Monitoring Sahelian temporary ponds using MODIS/TERRA imagery

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Several studies showed that remote sensing data appear as an appropriate solution for accurately locating ponds over large areas, but there are few studies on the temporal aspect to monitor their dynamics. Here, we presented a method to monitor ponds hydrological dynamics (filling/emptying) in arid lands using a time series of MODIS/TERRA images.

We studied two consecutive rainy seasons 2001 and 2002 for which we had corresponding measurements of daily water level data on several ponds. The study was conducted within a radius of approximately 13*13 km around the village of Barkedji (15.22° N, 14.86° W) located in the Ferlo region in North-East Senegal. This area is characterized by a complex and dense network of ponds that are filled during the rainy season. To evaluate MODIS images ability to capture pond dynamics, we calculated the correlation between the NDVI pixel value and the water level data collected at three ponds (Mous, Furdu and Barkedji) using an empirical temporal cross-covariance method. The temporal study showed very good results with a maximum of cross-covariance (Mous: *cov*=0.69; Furdu: *cov*=0.77; Barkedji: *cov*=0.83) for Δ t=-6 days for Mous and Furdu and Δ t=-10 days for Barkedji pond, suggesting that multi-temporal MODIS-NDVI data can prove very efficient for monitoring the state and dynamics of little ponds (about 2000 m²) in arid lands.