CHANGE DETECTION OVER A SEMI ARID AREA FROM A DATA FUSION APPROACH (OPTICAL, RADAR AND RAINFALL)

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Desertification, defined as the degradation of soil and vegetation cover affects more than 40% of global land surface [1]. Sahelian region is, since several decades, an area in crisis. Its 44 millions inhabitants have to deal with a significant water deficit which is the consequence of a series of endemic droughts. Several studies in optical remote sensing have been proposed to contribute to the struggle against desertification and to detect change in semi-arid lands. [2] and [3] noted that degradation of arid lands tends to increase the amount of light reflected from the land in almost cases, generally because vegetation density decreases and subsoil may be exposed. In this way, to locate the degraded or degrading land it is necessary to identify places showing the change in reflectance. [4] evaluated in detail the indicators of desertification process in semi-arid lands by making use of temporal satellite information along with the surface and statistical data with the aid of a GIS. The indicators were correlated to the surface information to establish the severity of desertification and factors helping the desertification process to continue.
It is interesting to note that several authors focused on the detection of changes without given any information [5], [6] on the observed changes.

To contribute to the struggle against desertification, our main objective is to both analyse and characterize the changes in surface conditions (vegetation and soil) over a semi arid area [12.5º-15ºN; 1.5º-4ºE] located in the southwest of Niger.

Four steps composed the methodology: 1) characterization of the surface conditions by means of Principal Components Analysis; 2) characterization of the changes through post-

classification comparisons and change detection technique; 3) changes quantification by means of a Principal Components Analysis applied to synthetic aperture radar (SAR) image differences; 4) the improvement of the changes and their characterizations using auxiliary data and the Dempster-Shafer theory of evidence [7]. The proposed approach will combine SAR remote sensing data (ERS 1&2, RADARSAT-1 and ENVISAT) acquired from 1993 to 2005 and auxiliary data (map of land occupation, rainfall). It will take advantage of multi-temporal, multi-angular and multi-polarization configurations of SAR data and auxiliary information to not only detect but also to characterize the changes in surface conditions. The results will be helpful for a better understanding of the spatial and temporal dynamics of surface characteristics and will be of great use to monitor the desertification process.

References

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