

PROJECT INFORMATION

Project title: Upscaling & spatially explicit estimation of biophysical variables with remote sensing (UPSPEX)

Project ID: 59

Contact person: Gherardo Chirici (gherardo.chirici@unifi.it)

PROJECT DESCRIPTION

Remotely sensed data have not only contributed to increasing the speed, cost efficiency, precision, and timeliness associated with forest and vegetation monitoring programmes, but they may nowadays facilitate the construction of maps of vegetation attributes with spatial resolutions and accuracies that were not feasible even a few years ago. Traditionally, vegetation monitoring and forest inventories used data collected from field plots to respond to the user question “How much?” by reporting plot based estimates of forest resources and vegetation characteristics for municipalities, counties, and provinces or states. Increasingly, however, users are also asking “Where?” and are requesting that field data report not only tabular estimates but also produce maps depicting the spatial distribution of vegetation characteristics.

Our proposal is based on the application of nearest neighbors techniques for predicting forest variables from satellite imagery and ground data acquired in ICP level I (biosoil) plots. This is the first time this kind of approach is used at a pan-European scale level.

With these techniques, population unit predictions are calculated as combinations of observations for the population units in a sample that are most similar, or nearest, in a space of ancillary variables to the unit requiring a prediction. Nearest neighbors techniques are appealing for multiple reasons: (1) they can be used with categorical response variables for which the objective is classification and with continuous response variables for which the objective is prediction, (2) they can be used for both univariate and multivariate prediction, (3) they are non-parametric in the sense that no assumptions regarding the distributions of response or predictor variables are necessary, (4) they are synthetic in the sense that they can readily use information external to the geographic area for which an estimate is sought, (5) they are useful for map construction, small area estimation, and inference, and (6) they can be used with a wide variety of data sets.

The primary forest inventory applications of nearest neighbors techniques for mapping forest variables are in Franco-Lopez et al., 2001; McRoberts et al., 2002, 2007; Koukal et al., 2007; Ohmann et al., 2011; Chirici et al., 2008; Tomppo et al., 2008.