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Effects of aerosol on lightning in Sichuan Basin, Southwest China

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The influence of aerosol on lightning is very dependent on environmental factors, including thermal factors, humidity factors, and terrain factors. ATD cloud-to-ground lightning data, ERA5 reanalysis data, and MERRA2 reanalysis data were applied to discuss the influence of aerosol on lightning activity in Sichuan basin. Thermodynamic factors were the main reasons for the difference in lightning density between the plateau and the basin. The results showed that the influence of aerosol on lightning activity in the basin and the plateau regions showed a significant difference, showing a positive correlation on the plateau and a negative correlation on the basin. In the plateau area, the aerosol concentration was relatively low, and the aerosol stimulated the lightning activity by influencing the microphysical processes. In the basin area, the aerosol load was very high, and the aerosol showed a more significant radiation effect. By reducing the solar radiation reaching the ground, the convective energy on the ground was reduced, and the intensity of lightning activity was finally suppressed.