The 36th International Symposium on Remote Sensing of Environment,
11 – 15 May 2015, Berlin, Germany, ISRSE36-210

DISCRETE VERSUS CONTINUOUS SPATIAL REPRESENTATION OF HABITATS FOR MODELING DISTRIBUTION PATTERNS OF AVIFAUNA

D. Sheeren[a,*], S. Lefevre[a], S. Bonthoux[b]

[a] University of Toulouse, INP-ENSAT, UMR 1201 DYNAFOR, 31326 Castanet-Tolosan, France – david.sheeren@ensat.fr
[b] ENSNP, UMR 7324 CITERES, Blois, France – bonthoux.sebastien@gmail.com

THEME: BIOD — Forests, biodiversity and terrestrial ecosystems.

KEY WORDS: unclassified imagery, species diversity modeling, bird, GLM

ABSTRACT:

Remote sensing offers several ways to represent habitats of biological organisms. The one that predominates is discretizing the landscape into homogeneous spectral units to establish land cover maps. Although widely used, this conceptualization of geographic space is not necessarily the most appropriate because of errors in land cover maps and the existence of *a priori* on the perception of habitat selection process by organisms. An alternative approach is to keep the continuous view of the landscape provided by unclassified satellite imagery. Spectral variability of earth observation data may reflect physical or functional properties of habitats. Therefore, this information can be a useful predictor of species diversity. In this study, we analyzed the impact of the representation of habitats to model the patterns of bird distribution in France. We compared the performance of bird-habitat models based on continuous and discrete information derived from several data sources.

Bird data were obtained from the French Breeding Bird Survey. These data were acquired in 2010 following a standardized sample scheme based on a grid of 2x2km cells. In each cell randomly selected (n=1091), 10 bird point counts were recorded. Species richness of bird specialists and generalists of habitat were estimated as response variables in each cell. Continuous earth observation data were derived from the Terra-MODIS products of 2010: time series of *Normalized Difference Vegetation Index* (NDVI, MOD13Q1), *Enhanced Vegetation Index* (EVI, MOD13Q1), and *Land Surface Temperature* (LST, MOD11A2) as well as the *Vegetation Continuous Fields* product (VCF, MOD44B). Discrete representations of habitats were obtained from the CORINE Land Cover map (CLC) and a functional non-supervised classification of the MODIS NDVI time series. For each type of data, several variables were calculated within each cell of the bird survey as predictors of species community patterns. We used generalized linear models (GLM) to analyse relationships between bird richness metrics and spatial representations of habitats.

Our findings indicated that bird richness patterns were always better explained by continuous data rather than discrete land cover maps (e.g. the difference of explained deviance $\Delta D^2 = 15\%$ between NDVI and CLC for the species richness of forest birds). We also found that model performance using the VCF product systematically exceeded the one based on the other continuous data (e.g. $\Delta D^2 = 16\%$ between VCF and NDVI for the species richness of farmland birds). Moreover, we observed a strong influence of the acquisition period of continuous spectral data on model response (e.g. $\Delta D^2 = 32\%$ between NDVI of March and June 2010 for the species richness of forest birds). We concluded that using continuous data is a good alternative to classified data for bird distribution modeling at large scales.

*Corresponding author.