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Absorbing aerosol decreases cloud cover in cloud-resolving simulations over Germany

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Here, we present investigations on the impact of absorbing aerosol particles on cloud and radiation fields over Germany. Using advanced high-resolution simulations with grid spacings of 312 and 625 m, numerical experiments with different aerosol optical properties are contrasted using purely-scattering aerosol as control case and realistic absorbing aerosol as perturbation. The combined effect of surface dimming and atmospheric heating induces positive temperature and negative moisture anomalies between 800 and 900 hPa impacting low-level cloud formation. Decreased relative humidity as well as increased atmospheric stability below clouds lead to a reduction of low-level cloud cover, liquid water path and precipitation. It is further found that direct and semi-direct effects of absorbing aerosol forcing have similar magnitudes and equally contribute to a reduction of net radiation at the top of the atmosphere .