



Projecting wildfire occurrence at regional scale from Land Use/Cover and climate change scenarios

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This work aims to project wildfire occurrence at regional scale by combining information derived from future Land Use/Cover change (LUCC) and climate scenarios in Madrid region (Spain). Generalized Linear Models have been used to obtain a historical wildfire occurrence model for the 2000-2010 period at 1x1km grid cell resolution. Land Use/Cover (LUC) interfaces: Wildland Urban Interface (WUI), Agricultural-Forest interface (AFI) and Grassland-Forest interface (GFI) have been derived and used as input drivers related to human-caused wildfire ignitions along with other variables such as orientation, precipitation, temperature and fuel moisture content (FMC). Wildfire presence-absence observations were obtained from available ignition points coordinates in the study site and used as the response variable in the model. A future LUC scenario by 2050 was run up by using Land Change Modeler (LCM). LCM transition susceptibility maps were calculated by neural networks and Markov chain matrices were used to determine the quantity of change. The model was calibrated with the observed LUCC between 1998 and 2008 derived from the ESA-CCI maps reclassified in eight classes. The obtained transition potentials and calibration rates were used to simulate LUC maps for the year 2015. Real 2015 map was used to assess model performance. Overall agreement between real and modelled maps was >90%. The trend scenario was run using drivers of change and restrictions to generate the LUC map for the year 2050, obtaining the future interfaces (WUI, AFI, GFI) from this map. Average projected precipitation and temperature for the 2050s were obtained from the regional climate change projections for Spain developed under the PNACC (<http://escenarios.adaptecca.es>). These projections considered both dynamical and statistical downscaling to obtain regional projections at 12x12 km, approximately, the spatial resolution from the IPCC-AR5 (CMIP5) global projections. In order to obtain the final resolution (~1 km) of the climate indicators, the climate change signal (~12 km), defined as the difference between the future and historical periods (delta), was added to the observed climatology (~1km), obtaining the future climatology at 1km (Bedia et al., 2013). Note that this is the simplest bias calibration method which assumes that the bias of the models disappeared when considering those deltas. FMC predictions for 2050 were obtained by using reflectance estimates for three LC vegetation types (grass, shrub, forest), the 2050 LUC map and the inversion of radiative transfer model following Yebra et al. (2018) methodology. Predictive reflectance models were calibrated using historical MODIS data for invariant LC pixels and climate variables. The approach was first tested for 2015 and validated using the real 2015 FMC map. Wildfire occurrence prediction was finally obtained by applying the historical wildfire occurrence model to 2050 data.

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