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Did anthropogenic land use change alter the amount and distribution of dust particles in the atmosphere?

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To improve our understanding of past, current, and future climate change, the analysis and quantification of the interactions and feedbacks between the terrestrial biosphere, atmospheric composition, and climate is one of the key challenges. Anthropogenic land cover change is one of the drivers for atmospheric composition changes. Changes in land cover likely affect the distribution and amount of several species including biogenic volatile compounds and mineral dust. Mineral dust particles represent a major component of the global aerosol load. A change in the magnitude and distribution of mineral dust in the atmosphere will have a substantial impact on climate and climate change as well as air quality [e.g. Rodriguez et al.; 2002], but the detailed interrelations between land-use change and mineral dust emissions are still largely unknown.
To investigate and better quantify the influence of anthropogenic land use change on natural emissions and the resulting implications for climate, we use the global climate-aerosol model ECHAM6-HAM together with land use maps developed by Pongratz et al. (2008). In the model, the aerosol simulations are fully coupled and interact with the climate system through radiative processes, and the complex cloud-aerosol interactions. We will show the latest development performed to insure a full and interactive coupling between the land component JSBACH of ECHAM6 and the different schemes for natural emissions of trace gases and aerosols in the model. Preliminary results on the impact of anthropogenic land cover change on dust emissions and distributions as well as the resulting impact on climate will be shown for the years 1900 and 2000.