



Climate and human influences on biomass burning during the Holocene

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Paleoenvironmental studies based on sedimentary charcoal accumulations have demonstrated that fire regimes are highly sensitive to climatic variations on multiple temporal and spatial scales. The degree to which human activities affected Holocene trends in biomass burning, however, is less clear. This research examines paleofire, paleoclimate, and archaeological data on regional, hemispheric and global scales to evaluate the impact of Holocene climate change and anthropogenic activities on biomass burning as well as potential feedbacks from fire to the climate system. Results indicate that early-Holocene warming and increased vegetation productivity drove broad-scale increases in biomass burning. During the mid- and late-Holocene however, the relationship between climate and fire shows increasing spatial variability, with strong climatic influences evident in some regions (e.g. relating to changes in monsoons), but not in others. Between 3 and 2 ka, global biomass burning in the tropics and subtropics increases due to weakening monsoon systems and increased aridity in the tropics. Increased burning in the extratropics at this time however, cannot be explained exclusively by existing climate trends. Extratropical burning, for example, appears to be associated with increasing anthropogenic use of fire for land clearance at the beginning of the Iron Age. After 2 ka, a northern hemisphere summer cooling trend and reduced anthropogenic burning corresponds to a decline in global biomass burning, which reaches a distinct local minimum during the Little Ice Age. In recent centuries, anthropogenic activities dominate the global biomass burning signal, but the nature of human impacts on fire regimes varies by region.