

## Changes in atmospheric chemistry, aerosols, and land use in Asia and their complex impacts on climate

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<http://www.env.nagoya-u.ac.jp/profile/467e.html>

We have been assessing the impacts of changes in aerosols and atmospheric chemistry on Asian climate and monsoon using a chemistry-aerosol coupled climate model. Our study focuses particularly on changes in secondary (reflective) aerosols like sulfate, nitrate, and organic carbons which play significant roles in direct radiative forcing and indirect forcing (cloud/precipitation modulation). We estimate significant reduction (more than 50%) in biogenic emissions of VOCs, precursors of secondary organic aerosols, due to land use changes in Southeastern Asia during the last century. This implies that organic aerosol in Asia has significantly decreased during the 20th century, and resultingly modulated Asian monsoon. Reduction in biogenic VOCs emissions (20-50%) is estimated in North America and Europe as well. In addition, our simulation shows that there are anomalously high concentrations of nitrate aerosol in South Asia (particularly around India), coming from abundant ammonium and less sulfate in this region; in India, free tropospheric mixing ratio and number concentration of nitrate are both larger than those of sulfate in winter to early summer. This result also suggests nitrate aerosol may play an important role in the observed changes in Asian monsoon.