Geophysical Research Abstracts, Vol. 7, 05624, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05624

Sampling design assessment for agrosystem monitoring based on virtual landscape modelling. Application to soil phosphorus contents

L. Sorel (1), C. Walter (1), T. Chauvet (1,2)

(1) Agrocampus-INRA UMR SAS, Rennes, France, (2) Now at DATACEP, Paris, France
(sorel@agrocampus-rennes.fr / Fax: 0(+33) 2-23-48-54-30 / Phone: 0(+33) 2-23-48-59-42)

Agrosystem monitoring, particularly of their soils, appears difficult to carry out due to high spatial variability, combination of short and long term temporal variations and large areal extent of the support. Nevertheless, increasing regulation constraints require the implementation of survey programmes to assess environmental policies efficiency. To assist the cost-effective design of future monitoring networks, we propose a method based on virtual landscapes to test the accuracy of several sampling schemes differing by their sampling strategies and intensities.

Considering its implication in soil and water quality issues, soil phosphorus content was chosen as our study topic. A realistic distribution of soil phosphorus was generated on a 15km by 15km area, using known spatial structures and crop field patterns. The evolution of this virtual landscape was modelled over 50 years according to 3 different manure spreading scenarios which might be adopted by farmers. These spatio-temporal evolutions served as a support to test the accuracy of the following sampling designs: regular grid, stratified sampling based either on initial or on current land use, transect sampling and stratified sampling based on topography. Two criteria were considered to evaluate the sampling schemes accuracies: annual RMS between sampled and virtual mean contents, and correlation with evolution trends over time.

The results are presented to highlight the influence of sampling strategy and sampling density, with respect to the different fertilisation practices. The results show that sampling strategy is a crucial choice. Transect sampling appeared to be systematically biased. In other respects, by lowering sampling densities, all strategies proved to be less efficient to detect soil phosphorus content evolution trends. However, a low sampling

density can be compensated for, to a certain extent, by a stratified sampling based on an other distributed parameter (such as land use or topography) involved in the biogeochemical transformations of the surveyed variable. Therefore testing sampling schemes on modelled virtual landscapes allows efficient and cost-effective design of survey programmes.