Geophysical Research Abstracts
Vol. 21, EGU2019-19068, 2019
EGU General Assembly 2019

Detection of temporary surface water bodies in Niger using high resolution imagery

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Temporary surface water bodies in sub-Saharan areas have important socio-cultural values, providing freshwater for population and many agro-pastoral services. Nevertheless, they can be the perfect habitat for insects and pests, thus endangering human health. Moreover, temporary water bodies can cover vast areas of cities and villages hindering the practicability of the roads networks. Addressing the problem within villages and cities requires not only the identification of the extension and position of the water bodies, but also of their seasonal maximum potential extension. Temporary surface water bodies are usually remote sensed from satellite imagery. This technique is very effective on large scale, although limited at local scale by temporal and spatial resolutions of satellites. Traditional surveys can be time-consuming and limited by the hard surveying condition of the area, a valuable alternative to collect punctual and high resolution data are the UAVs (Unmanned Aerial Vehicles). This contribution presents a semi-automatic method to detect temporary surface water bodies at local scale using UAV high resolution imagery. It was tested in two villages of the Tillaberì region, South-West Niger. A digital terrain model (DTM, 10 cm grid) generated from UAV imagery and analysed to localize the depressions of the area with fill sink algorithm. The depressed areas were classified based on their depth and extension. The areas presenting high depth and extension were considered as potentially interested by temporary surface water bodies. The method was validated by the comparison to radiometric information (6cm/pixel) collected from near infrared (IR) and visible (Red Green Blue) sensors mounted on UAV during the rainy season, in a period of minimum expansion of temporary surface water bodies. The radiometric data were elaborated in a Normalized Difference Water Index (NDWI); which information correspond to the one obtained from the DTM. The proposed methodology appears solid and effective, and allows the identification of those areas that may be interested by temporary stagnant water in case of abundant precipitations. The cross-reading of radiometric and digital elevation information provides a high resolution localization of present, and potentially present, temporary surface water bodies.