Using mathematical morphology from Geoeye satellite image for automated extraction of dykes lineaments. Application to field Tasiast geology, Reguibat ridge, Moroccan Sahara

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In recent years, the use of high spatial resolution satellite images in geological environments study, especially in the detection of lineaments, hasn't stop evolving. Along with the progress of digital techniques in image processing, several approaches have been developed to detect intuitively and extract lineaments. For this purpose, extraction techniques such as the visual photo-interpretation and the conventional classification algorithms are used. Certainly these extraction methods lead to a result close to the reality of the field, but they have inherent operational limitations. In this document, an approach based on the use of mathematical morphology set algorithms has been developed in order to automatically extract dyke lineaments. Mathematical morphology has been applied to a GeoEye satellite image acquired on 17/07/2005, South West side of the Reguibat ridge (Moroccan Sahara). This image underwent a set of processing, mainly based on textural filters of a co-occurrence matrix (5x5), and followed by a directional filter (5x5) ideal for lineaments detection. Then morphological operators were applied with a structuring element of a (3x3) neighborhood matrix. To validate the accuracy of the results, the statistical Kappa coefficient has been calculated using the geological map 1/50.000, and is equal to 70.7 %. It is therefore concluded that the use of mathematical morphology coupled with textural filters and lines detection algorithms for dyke lineaments extraction, provides greater accuracy and more details than traditional extraction methods that are used. The methodology suggested will thus enable to review and update the existing lineaments maps, as may be requested for the production of new map releases.