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Characterising Atmospheric Electricity in the United Arab Emirates to improve droplet growth models

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Countries in arid and desert climates have small amounts of rainfall each year and use cloud seeding techniques to enhance the little rainfall that is present. Typically, this is achieved by seeding the cloud with hygroscopic nuclei to increase the rainfall. An alternative method would be to inject the cloud with electric charge, which has been shown in models to alter the droplet size and distribution and influence rainfall properties.

In order to improve the accuracy of droplet growth models, local observations of the electrical properties of clouds are needed, such as from a desert site. For this, an automatic measurement site was set up in the United Arab Emirates, at Al Ain airport. The vertical electric potential gradient obtained from a CS-110 electric field mill, visibility from a Biral SWS-100 visibility sensor and vertical backscatter profile from a Vaisala CL-31 ceilometer were used to characterise the electrical properties of clouds, precipitation, dust and fog events at the desert site.

Enhanced PGs were recorded during the measurement campaign, with values far exceeding those expected in the UK, for rain and fog occurrences. This suggests that dust contributes strongly to the atmospheric electrical variability in this region, due to charging of the dust, probably tribo-electrically. By contouring the backscatter from the ceilometer during rain events it was possible to derive the fall speed and hence droplet size, which can be used to improve droplet growth models.