Geophysical Research Abstracts, Vol. 8, 06073, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06073

Measuring the geo-electric field in the Antarctic.

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Measuring the geo-electric field becomes important in understanding the global electric circuit and how it is affected by other phenomena. It is also useful in assessing how the global electric circuit variations can affect climate.

The challenge of measuring the geo-electric field in Antarctica can be broken down in two main difficulties.

The first difficulty is to measure the geo-electric field parameters, mainly the “Air to Earth current” and the electric field potential. The “Air to Earth current” is very weak, about 5pAm-1, therefore a high sensitivity transconductance amplifier must be used. This circuit is greatly affected by noise of various kinds. On the other hand the electric field potential is fairly easy to be measured from the point of view of the electric signal. But it has a rotating part that make it very difficult to be deployed in the harsh environment that the Antarctic poses.

The second difficulty is to cope with the extreme conditions of the Antarctic climate when deploying the measuring infrastructure. Temperatures down to –60C, winds up to 150km/h, more than 180 days of absolute darkness and inaccessible sites are the main problems that must be taken into account when planning and designing the measuring facility.

Thus there are two factors which make the measurements a difficult goal to be achieved: difficulty of sensing the geo-electric field magnitudes and the challenging Antarctic environment. Therefore specific approaches must be carried out to overcome these exceptional design constrains.