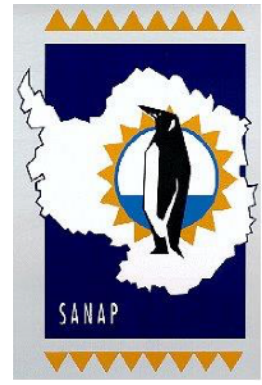




# 71° Below

**SANAE 57 Newsletter**  
**September 2018**



Good day everyone! I hope you enjoy this latest newsletter, meeting another team member, and getting some insight into the space science research that happens here. The space science section also provides some information about what causes the Aurora Australis, or the Southern Lights, that we experienced. There is also a little bit of information on the Movember campaign that we are doing as a team this coming month.

## **Will Jelbert**



Hi! My name is Will Jelbert. I'm the team leader and medic for S57. My job as the medic is to look after the general health of the team, take care of any emergencies and evacuations (if needed!) and make sure the medical centre is clean, organised and ready to use. The medic is also responsible for the food stores and general hygiene in the kitchen and dining room. As the team leader my role is the wellbeing of the team and also the overall cleanliness and functioning of the

base. As the team leader I am also a part of the technical team and so I also get to be involved in some of the technical aspects of the base, which has been fascinating and challenging at times.

Before deciding to come to Antarctica I was working on cruise ships for 2 years. I was wanting to undertake a more adventurous and challenging role and the thought popped into my head that Antarctica was just what I was looking for. So I started searching for possibilities and came across the South African National Antarctic Program, which seemed perfect for what I was looking for. I applied and was accepted and suddenly I was here! It's been a bit of a whirlwind trip and I can't quite believe that it's heading towards the end of October already!

The learning curve was steep, and I was learning all sorts of new skills to enable me to live out here and do the work. The biggest learning curve was the outdoor cargo work that required using cranes, bulldozers, and huge CAT Challenger tractors that are on massive rubber tracks. I also had to learn how to grade a runway so that planes could land during the summer. And shovelling snow...lots and lots of shovelling snow!

The biggest challenge for me has been the long periods of time stuck inside. I came prepared with a variety of things to do but sometimes I just want a walk outside, to get out and visit a friend, to eat different food, or even just enjoy a piece of fruit. As the months passed, through winter and now into spring and heading to summer, keeping positive and active and busy has been harder than I anticipated. I will be sharing some of the activities that we have been busy with in a later newsletter.

What I've missed the most so far are family and friends. Being in contact through the internet is an amazing thing, but obviously not the same as visiting. Seeing pictures of my nieces and nephews growing up and exploring life has been bittersweet. I want to be with them and play with them and learn about what they are into these days. I can't wait to sit up into the evenings with my siblings, parents and friends chatting and catching up. That's what I'm looking forward to the most...oh, and fresh fruit and berries!

The next summer take-over period is fast approaching. We will get some fresh fruit, and two chefs who will do the cooking, and fresh faces. But there will also be a lot of work to do, which will make it go fast. I want to enjoy the last few months in this incredible place. It is highly likely I will never return. I am fine with that. But I am also glad that I came, put my self through this, challenged myself, grew, learned random skills, made lifelong friends, and witnessed nature at her most savage and most beautiful. It has been a truly once in a lifetime undertaking that very few will have the privilege of experience, and I'm grateful for it.

## **Weather news**

The weather is slowly getting warmer and less stormy. We are seeing now several days at a time with low winds and good sunshine.

