They, therefore, suffer a fall in skin temperature to lower levels before the stimulus to the shivering center from the cold receptors in the skin is powerful enough to produce a sharp increase in metabolism. This hypothesis was also put forward to explain similar behavior on the part of the men who had been in residence in Antarctica for 1 year (12).

The fourth point brought out by this study is that the decrease in heat conductance with a fall in average skin temperature occurs over the same range of average skin temperatures in the fat man as in the normal man, there being a sharp fall in heat conductance as the average skin temperature falls from 30 to 27 C and no further decrease in heat conductance at skin temperatures below 27 C. The behavior of heat conductance with fall in skin temperature contrasts, therefore, with that of metabolism. This difference would imply that the vasomotor control of peripheral blood vessels in cold conditions bears a direct relationship to the level of skin temperature, whereas the relationship between skin temperature and increased metabolic rate, due to shivering, is influenced by other factors, such as habituation, depth of sleep, etc. These possibilities were also raised in a previous paper from this laboratory (11).

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GEOLOGIESE OORWINTERINGSBASIS IN DIE BORGABERGE, WESTELIKE KONINGIN MAUDLAND

Volgens Mnr. D.C. Neethling, programdirekteur vir Antarktiese geologie en gletserkunde, sal 'n tydelike oorwinteringsbasis in die Borgaberge sowat 350 km ten suide van SANAE-basis opgerig word gedurende die 1969-voorwinterveldseisoen.

Hierdie basis sal deur twee geoloë, 'n meganikus en 'n radio-tegnikus beman word en alle moontlike voorsorgmaatreëls is getref om die oorwintering van ongeveer 10 maande op hulle eie so veilig en gerieflik as moontlik te maak. Sowat 20 ton voorrade is reeds per Belgiese Ottervliegtuig gedurende Februarie op die basis-terrein by Huldreslottet-nunatak ($4^{o}10'W$, $72^{o}55.5'S$) geplaas en Muskeg sneeutrekkers is reeds op pad vanaf SANAE na die berge met die res van die voorrade en toerusting. Die basishutte sal op 'n hoogte van ongeveer 6000′ bokant seevlak opgerig word en na verwagting sal wintertemperature tot onder $-60^{o}C$ daal. Die hoofhut, 'n Kanadese 'Parcoll' eenheid, is egter ontwerp vir hierdie toestande en kan ook winde van oor die 100 mpu weerstaan.

Die basiese motivering vir die oprigting van hierdie bergebasis is om die beskikbare tyd vir geologiese veldwerk in Antarktika beter te benut asook om te voorsien in die toekomstige gebiedsuitbreiding van die geologiese program. Daar word ook beoog om gedurende die somer van 1970/71 met die sneeutrekkers 'n verdere 350 km suidwaarts vanaf Borgabasis tot by die draaipunt van die Amerikaanse Suidpool-Koningin Maudlandtravers op die Poolplato, te gaan.

Die oprigting van 'n bemande Suid-Afrikaanse basis vir die eerste keer op die Antarktiese kontinent en die beoogde oorsneeuse trek in die onbekende binneland van die Suidpoolgebied, is van groot wetenskaplike en prestige belang vir ons nasionale ekspedisies.

PREDAWN AIRGLOW ENHANCEMENT AT SANAE

M.R. TORR

– NITR of CSIR –

As is well known, the earth's magnetic field may be regarded to a first approximation as a dipole, slightly displaced from the centre. At very high latitudes this approximation falls away, but still holds reasonably well in the case of the Antarctic station SANAE (70°S, 2°W). The skewness of the earth's magnetic field in relation to the rotation axis allows one end of a magnetic field line at times to be illuminated by the sun while the other end is still in darkness. For example, the magnetic field line passing through SANAE intersects the earth's surface in the other hemisphere at 53°N, 43°W and this is known as the magnetically conjugate point or MCP. At SANAE in June the sun does not rise at all at ground level, but it does rise at an altitude of 100 km at 08.20 local time (L.T.) while at the MCP, it rises at the same altitude some 4 hours SANAE L.T. earlier.

Ultraviolet radiation from the sun releases photoelectrons from the atoms and molecules of the atmosphere. An appreciable fraction of those[1] photoelectrons produced near 300 km and above in the 10 to 50 eV energy range can escape upwards without collision. This is because the density of the neutral atmosphere decreases exponentially with increasing altitude and eventually the mean free path of the photoelectrons exceeds the scale height of the neutral atmosphere. These electrically charged particles then spiral along the magnetic field line to the other hemisphere. This transport process takes a couple of seconds. As they descend into the atmosphere of the other hemisphere they lose their energy to the ambient electrons (thus increasing the electron temperature) and at lower altitudes (below ~ 300 km) they are rapidly thermalized and lose the bulk of their energy through inelastic collisions with atomic oxygen, the main constituent at these heights. The excitation of the ^1D state of atomic oxygen, for example, results in the 6300Å airglow line. The effects of these photoelectrons will be most pronounced when the 'receiving' hemisphere is not yet illuminated.

Figure 1 shows a plot of hourly values of airglow intensities for the 3 wavelengths 6300Å, 5577Å and 4278Å for SANAE in June, 1964. These airglow observations were made by G.T. Robertson[2] of the Department of Physics, Stellenbosch University. The times of local and MCP sunrise at various altitudes are indicated. There is a distinct increase in the intensities of all three airglow lines at a time corresponding to MCP sunrise at ~ 100 km.

Broadfoot and Hunten[3] suggested that these photoelectrons were responsible for the twilight values of the N_2^+ airglow band at 3914Å and Cole[4] has reported a predawn enhancement in the 6300Å line. Carlson[5] and Evans[6] have found this predawn enhancement in electron temperature at altitudes of 300 km and above. Figure 2 shows that it is also to be seen in the F_2 region peak electron density at Johannesburg. No evidence of this predawn increase is found in the summer January plot, as in this case sunrise at the MCP follows instead of preceding local sunrise.

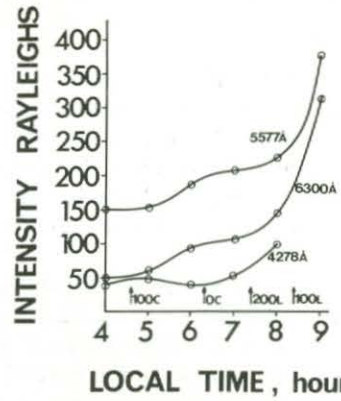

Fig. 1 - Hourly median values of airglow intensity for SANAE, June 1964. Times of local (L) and conjugate (C) point sunrise at altitudes of 0, 100 and 200 km are indicated.

The results described here are interesting in that they appear to support recent theories favouring direct excitation of 6300Å airglow by the photoelectron flux[7] in view of the fact that heating of the ambient electrons by MCP photoelectrons could not result in an enhancement as large as that observed. The enhancement in electron density must be due to direct ionization as heating alone would result in a decrease in electron density.

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Fig. 2 - Hourly median values of f_0F_2 for Johannesburg for January and June 1964.