Beyond the geographic variability of environmental factors: consequences of the statistical distributions of species abundance for detailed regional dynamic vegetation models

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Global and regional dynamic vegetation models use correlational approximations to estimate composition of coarse-resolution cells in terms of vegetation categories (species or, most commonly, functional types). Under this approach, a measure of environmental suitability calculated for each cell determines its composition. As a result, all cells under the same environmental conditions are set to have identical composition.

This approach might be appropriate as an initial step at global scale and for a very limited set of categories. However, regional-scale dynamic models require more detailed descriptions of vegetation composition, and ignoring the biotic spatial variability that is often present within environmentally-homogeneous conditions may cause important errors.

Our analysis of inventory plots of evegreen Mediterranean forests in NE Spain clearly shows bimodal distributions of P. halepensis and Q. ilex abundances for given values of annual drought length. This result implies that predictions made on the basis of observed mean abundances for homogeneous environmental conditions (here resumed by annual drought length) are seriously flawed. We discuss the possible ecological processes underlying these statistical distributions and the ways in which realistic statistical distributions of abundances, and not only the means, could be incorporated into regional- scale dynamic vegetation models.

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