Forest Modelling

2884100

Development of an Integrated Approach Using Space, Aerial and Terrestrial Data for Modeling Forest Eco-System Services
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Forest resource management and protection focus on different key services supplied by the forest. Forest services play a key role regarding forest resource management and protection. Estimating and characterizing forest services will allow to identify trade-offs between different services depending on the stakeholder interest and the national environmental policies.

The present study focuses on the identification and analysis of forest services via remote sensing in northern China, namely biodiversity and timber supply as well as hazard prevention.

Recently recorded field data do neither meet required quality specifications nor badly needed parts of them have been made accessible. To overcome this situation a new field survey is foreseen. Based on previous knowledge of the study area and unsupervised classifications of available remote sensing data, field plots will be determined which will suit the DRAGON data processing approach. Within these field plots the required parameter will be recorded in order to assess the specified quality of the addressed forest services and ground data will be collected for both training and verification processes of the remote sensing products.

The surveyed forest service parameter will feature the dependent variable/response for the modeling approach. As predictors various remote sensing products (e.g. spectral variances, vegetation indices, tree species, biomass, growing stock, topography) will be analyzed for their potential to explain the forest service distribution.

As statistical model Generalized Additive Models (GAM) will be applied, since their flexibility supports the large number of covariates and can compensate different distributions of the data, while outliers are removed and each covariate is separately fitted via a non-parametric link function. Thus, this will not only minimize data manipulation and adaption, but will also allow for a direct comparison between the additive effects of the predictors.

Due to the mentioned issues regarding the field data first modeling attempts will be carried out using test areas in Germany, Europe until field data of the Chinese study areas can be provided. Afterwards the developed models can be validated in these areas.

After validation the results will serve as a basis for a multi-criteria DSS prototype, which will allow a comparison between competing forest services and stake holder interests.