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Soil moisture and NDVI spatial dynamic through Recurrence Plots

Ana Maria Tarquis
Universidad Politecnica de Madrid, ETSIAAB-CEIGRAM, Matematica Aplicada, Madrid, Spain (anamaria.tarquis@upm.es)

Food security is of global concern, and land-based production has to meet the population demands. To define an optimum tradeoff between agricultural expansion and intensification on the one hand, and sustainable ecosystem service provision on the other hand, reliable information about the dynamic patterns of crop lands and pasture areas is required. In this context, the pasture lands are critically important. First, it suffers from enormous land conversion pressure, and second, sustainable land use is a key concern in ecosystems services.

Satellite image data have become an important source of information for monitoring vegetation and mapping land cover at several scales. Beside this, the distribution and phenology of vegetation is largely associated with climate, terrain characteristics and human activity. There are several indexes to study vegetation activity, but the most used for monitoring vegetation is NDVI (Normalized Difference Vegetation Index), calculated from the spectral bands of red (RED) and near infrared (NIR), obtaining the value according to relationship: [(NIR - RED) / (NIR + RED)]. During the years 2001-2010, monitoring was conducted in selected pasture plots areas of Colmenar Viejo (Madrid, Spain). Eight day compose satellite images of MODIS, with a resolution of 500x500 m, were used to analyse the NDVI time series.

There are several ways to analysed time series, being one of them the Recurrence Plots (RP). RP, introduced by Eckmann et al. (1987), are a simple way to visualize the periodic or chaotic behaviour of a dynamical system through its phase space (Valdiviezo et al., 2014). These plots have proven being useful for investigating the natural processes, which can have quite distinct recurrent behaviours including vegetation indexes (Li et al., 2008).

In this work, we will show and discuss these NDVI series and applied a recurrence quantification analysis (Mocenni et al., 2011) to study the pasture dynamics during these years.

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