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EUROPE'S TERRESTRIAL CARBON SINK MAY LAST UNTIL 2050 AND THEN DECLINE

S. Zaehle (1), A. Bondeau (1), P. Smith (1,3), S. Sitch (1), D. Schroeter (1), M. Erhard (2) and W. Cramer (1)

(1) Potsdam Institute for Climate Impact Research, (2) Institute for Atmospheric Environmental Research, Research Centre Karlsruhe, (3) now at Laboratoire des Science du Climat et de l'Environnement, Gif-sur-Yvette (zaehle@pik-potsdam.de/FAX: +49-331-2882640)

Recent studies indicate that Europe's terrestrial biosphere presently acts as a small net carbon sink (e.g. Janssen et al., 2003). The future of this sink will (inter alia) depend on the combined effects of climate and land-use changes. Any attempt to assess the future development of the net sink will therefore need to comprise a process-based treatment of the effects of climate and atmospheric change on vegetation and a realistic representation of the actual landcover, and land-use processes. Here we present an advanced version of the LPJ-DGVM (Sitch et al., 2003) that combines generic representations of croplands, managed forest ecosystems, and natural vegetation dynamics within a common land-atmosphere coupling scheme. To evaluate the effect of future climate and land-use changes on Europe's terrestrial carbon balance, the model is driven with a consistent set of climate and land-use scenarios from the ATEAM project (Mitchell et al., submitted, Rounsevell et al., in prep, pik-potsdam.de/ateam). The approach allows to separate the effects of climate change and land-use change on the carbon budget, as well as to assess the uncertainty associated with the results of different climate models and socio-economic assumptions.

The model performance has been evaluated for present day conditions on several scales applying a set of benchmarking exercises, including point scale eddy-covariance measurements, FPAR from satellite observations, and comparison to recently published continental scale carbon budget studies. Our results agree with the view that Europe's terrestrial biosphere currently acts as a small net carbon sink. Fur-

thermore, they indicate that the current net carbon sink function will be maintained until about the mid of the 21st century. Thereafter, all scenarios consistently show a weakening of the net carbon uptake rate, depending primarily on the rate of warming, and also on the magnitude of re- or afforestation activities. The generality of our results and the robustness of their spatial patterns are discussed.