



Scale and space dependencies of Nitrogen variability

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In this study we use the relative entropy ($E(\delta)$) to investigate residual effects on wheat and grain, biomass and nitrogen content, of fertigation treatments applied to a previous crop. The wheat crop covered nine subplots from a previous experiment on melon response to fertigation. Each subplot had previously received a different level of applied nitrogen and plants from the previous melon crop had already taken up the applied nitrogen. Many factors affect these variables, causing it to vary at different scales creating a non uniform distribution. $E(\delta)$, and their increments between scales, were used to identify the scale at which the variable had a maximum structure and compare with the scaling behavior of the nitrogen applied. The $E(\delta)$ is particularly appropriate for this because of does not require any prior assumptions to the structure of the data and it is easy to calculate.

The results showed that the applied nitrogen through fertirrigation dominated the wheat and grain biomass response as well as nitrogen content of the whole plant; surprisingly grain nitrogen content didn't show the same structure than the applied nitrogen. At the same time, there was a noticeable structure variation in the biomass and nitrogen content at the smaller scales that correspond to the melon cropping due to uptake of the applied nitrogen by the previous crop. The $E(\delta)$ and the increments in $E(\delta)$ help us to detect changes in the scaling behavior of all the variables studied, showing at which scale there is a maximum structure. These results are in agreement with previous studies.

References

- Castellanos, M. T., Cartagena, M. C., Arce, A., Ribas, F., Cabello, M. J., and Tarquis, A. M. 2010. Efficiency Indexes for melon crop optimization, *Agron. J.*, 102, 716–722.
- Milne, A.E., Castellanos, M. T., Cartagena, M. C., Tarquis, A. M. and Lark, R. M. 2010. Investigating the effect of previous treatments on wheat biomass over multiple spatial frequencies. *Biogeosciences*, 7: 2739-2747.
- Tarquis, A.M., N.R. Bird, A.P. Whitmore, M.C. Cartagena, and Y. Pachepsky. 2008. Multiscale analysis of soil transect data. *Vadose Zone J.* 7: 563-569.

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