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On aerosol-chemistry-cloud-climate interactions and entanglements

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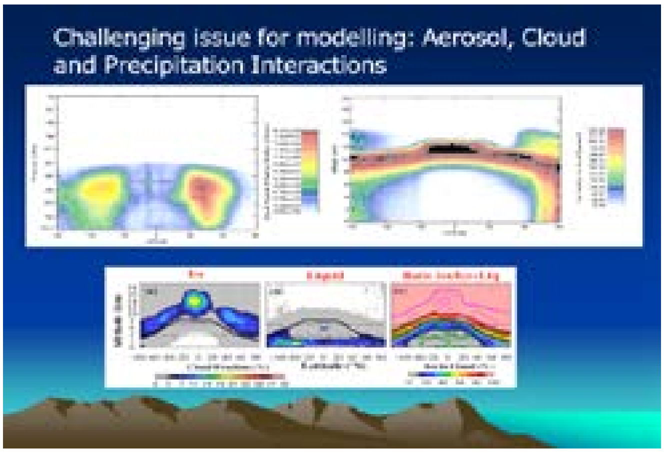
Aerosols and chemically reactive gases have important impacts on regional and global air quality and climate change. Despite decades of efforts, the model simulations of aerosols, chemically reactive gases and clouds are still uncertain due to the complex conundrum of aerosol-chemistry-cloud-climate interactions. The complicated entanglements and feedbacks among those atmospheric elements lead to a difficult and painstaking task for reducing the uncertainties in the future air quality and climate predictions. Nevertheless, the increasing demands for the accurate future air quality and climate information with high resolution require the high performance of multi-scale modelling. The Aerosol Chemistry Model Intercomparison Project (AerChemMIP) provides us a good opportunity to quantify the air quality and climate impacts of aerosols and chemically reactive gases. The project is designed to reduce the uncertainties in emissions, atmospheric compositions, radiative forcing and climate feedbacks, and improve the capabilities of model predictions. The outcomes of global model simulations will also be a benefit to improving the regional model simulations using the downscaling technique. With the amazing progress from ground-based, airborne and space-based measurements, we advocate an approach of integrating modelling and observation for model process studies, model validations and data assimilation. More *in situ* measurements and model improvements are necessary to better predict future air quality and climate change on multiple temporal and spatial scales.



Recent Publications

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2. Shere K, et al. (2013) Trace gas/aerosol boundary concentrations and their impacts on continental-scale AQMEII modelingsub-regions. Atmos. Environ. 53:38–50.
3. Appel K W, et al. (2012) Examination of the community multiscale air quality(CMAQ) model performance over the North American and European domains. Atmos. Environ. 53: 142–155.
4. Hu R-M, et al. (2009) Light scattering and absorption properties of dust particles retrieved from satellite measurements. JSQRT 110:1698–1705.
5. Hu R-M, et al. (2009) New algorithms and their application for satellite remote sensing of surface PM2.5 and aerosol absorption. Journal of Aerosol Science 40(5):394–402.