



Effects of anthropic vegetation on European climate

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The diagnostic PNV (Potential Natural Vegetation) model VERDE (VEgetation Reconstruction by Diagnostic Equilibrium), recently developed by the authors, is coupled to the regional climate model RegCM (Regional Climate Model, ICTP, Italy) and implemented in the European and Mediterranean region. The objective of this study is the assessment of the effect of the anthropic land use on the present climate over central Europe and Mediterranean region. This study computes the climate associated with the PNV by the iteration of a two-step procedure, which is composed of a multi-annual model simulation and of the subsequent computation by VERDE of the PNV corresponding to the simulated climate. In the first iteration RegCM adopts the present land-use (which over Europe is dominated by crops and farming, with hardly any natural vegetation). The procedure is iterated until when there is no appreciable difference between the PNV used by RegCM and that associated with the climate that it produces, so that PNV and model climate are consistent. The equilibrium PNV consists mainly of shrubs in the Mediterranean and deciduous broadleaf forest in central Europe. The effect of the anthropic land use on climate are assessed by analyzing the difference between the simulated present-day and PNV climates (ANTcli and PNVcli, respectively), which is given by the difference between the first and the last iterations of the procedure. A significant effect is found in summer when the anthropic land use produces a cooler climate. Two different mechanisms have been identified. Over the Balkan Peninsula anthropic land use modifies the surface energy balance by increasing evapotranspiration, while over central-western Europe, cooling is mostly due to cloudier sky conditions. These results shows that a) considering reforestation as a tool for climate change mitigation at regional scale remains a controversial issue and b) increasing farming might have reduced past warming signal at regional scale, though historical records of land-use evolution make this effect likely small for Europe during the 20th century.