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A hybrid Land Cover Dataset for Russia: a new methodology for merging statistics, remote sensing and in-situ information

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There is a critical need for accurate land cover information for resource assessment, biophysical modeling, greenhouse gas studies, and for estimating possible terrestrial responses and feedbacks to climate change. However, practically all existing land cover datasets have quite a high level of uncertainty and suffer from a lack of important details that does not allow for relevant parameterization, e.g., data derived from different forest inventories.

The objective of this study is to develop a methodology in order to create a hybrid land cover dataset at the level which would satisfy requirements of the verified terrestrial biota full greenhouse gas account (Shvidenko et al., 2008) for large regions i.e. Russia. Such requirements necessitate a detailed quantification of land classes (e.g., for forests – dominant species, age, growing stock, net primary production, etc.) with additional information on uncertainties of the major biometric and ecological parameters in the range of 10-20% and a confidence interval of around 0.9. The approach taken here allows the integration of different datasets to explore synergies and in particular the merging and harmonization of land and forest inventories, ecological monitoring, remote sensing data and in-situ information.

The following datasets have been integrated: *Remote sensing:* Global Land Cover 2000 (Fritz et al., 2003), Vegetation Continuous Fields (Hansen et al., 2002), Vegetation Fire (Sukhinin, 2007), Regional land cover (Schmullius et al., 2005); *GIS:* Soil 1:2.5 Mio (Dokuchaev Soil Science Institute, 1996), Administrative Regions 1:2.5 Mio, Vegetation 1:4 Mio, Bioclimatic Zones 1:4 Mio (Stolbovoi & McCallum, 2002), Forest Enterprises 1:2.5 Mio, Rivers/Lakes and Roads/Railways 1:1 Mio (IIASA's data base); *Inventories and statistics:* State Land Account (FARSC RF, 2006), State Forest Account – SFA (FFS RF, 2003), Disturbances in forests (FFS RF, 2006).

The resulting hybrid land cover dataset at 1-km resolution comprises the following classes: Forest (each grid links to the SFA database, which contains 86,613 records); Agriculture (5 classes, parameterized by 89 administrative units); Wetlands (8 classes, parameterized by 83 zone/region units); Open Woodland, Burnt area; Shrub/grassland (50 classes, parameterized by 300 zone/region units); Water; Unproductive area. This study has demonstrated the ability to produce a highly detailed (both spatially and thematically) land cover dataset over Russia. Future efforts include further validation of the hybrid land cover dataset for Russia, and its use for assessment of the terrestrial biota full greenhouse gas budget across Russia.

The methodology proposed in this study could be applied at the global level. Results of such an undertaking would however be highly dependent upon the quality of the available ground data. The implementation of the hybrid land cover dataset was undertaken in a way that it can be regularly updated based on new ground data and remote sensing products (ie. MODIS).