



Land cover change impacts on surface ozone: an observation-based study

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Ozone air quality is a critical global environmental issue. Although it is clear that industrialization and urbanization has increased surface ozone through enhanced emissions of its precursors, much less is known about the role of changes in land cover and land use. Human activities have substantially altered the global land cover and land use through agriculture, urbanization, deforestation, and afforestation. Changes in Land cover and land use affect the ozone levels by altering soil emissions of nitrogen oxides (NO_x), biogenic emissions of volatile organic compounds (VOCs), and dry deposition of ozone itself. This study performs a series of experiments with a chemical transport model based on satellite observation of land types to analyze the influences of changes in land cover/land use and their impact on surface ozone concentration. Our results indicate that land cover change explains 1-2 ppbv of summertime surface ozone increase in the Western United States and 1-6 ppbv of increase in Southern China between 2001 and 2012. This is largely driven by enhanced isoprene emissions and soil NO_x emissions. It is also found that land cover change itself elevates summertime surface ozone in Canadian coniferous forests by up to 4 ppbv mainly through substantial decreases in ozone dry deposition associated with increased vegetation density in a warmer climate.