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Land use change suppresses precipitation

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Abstract. A feedback loop between regional scale deforestation and climate change was investigated in an experiment using novel, small size airborne platforms and instrument setups. Experiments were performed in a worldwide unique natural laboratory in Western Australia, characterized by two adjacent homogeneous observation areas with distinctly different land use characteristics. Conversion of several ten thousand square km of forests into agricultural land began more than a century ago. Changes in albedo, surface roughness, the soil water budget and the planetary boundary layer evolved over decades. Besides different meteorology, we found a significant up to now overlooked source of aerosol over the agriculture area. The enhanced number of cloud condensation nuclei is coupled through the hydrological groundwater cycle with deforestation. Modification of surface properties and aerosol number concentrations are key factors for the observed reduction of precipitation. The results document the importance of aerosol indirect effects on climate due to nanometer size biogenic aerosol and human impact on aerosol sources.

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