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## Atmospheric electric field measurements in the central United Arab Emirates

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Measurements of the atmospheric electric field (or Potential Gradient, PG) in arid, desert regions are few in comparison to those in more wet/mid latitude regions, despite the fact that such measurements can provide important insights into dust charging processes. Dust charging is emerging as potentially important in sustaining the long range transport of particles, for which new charge and field data are essential. Here we present new PG data from an electric field mill at Al Ain international airport in the eastern part of the Abu Dhabi Emirate in the United Arab Emirates (UAE). Measurements were made alongside a visibility sensor and ceilometer to provide information on the background meteorological conditions. At Al Ain, the conditions are generally fair weather in mid-latitude terms (predominantly no clouds or precipitation), with very occasional fog or thunderstorms, but the PG still demonstrates considerable variability associated with local factors such as dust and aerosol content. Throughout the data series, the PG is almost entirely positive, with the only negative values occurring during thunderstorms and violent dust storms. The desert climate of the UAE lead to widespread uplift of dust on a regular basis, as evidenced by the generally low visibility measured at the airport (mean visibility = 9km). The PG at Al Ain was found to be generally much larger than typical fair weather values at other sites, with a mean of 116 V/m, with 2 kV/m exceeded regularly. The local influences on the PG at Al Ain are strongly apparent and the daily variation in PG was found to fall into two main categories: 1) convection dominated, 2) sea breeze dominated. On the convection dominated days the PG followed the daily variation in temperature and wind speed closely, with very large maximum values of PG up to 4 kV/m in the mid afternoon. The other regular daily feature in Al Ain PG was a sharp positive increase in PG up to several kV/m around 1800-1900 local time. This feature is associated with the arrival of a sea breeze front, which originates more than 150 km away on the Abu Dhabi coastline. The extremely large change in PG over a very short time scale (tens of minutes) is thought to be due to the action of dust pickup within the sea breeze front as it travels substantial distances over the flat arid landscape. Overall, the electrical environment at Al Ain is found to be generally very highly charged and so the local effects (primarily from dust and aerosol) mask Global Electric Circuit influences in the surface data.

