

structures developed locally. It is believed that this deformation occurred when the glaciers were warm.

Determination of Silver and Iodine in Antarctic Precipitation

J. A. WARBURTON and L. G. YOUNG

*Desert Research Institute
University of Nevada System*

During the 1969–1970 antarctic season, approximately 250 ice cores, 1 m long and 7.5 cm in diameter, were taken from three pits near Byrd Station. The cores were packed in plastic liners in standard core holders and kept frozen during the return to Reno, Nevada. The cores are being used to determine concentrations of silver and iodine in precipitation before and during the large-scale weather modification programs that began in the early 1950s. The concentrations, in turn, will provide a measure of the transport of sub-micron size particles of seeding materials into nominally unseeded areas. The silver and iodine will be extracted by ion-exchange methods, and the quantities of these elements in the samples determined by neutron-activation analysis.

Our party of two arrived at McMurdo in mid-December, 1969, and spent five weeks in Antarctica. At Byrd Station, the first 60 samples were collected from a 10-m deep vertical pit dug in 1963 by Dr. Richard Cameron and his group from Ohio State University. Anthony Gow of CRREL helped us locate this pit. Another 60 samples were taken from a 3-m pit dug by us about 30 m from the Cameron pit. This snow was too loosely packed to be cored with a SIPRE auger, and the samples were collected by scraping the sample into the core holders with a plastic scoop. The remaining 130 cores were taken from the "lead mine", about one mile south of the main Byrd Station.

To measure concentrations of silver in precipitation in the continental U.S.A.—between 10^{-10} and 10^{-12} g/cm³ of water—about 1 l of snow melt is required. Since the concentrations in Antarctica were expected to be lower, approximately 20 cores were collected at each depth of interest. The oldest ice samples obtained were approximately 300 years old, with most dating from 1900–1970.

In addition to the ice sampling, the opportunity was taken to measure the Aitken nucleus concentrations on several different occasions and locations at Byrd and McMurdo. These measurements are to be compared with similar ones being made in the Arctic.

Magnetospheric and Ionospheric Studies at Siple Station During the Austral Summer of 1969–1970

J. KATSUFRAKIS

*Radioscience Laboratory
Stanford University*

Siple Station was established during the past season for the purpose of conducting magnetospheric and ionospheric studies of the plasmasphere. At 75°55'S, 83°55'W, and $L=4.12$, its VLF transmitting facility will be strategically located to produce efficient excitation of propagation paths near the plasmapause. Since most of the whistler ducts to be excited by VLF transmissions from Siple Station are overhead, the location of the transmitter at this L value is optimal because the maximum radiation from the antenna will be at vertical incidence. Also, the station has the advantages of being conjugate to a site near Roberval, Quebec, Canada that is free of man-made interference and that can easily be supported logistically, and it is in view of the geostationary satellites over the Atlantic Ocean.

The following experiments were carried out at Siple Station during the summer of 1969–1970:

1. Two balloon-borne electric-field detectors were launched during moderate activity. Approximately 52 hours of data on magnetospheric electric fields near the plasmapause boundary were recorded. Continuous whistler recordings were made from the ground during the balloon flights. Magnetospheric electric-field intensity derived from the whistler time-delay and dispersion analysis will be compared with the electric-field intensity measured by the balloon detectors.

2. A VLF direction-finding system incorporating two crossed loop antennas and a vertical antenna was installed to obtain information on the convective motion of whistler ducts and, hence, on the location and dynamic behavior of the plasmapause.

3. A polarimeter system was installed to record the polarization angle of linearly polarized VHF (137.35 MHz) transmissions from the geostationary satellite ATS-3. Measurements of the diurnal change in Faraday rotation angle of the telemetry transmissions give the electron content variation along the ray path from the satellite to the ground receiver. One of the objectives of this experiment is to detect the plasma trough. During magnetic storms, the plasma trough is expected to pass through the sub-ionospheric point of Siple Station.

