

# The impact of fire under future changes

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Fire is an important component of the Earth system. It alters vegetation structure, carbon and nutrient cycle, and water and energy budget. Particulate matters and trace gasses from fires deteriorate air quality and impact on human health. In detail, Fire accounts to 8–21 % of ambient air pollution mortality [1].

We identified the burned area in the global scale, and their impacts such as carbon emissions and health burden during 2006–2015. Especially, climate, land use, and socioeconomic changes influence fire regime [2], and we predicted the future changes in fire carbon emissions throughout 21<sup>st</sup> century by focusing these three factors' changes. The climate factors follow two Representative Concentration Pathways (RCPs), and socioeconomic factors follow three Socioeconomic Pathways (SSPs). Land use factors follow the six combinations of RCPs and SSPs.

Our study found that fires emitted  $2.15 \times 10^{15}$  gC per year during historical period and tropic region accounted about 80% of the total fire carbon emissions. Particulate matters from fires led to 159,000–271,000 mortality. Future fire emissions will increase under SSP3-RCP6.0, which means higher greenhouse gas emissions will lead to higher fire carbon emissions. However, global fire emissions are expected to decrease under other scenarios. GDP per capita and climate factor were the most influential factor for decreasing and increasing future fire emissions, respectively.

- [1] G. Roberts and M. J. Wooster, Global impact of landscape fire emissions on surface level PM2.5 concentrations, air quality exposure and population mortality. *Atmos. Environ.* 2021; 252: 118210.
- [2] F. Li, S. Levis, and D. S. Ward, Quantifying the role of fire in the Earth system - Part 1: Improved global fire modeling in the Community Earth System Model (CESM1). *Biogeosciences*. 2013; 10: 2293–2314.