Artificial reservoirs monitoring using all the available Landsat and Resourcesat archives in Central India: from the Green Revolution until Now

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We use all the available Landsat and Resourcesat archives to analyze the long term fluctuations in terms of water spread of three artificial reservoirs in the state of Telangana in Central India. This State is characterized by a semi arid climate with a short rainy season from June to September. In the same time, agriculture highly depends on surface and groundwater for irrigation and the capital city Hyderabad is facing a quick economic and demographic growth. Most of the water consumed by urban activities comes from surrounding artificial reservoirs while groundwater is used as a complementary source. It is the first time, a scientific study analyses the fluctuations of these water resources over the last 40 years.
The satellite archives used are long enough to follow the evolution of these reservoirs from the Green Revolution of the seventies to the beginning of the 21st century and the growth of Indian economy in the context of changing climate. By coupling these satellite images to ground data, we can reconstruct the fluctuations of the volumes of water stored in these reservoirs from 1973 to 2017. The water spreads were extracted using an automatic chain of treatments written in Python and using GRASS GIS modules.
Despite some gaps in the data due to the sensors or to the presence of clouds during the short rainy season, it is possible to analyze the intra and inter annual fluctuations in terms of water spreads for each reservoir. Both intra and inter annual fluctuations are sizable. Obviously, the maximum extents occur at the end of the rainy season and the minimum at the end of the dry season. The largest reservoir may fluctuate from 7 km^2 to 64 km^2 within the same year. On the whole period, for the same reservoir, the water extent vary from 3 km^2 to 155 km^2. Even if it is not easy to detect any long term trend, the intra-annual fluctuations are higher during the last ten years. In parallel, the government data on groundwater dynamic across the state show an increase of aquifer exploitation since the last decade as alternative to surface water. These increasing fluctuations confirm the scaling-up of human impact on water resources. Finally this study offers an accessible and cost- efficient monitoring method to improve the management of such sensitive resource.