Chapter 6
Investigating the Pixel Quality Influence on Forecasting Vegetation Change Dynamics: Application Case of Tunisian Olive Sites

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ABSTRACT

To date, analysis of remotely sensed images remains a big challenge. Despite its high quality and free availability, scientists ask more questions about the reliability of the existent works and developed tools. Indeed, the input choice is under investigation in order to minimize the imprecision within the work's methodology and results. In order to construct a good forecasting model, the researcher focuses on the first place on the data collection. Traditionally, this step is usually neglected, or it does not attract a sufficient amount of attention. Therefore, the obtained forecaster may be trained on the false data sets which makes more questions about its reliability. This chapter investigates the influence of the presence of mixed pixel on the forecasting accuracy final results of vegetation dynamics tracking. The authors also use different similarity measures to differentiate between the pure and the mixed time series.

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INTRODUCTION

Geographic Information Systems (GIS) and Remotely Sensing (RS) have many benefits for the scientific community. They provide sophisticated tools and data for a wide range of applications. Indeed, they generally satisfy all users' main objectives by its rich, freely available materials (Benz et al., 2004).

Despite their success, it remains a challenge using GIS and RS without referencing to the imprecision. This singularity is inherent to spatial data. Most importantly, it has a direct influence on the accuracy and reliability of any spatial analysis results. Particularly, land cover change tracking and forecasting do mainly depend nowadays on previously mentioned tools. Therefore, special attention should be given in this field to minimize the effect of imprecision on the outputs. Many researchers tried to tackle this problem (Ferchichi et al., 2017). Works on data quality and reliability are exponentially increasing giving birth to different communities and national/ international research initiatives (Devillers et al., 2010).

Among the land cover change, we specifically focus on vegetation cover change. This area covers different aspects as well, e.g. deforestation, drought, erosion, agriculture, forest fires and so on (Thenkabail and Lyon, 2016). Green cover represents an essential element for the human kind survival because it is the main home for both fauna and flora. Thanks to the sensitivity of green plants to wavelengths, several products are offered by the remote sensing scientific community for tracking vegetation cover dynamics. These tools are known by their indirect contact, ready-to-use tools and affordable cost. We particularly mention the normalized vegetation index (NDVI) and the enhanced vegetation index (EVI). Both indices are mainly based on mathematical operations applied to red and near infrared wavelengths. Whether the application focuses on the spatial variation (deforestation, desertification, and so on) or it is a pixel-based analysis (phenological metric extraction, yield production, diseases, etc), the spatial metric choice matters. In this work, the authors, principally, discuss pixel-based analysis in vegetation change tracking.

Certainly, high temporal resolution is a primordial criterion when it comes to vegetation dynamics studies for rapid changes tracking. However, despite the sophisticated technology of satellites, a trade-off must be made between spatial, spectral, and temporal resolutions (Gavaert et al., 2015). Some products may offer inadequate temporal resolution due to missing values, clouds and so on (Lhermitte et al., 2011) such as the case of LANDSAT and Sentinel. At the same time, they provide a good spatial resolution. At contrast, a good temporal resolution is offered by moderate spatial resolution sensors such as the case of Moderate-Resolution Imaging Spectroradiometer (MODIS) products. In developing countries such as African ones, this particularity presents a great dilemma. Generally, except their natural green spaces, such as forests, agriculture areas are small due to small farmers' strategy.