

# MODELING THE HISTORY OF TERRESTRIAL CARBON SOURCES AND SINKS

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## ABSTRACT

We report modeling experiments with a new global dynamic land model (LM3V), to reconstruct possible causes of the terrestrial carbon sources and sinks over the past century. The model is unique, in that it is capable of representing the global history of land use, including the management of secondary forests (those forests that have re-grown at least once following harvest). Several published carbon inventories attribute the majority of the carbon sink caused by land use in the temperate zone to the management of secondary forests.

We performed an ensemble of experiments that covered possible factorial combinations of: (1) historical climate change vs. “recycled” climate of 1980-2000, (2) historical trajectory of atmospheric CO<sub>2</sub> concentration vs. constant year 2000 CO<sub>2</sub> concentration, (3) historical land use transitions among crop, pasture, primary, and secondary vegetation vs. constant year 2000 land cover, (4) historical reconstruction of secondary harvest rotation vs. no secondary harvest, (5) historical reconstruction of fire suppression vs. no fire suppression. In the runs with historical changes in land use, we used a median scenario from a family of possible land use histories that are all consistent with historic records and current land cover. To evaluate the sensitivity of the results to the details of this scenario, we repeated the runs using two bracketing alternatives.

We analyzed the results to partition the causes of terrestrial carbon sources and sinks among the alternatives studied.

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