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Electric field measurements from Halley, Antarctica

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Antarctica is a unique location for the study of atmospheric electricity. Not only is it one of the most pollutant free places on Earth, but its proximity to the south magnetic pole means that it is an ideal location to study the effects of solar variability on the atmospheric electric field. This is due to the reduced shielding effect of the geomagnetic field at the poles which leads to a greater flux of incoming Galactic Cosmic Rays (GCRs) as well as an increased probability of energetic particle precipitation from SEPs and relativistic electrons.

To investigate such effects, two electric field mills of different design were installed at the British Antarctic Survey Halley base in February 2015 (75. 58 degrees south, 26.66 degrees west). Halley is situated on the Brunt Ice Shelf in the south east of the Weddell Sea and has snow cover all year round. Preliminary analysis has focused on selection of fair weather criteria using wind speed and visibility measurements which are vital to assess the effects of falling snow, blowing snow and freezing fog on the electric field measurements. When the effects of such adverse weather conditions are removed clear evidence of the characteristic Carnegie Curve diurnal cycle exists in the Halley electric field measurements (with a mean value of 50V/m and showing a 40% peak to peak variation in comparison to the 34% variation in the Carnegie data). Since the Carnegie Curve represents the variation in thunderstorm activity across the Earth, its presence in the Halley data confirms the presence of the global atmospheric electric circuit signal at Halley. The work presented here will discuss the details of the Halley electric field dataset, including the variability in the fair weather measurements, with a particular focus on magnetic field fluctuations.