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Radiative effects of tropospheric aerosols on the evolution of the atmospheric boundary layer and its feedback on the haze formation

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Planetary boundary layer (PBL) plays a key role in air pollution dispersion and influences day-to-day air quality. Some studies suggest that high aerosol loadings during severe haze events may modify PBL dynamics by radiative effects and hence enhance the development of haze. This study mainly investigates the radiative effects of tropospheric aerosols on the evolution of the atmospheric boundary layer by conducting simulations with Weather Research and Forecasting single-column model (WRF-SCM). We find that high aerosol loading in PBL depressed boundary layer height (PBLH). But the magnitude of the changes of PBLH after adding aerosol loadings in our simulations are small and can't explain extreme high aerosol concentrations observed. We also investigate the impacts of the initial temperature and moisture profiles on the evolution of PBL. Our studies show that the impact of the vertical profile of moisture is comparable with aerosol effects.