Geophysical Research Abstracts
Vol. 20, EGU2018-18020, 2018
EGU General Assembly 2018

Southeast Asian biomass fires in 2015 impacts on trace gases and aerosol during El Niño in Malaysia

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In Southeast Asia (SEA), haze pollution is a major concern and a significant issue due to its huge impact on human health and the ecosystem. Smoke-haze episodes caused by vegetation and peat fires in Indonesia severely affected some parts of Malaysia during the 2015 El Niño phenomenon. This study aimed to evaluate the factors that influenced the concentrations of aerosol and trace gases during the 2015 haze and non-haze periods on a rural site facing Sumatra and on a semi-urban site influenced by the city centre. Local land use data and the cluster of air mass weighted backward trajectory were used to identify the potential factors from local sources and the transboundary region, respectively. The annual concentrations of particulate matter (PM10) for rural and semi-urban sites were 55.19 μg/m3 and 58.28 μg/m3, respectively. The highest PM10 concentrations during the haze were 358 μg/m3 and 415 μg/m3 for the two sites, respectively, representing absolutely unhealthy air. The increase in PM10 concentration throughout September was mainly caused by agriculture and peat burning in Sumatra and partly by the local activities. The average concentrations of PM10 and carbon monoxide were two fold higher during the haze than the non-haze episodes on both sites. Nitrogen dioxide was more influenced by haze compared with sulphur dioxide and ozone. In 2015, prolonged peat burning might be a primary reason for the high emission of SO_2 during the haze episode. The results of the land use change suggest that the local factor can also partially affect the air pollution on the semi-urban site. The Hybrid Single-Particle Lagrangian Integrated Trajectory model and the wildfire radiative power showed that the smoke-haze episodes that affected Malaysia in 2015 were mainly initiated in the Indonesian Sumatra and Kalimantan regions.