

Improved species distribution models with explicit modelling of spatial effects: challenges and perspectives using INLA and SPDE.

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Species distribution models (SDMs) are a standard tool for predicting species occurrence under climate change projections. Despite its limitations to reflect the species fundamental niche, SDMs have been widely used to assist forest management decisions in their choice of future tree species, such as through the Bavarian site information system (BaSIS). The accuracy of SDMs is often affected by heterogenous occurrence data caused by different forest inventory schemes, historical processes, climate and insect calamities and more. These processes bias the relationships modelled between species occurrence and climate. However, numerous studies have shown that explicit modelling of spatial effects may improve model accuracy. The INLA algorithm is a fast and relatively new tool enabling modeling predictions with Bayes and describing spatial dependence of species occurrence by means of spatial differential equations (SPDE). First results suggest a promising alternative to non-spatial SDMs, which might improve decisions for tree species suitability in the future.