

Spatio-temporal optimization of agricultural practices to achieve a sustainable development at basin level; framework of a case study in Colombia

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The flood events present during the last years in different basins of the Colombian territory have raised questions on the sensitivity of the regions and if these regions have common features. From previous studies it seems important features in the sensitivity of the flood process were: land cover change, precipitation anomalies and those related to impacts of agriculture management and water management deficiencies, among others. A significant government investment in the outreach activities for adopting and promoting the Colombia National Action Plan on Climate Change (NAPCC) is being carried out in different sectors and regions, having as a priority the agriculture sector. However, more information is still needed in the local environment in order to assess where the regions have this sensitivity. Also the continuous change in one region with seasonal agricultural practices have been pointed out as a critical information for optimal sustainable development. This combined spatio-temporal dynamics of crops cycle in relation to climate change (or variations) has an important impact on flooding events at basin areas. This research will develop on the assessment and optimization of the aggregated impact of flood events due to determine the spatio-temporal dynamic of changes in agricultural management practices. A number of common best agricultural practices have been identified to explore their effect in a spatial hydrological model that will evaluate overall changes. The optimization process consists on the evaluation of best performance in the agricultural production, without having to change crops activities or move to other regions. To achieve this objectives a deep analysis of different models combined with current and future climate scenarios have been planned. An algorithm have been formulated to cover the parametric updates such that the optimal temporal identification will be evaluated in different region on the case study area. Different hydroinformatics techniques for optimization and uncertainty analysis are included in a framework that will solve partially the computational load found in the pre-runs of the case study. The work will focus on the region Fuquene basin in Colombia but this will not limit the scope of this study to have general methodological applications to other areas.

Key words
Modelling, WFlow_sbm, agriculture practices, climate change, optimization, flooding, spatial and temporal analysis