Geophysical Research Abstracts
Vol. 20, EGU2018-17924, 2018
EGU General Assembly 2018

Evaluation and calibration of an agent-based model of European land use change using historical land use and land cover datasets

Bumsuk Seo (1), Calum Brown (1), Richard Fuchs (1,2), and Mark Rounsevell (1)

(1) Institute of Meteorology and Climate Research - Atmospheric Environmental Research (IMK-IFU), Karlsruhe Institute of Technology (KIT), Garmisch-Partenkirchen, Germany (bumsuk.seo@kit.edu), (2) School of Geosciences, University of Edinburgh, Edinburgh, UK

Identification of land use and land cover and their changes is important in integrated assessments of ongoing rapid climate and social changes. However, future land use information is naturally non-existent. Agent-based land use models allow us to explore how people's responses to environmental change shape future land use but unavoidably introduce a new source of uncertainty, which can be potentially huge. To project long-term land use, calibration and evaluation frameworks for land use projection models are greatly needed. However, due to the lack of ground land use observations and reliable comparative predictions, such frameworks are difficult to establish. For developing an evaluation and calibration framework for agent-based land use models, we conduct a comparative analysis between a simulated land use product and reference land cover products in the EU area. First, we quantify correspondence between historical land cover products and a model-derived projection of European land use. We compare simulated land uses from a model (CRAFTY-EU), defined as agent functional types (AFT), against remotely sensed MODIS land cover (MCD12Q1) [Friedl et al. 2010] and historic land dynamics data HILDA [Fuchs et al., 2013]. The land use simulation was carried out using the European land use change model 'CRAFTY-EU' [Murray-Rust et al., 2014; Brown et al., 2014]. We primarily investigate type-wise distributions of remotely sensed signals and their changes over time, under the assumption that modelled land use types should have consistent make-up over time. Spatial correspondence between simulated and reference land data as well as within- and between-class-variability of AFTs based on proportions of MODIS and HILDA land cover classes are investigated. For being robust in characterising errors and biases and sensitive to changes in minor land use types, we develop a normalisation strategy for imbalanced class distributions, which can detect even slight changes. The initial results from the comparison between the simulated AFTs and the MODIS land cover (LC) (2010—2013) show significant variabilities in mixed and unmanaged forest types while low variabilities in cropland types; the highly variable types showed drastic changes in the MODIS LC proportions (>30%). A visual comparison of the land use and land cover maps suggest a possible explanation that the AFTs exhibiting unstable MODIS LC proportions over the years occurred in the pixels where land use changed during the simulation. In 2012 and 2013, unmanaged forest and urban types increasingly occurred in previously homogeneous arable lands and agricultural areas became more and more fragmented in the simulated results, especially in Northern Italy, Romania and Bulgaria; these are not clearly shown in the MODIS LC maps. The discrepancy between the simulated and the observed land use datasets is being minimized by systematically changing land use decision parameters of the model for calibration of land use decision models to increase model usability and improve the projections of land cover. We hope that the presented approach could improve quality of land use projections, thus contribute to integrated assessments ongoing climate and societal changes in the EU area.