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Exploring unintended anthropogenic impacts on severe weather over the South African Highveld

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Aerosols and pollution particles alter precipitation processes in various ways, which, indented or unintended, has considerable effects on local, regional and synoptic scale weather. Known changes occur to the thermodynamic profile of the atmosphere and also cloud properties through changes in albedo and surface roughness. These dynamical effects are simulated with increasingly refined parametrisation schemes. In contrast, the microphysics of cloud-aerosol interactions is a major cause uncertainty within regional and global scale models. Globally, the industrial Highveld of South-Africa contributes 0.3% of total aerosol emissions and the local effect on severe weather is not yet fully understood. In this study the Weather Research and Forecasting Model (WRF) is used to simulate convective scale weather events using aerosol-aware microphysics schemes. Southern Africa is forecasted to have some of the highest relative increases in surface temperatures and Africa is also estimated to see massive population growth in the next few decades, both these predictions will have a major impact on the thermodynamic and microphysical properties of clouds and possibly severe weather events. It is therefore a rational choice to understand the unintended alterations of aerosols on the weather and climate system in order to better understand how small scale geoengineering interventions can be applied to mitigate the worst impacts of global warming.