Challenges of flood monitoring in the Senegal river valley using multi-temporal data

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In Sub-Saharan Africa, floodplains wetlands play an important role for livelihoods and economy, especially for agriculture and fishing. However, tropical rivers flows are increasingly modified by climate change and dam regulation. In the Senegal river valley, the annual flood, from August to November, is an important water resources creating ecosystems services for people. Senegal river basin face to hydrological changes, due to rainfall diminution during the 1970's and building of large dams during 1980's to secure water resources. Water management and development of irrigation have modified the floodplain functioning. Flood recession agriculture, grazing and fishing are now confronted to a high uncertainty about floods level, duration and extension.

Thus, spatiotemporal information of flood extension and duration are important for local communities and stakeholders to ensure food security and ecosystems services. Multi-temporal satellite data demonstrates an important applicability for flood mapping.

Aims of this work is to present potentiality of using multi-temporal data from MODIS and new satellite Sentinel-2 for flood monitoring in a Sahelian context. It will also discuss the potential of flood mapping for the analysis of the dynamics of riparian vegetation and flood recession agriculture. This study uses two datasets to explore flood monitoring in Senegal river valley. Firstly, MODIS 8-days data (MOD09A) are first used, because of its temporal resolution of 8 days covering the period from 2000 to 2016. However, MODIS data are limited due to a low spatial resolution, that's why we also use Sentinel-2 data, available since summer 2015.

The data were processed by constructing NDWI time-series (NDWI threshold is empirically defined) and extracting NDWI values for each inundated pixel during flood. First results demonstrate that using MODIS on a large scale is enough for analyze interannual variability of the flooded surfaces. We present here maps of flood frequency of the pixels between 2000 and 2016. MODIS spatial resolution is insufficient to analyze the interaction between flood hydrology and vegetation dynamics, whereas flood monitoring by Sentinel data seems to offer better potential. We illustrate our observations through a cartographic example of these interactions at local scale in Senegal river floodplain.