



Multifractal characteristics of NDVI maps in space and time in the Community of Madrid (Spain)

Juan J. Martín Sotoca (1), Antonio Saa-Requejo (1,2), Juan B. Grau (3), Ana M. Tarquis (1,4)

(1) CEIGRAM, ETSI Agrónomos, Universidad Politécnica de Madrid (UPM), Spain., (2) Dpto de Producción Agraria, UPM, Spain, (3) Grupo de Automatización en Señal y Comunicaciones (GASC), UPM, (4) Dpto de Matemática Aplicada, UPM, Spain (anamaria.tarquis@upm.es)

Satellite information has contributed to improve our understanding of the spatial variability of hydro-climatic and ecological processes. Vegetation activity is tightly coupled with climate, hydro-ecological fluxes, and terrain dynamics in river basins at a wide range of space–time scales (Scheuring and Riedi, 1994). Indices of vegetation activity are constructed using satellite information of reflectance of the relevant spectral bands which enhance the contribution of vegetation being Normalized Difference Vegetation Index (NDVI) widely used. How can we study such a complex system?

Multifractals and fractals are related techniques mainly used in physics to characterize the scaling behaviour of a system; they differ in that fractals look at the geometry of presence/absence patterns, while multifractals look at the arrangement of quantities such as population or biomass densities (Saravia et al., 2012). Scaling laws are an emergent general feature of ecological systems; they reflect constraints in their organization that can provide tracks about the underlying mechanisms (Solé and Bascompte, 2006).

In this work, we have applied these techniques to study the spatial pattern through one year of NDVI maps. A rectangular area that includes the Community of Madrid and part of the surroundings, consisting of 300 x 280 pixels with a resolution of 500 x 500 m² has been selected and monthly NDVI maps analyzed using the multifractal spectrum and the map of singularities (Cheng and Agterberg, 1996). The results show a cyclical pattern in the multifractal behaviour and singularity points related to river basin networks (Martín-Sotoca, 2014).

References

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