4. A horizontally polarized, 8,000-foot long VLF dipole antenna was placed above the snow to provide electrical and mechanical engineering data for

the elevated 13-mile long dipole to be installed at Siple during the 1970–1971 summer. The elevated antenna proved to have the mechanical properties required to survive the worst weather conditions expected for that area. In addition, and probably most important, the radiation efficiency of the elevated antenna can be at least 50 times greater than that of a buried antenna over the range 3 kHz–20 kHz.

The plasmasphere is a region of relatively dense ionization around the earth having a field-aligned outer boundary called the plasmopause. The lower part of the plasmasphere includes the ionosphere. Normally, the plasmopause is closest to the earth near dawn, and most distant and least well defined near dusk. The plasmopause is most often positioned at about the $L = 4$ magnetic shell. Within the plasmasphere, ionization seems to be in diffusive equilibrium along field lines, with plasma flowing upward from the ionosphere during the day and downward at night. Field-aligned columns of ionization (ducts) appear to extend between the hemispheres. Outside the plasmasphere is a relatively empty region (electron density 1 to 10 cm^{-3}) called the plasma trough.

Two types of radial motion have been detected within the plasmasphere by observing systematic changes in the effective latitudes of whistler ducts. The first type includes the slow radial movements required to maintain the asymmetry of the plasmopause position in the earth-sun coordinate system. The other is of short duration (1 hr) and involves inward and outward movements of the plasma—including the plasmopause—at radial speeds of the order of 0.4 earth radii per hour.

The most pronounced inward movements occur on the night side during polar substorms. These movements may be explained by a westward component of electric field of 1 to 2 hours' duration and a longitudinal span of several hours in local time, with a magnitude in the range 0.1 to 1 mV/m at 3 to 4 earth radii. Outward drifts, corresponding to an eastward component of the electric field, appear both as the magnetic substorm decays and following the substorm, but in the pre-dawn sector. During enhanced magnetic activity, there may be enhanced inward drifts extending into the post-dawn sector. Strong micropulsation activity is usually observed during substorm inward drifts.

During a geomagnetic storm, the plasmopause radius decreases, apparently as the result of the erosion of plasma from the plasmasphere. Local variations in plasmopause radius appear, sometimes exhibiting longitudinal ripples that move in the direction of the earth's rotation. The plasma density in the ionosphere, especially at high and middle latitudes, is often drastically altered.

The evening bulge of the plasmasphere shows evidence of being the region of interaction between the plasma flow from the tail and the corotational flow associated with the earth. During periods of quieting, the bulge seems to become "untrapped" from the tail flow and to be pulled around as the earth rotates.

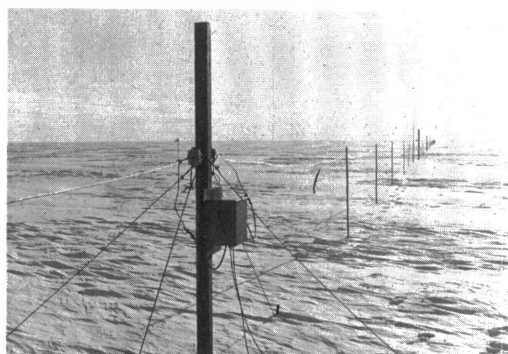


Figure 1. The northern leg of the elevated dipole antenna as viewed from the dipole center feed point.

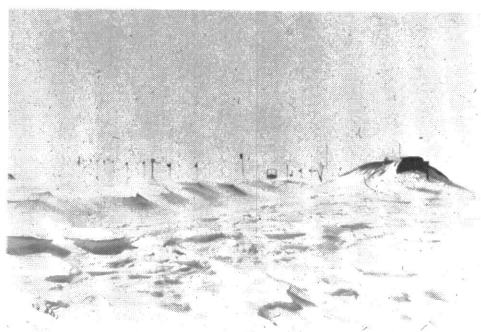


Figure 2. A view of the station with the VHF polarimeter yagi antenna on the left.



Figure 3. The flag mast at Siple Station with the Stanford University School of Engineering herald at the bottom.