two periods: a pre- and post-change period. Some geographical features (e.g. aridity index, average catchment slope, and historical land use) were expected to explain the results. To evaluate the attribution method the results are compared with trends in potential evapotranspiration and precipitation and with documented land use changes.

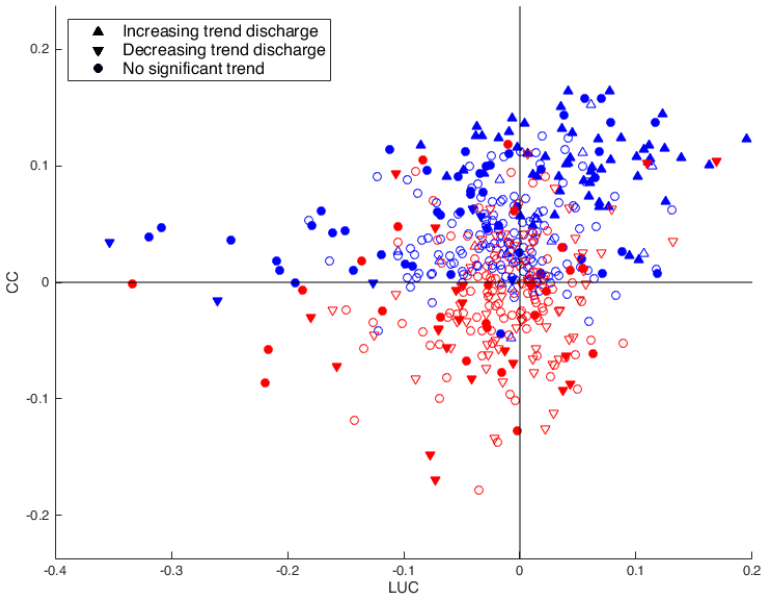


Figure 1: The contribution of climate change (CC) and land use change (LUC) for the American (blue) and Australian (red) catchments. The filled symbols indicate a significant change in LUC and/or CC values between the two periods. Open symbols indicate that this change is not significant.

The results (Figure 1) indicate that in general an increase (decrease) of the annual discharge is caused by deforestation (afforestation) and a wetter (drier) climate. A difference between the American and Australian catchments is present. The changes in streamflow of American catchments are caused by a wetter climate, while these changes in Australian catchments are caused by a wetter or drier climate. Geographical features which explain the results of the attribution method are the aridity index and the historical land use. The average catchment slope seems to be less well explaining the results however this could be the result of only including catchments with a relatively flat slope. The trends in potential evapotranspiration and precipitation support the results of the attribution method and the documented land use changes support the values of land use induced changes.

Based on the assumption that climate change will only affect potential evapotranspiration and precipitation, but not the actual evapotranspiration it is reasonable to assume that the land use induced change is overestimated and the climate induced change is underestimated, both to a small extent.

Generally, the method performs quite well based on documented land use change and trends in precipitation and evapotranspiration. It also can be concluded that the results are best explained by the location of the catchment, the aridity index and historical land use.

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