

INFERRING FLUCTUATIONS OF THE AQUIFER BY MONITORING THE AREA OF SMALL LAKES IN A BRAZILIAN SAVANNA REGION USING A TEMPORAL SEQUENCE OF 50 LANDSAT IMAGES

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ABSTRACT:

Water availability is subjected to a complex dynamic involving fluctuation of the aquifer level, itself subject to climatic and edaphic factors as well as land use and land cover. Human pressure can have a drastic effect on the aquifer level, the effect of which are often only noticeable after years of continuous usage. In this article we are using a temporal sequence of 50 Landsat images to study a complex of small lakes in Northern Minas Gerais. Our objective is to quantify the fluctuations of the aquifer for the 1984-2009 period by monitoring the area of these lakes bi-yearly and compare it with the hydric balance to understand its evolution. Having no measurements of the aquifer, we developed a methodology entirely based on remote sensing and meteorological data. Because these lakes are very small, the 30m resolution of the Landsat data rendered very poor results. Based on the postulate that the water pixels behave like a continuous surface, we increased the resolution to 5m using minimum curvature interpolation. Two methods were tested for extracting the lake surface pixels: supervised classification and thresholding of the normalized difference water index. The results show that the interpolated Landsat data compared well with a high resolution Ikonos image of the same date and can improved the contouring of water bodies. For extracting the water pixel the classification approach performed better by about 15%. Statistical tests showed that the lakes have been systematically decreasing but that these changes cannot be attributed to climatic factors.

TOPIC: Change detection and process modelling

ALTERNATIVE TOPIC: Remote sensing applications