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Impact of deforestation on local precipitation patterns over the Da River basin, Vietnam

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Change in land cover, e.g. from forest to bare soil, might severely impact the hydrological cycle at the river basin scale by altering the balance between rainfall and evaporation, ultimately affecting streamflow dynamics. These changes generally occur over decades, but they might be much more rapid in developing countries, where economic growth and growing population may cause abrupt changes in landscape and ecosystem. Detecting, analysing and modelling these changes is an essential step to design mitigation strategies and adaptation plans, balancing economic development and ecosystem protection. In this work we investigate the impact of land cover changes on the water cycle in the Da River basin, Vietnam. More precisely, the objective is to evaluate the interlink between deforestation and precipitation. The case study is particularly interesting because Vietnam is one of the world fastest growing economies and natural resources have been considerably exploited to support after-war development. Vietnam has the second highest rate of deforestation of primary forests in the world, second to only Nigeria (FAO 2005), with associated problems like abrupt change in run-off, erosion, sediment transport and flash floods. We performed land cover evaluation by combining literature information and Remote Sensing techniques, using Landsat images. We then analysed time series of precipitation observed on the period 1960-2011 in several stations located in the catchment area. We used multiple trend detection techniques, both state-of-the-art (e.g., Linear regression and Mann-Kendall) and novel trend detection techniques (Moving Average on Shifting Horizon), to investigate trends in seasonal pattern of precipitation. Results suggest that deforestation may induce a negative trend in the precipitation volume. The effect is mainly recognizable at the beginning and at the end of the monsoon season, when the local mechanisms of precipitation formation prevail over the large scale ones.