Carbon & Nitrogen Cycling

Quantifying US Terrestrial C Sources and Sinks

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ABSTRACT Quantifying the dynamics of CO2 exchange between terrestrial ecosystems and the atmosphere within the conterminous US has been a major challenge. The impacts of dynamic land cover and land use change on CO2 exchange have not been quantified owing to the unavailability of adequate land cover change databases and model simulation approaches at the national scale. Previous modeling efforts regarding the impacts of climate variability and change, nitrogen deposition, and management practices on carbon stocks and fluxes are likely flawed or incorrect because of the lack of those critical databases. In this study, we developed a data assimilation system to predict the spatial and temporal patterns of carbon exchange between the land and the atmosphere in the conterminous US. Newly developed high resolution land cover change databases from the EROS Data Center were used to support the quantification of the impacts of land cover and use change on CO2 exchange. Results indicate that both climate variability and land cover change significantly affect the magnitude of carbon sources and sinks. Therefore, an accurate land cover and use change database is essential for the determination of the magnitude, mechanisms, and spatial and temporal changes of the contemporary US carbon sources and sinks. The interannual variability of climate has also played a predominant role on determining the interannual variability of C sources and sinks. The temporal change of C sources and sinks varies across ecoregions, mainly determined by land cover or ecosystem types. This study contributes significantly to the North American Carbon Program and the US Global Change Research Program.