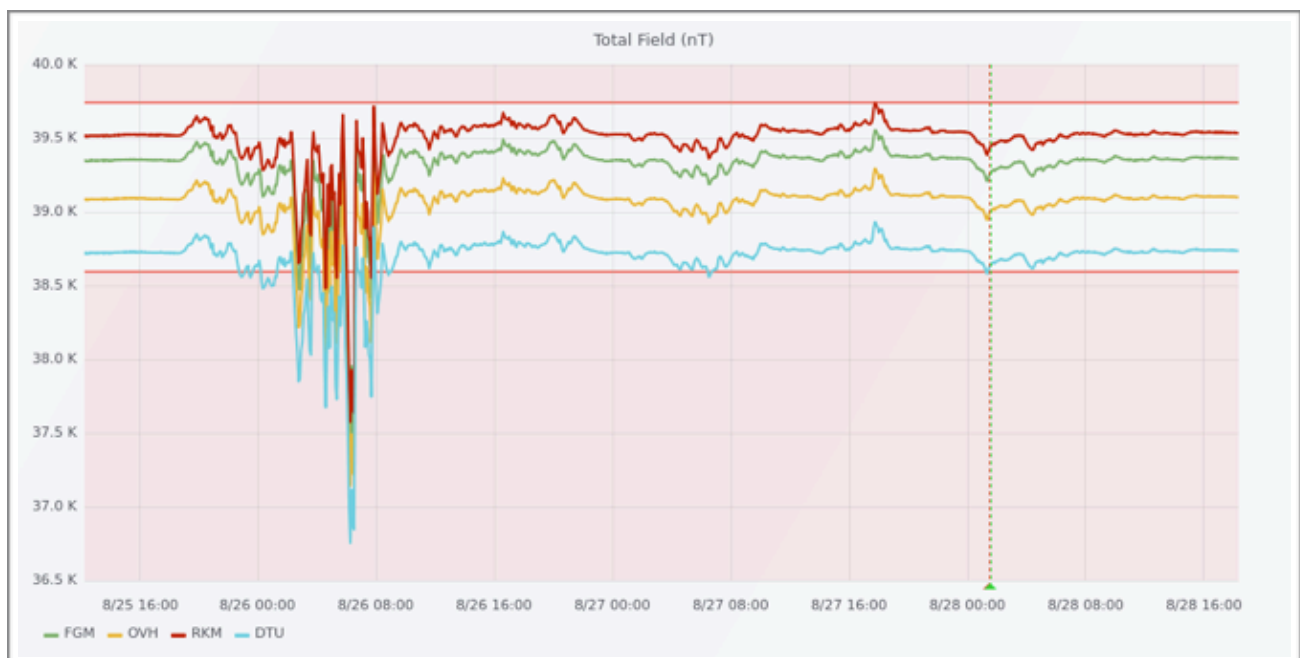
Maximum temperature:	-9.4°C
Minimum temperature:	-33.8°C
Average temperature:	-20.6°C
Strongest wind gust:	35.9m/s (129.2 km/hr or 69.8 knots)

# Science at SANAE IV

**Many thanks to Stephanus Schoeman, who you read about at the beginning of this newsletter, for writing this piece on the space research being done here at SANAE IV.**

SANSA (the South African National Space Agency) has two engineers overwintering at the SANAE IV base every year. They are the VLF (Very Low Frequency) and HF (High Frequency) Radar engineers. We look after a variety of ongoing experiments SANSA has running here in Antarctica.

The research conducted here by SANSA mostly concerns space weather. This encompasses solar flares and coronal mass ejections (CME's), and how they interact with Earth's magnetic field and atmosphere. Solar flares are big explosions on the sun's surface. These explosions are occasionally accompanied by CME's, which are massive expulsions of charged particles from the sun. When these particles hit the earth's magnetic field, atmosphere and finally its surface, it interacts with them in spectacular and sometimes inconvenient ways. One of the spectacular ones being, of course, the magnificent aurora visible around the North and South poles.



1. Fluctuations in the magnetic field strength (measured by SANSA's magnetometers here at SANAE IV) during a "solar storm", when a CME hit the earth. This presented us with a magnificent show of the Southern Lights as well.

In the last newsletter, Foster explained how the VLF, magnetometer and riometer experiments work. To summarise: VLF antennas detect low frequency electromagnetic waves propagating through the atmosphere, mostly caused by lightning. Magnetometers measure variations in the strength and direction of the earth's local magnetic field and riometers can measure and map the electron density in the D and E layers of the ionosphere (a layer of the atmosphere consisting of charged particles, or ions).

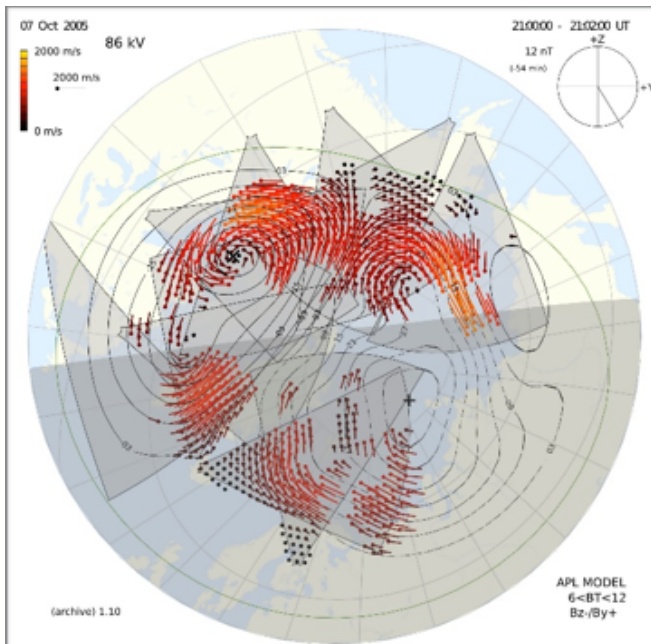
Other instruments we have here include a SuperDARN HF radar, several GNSS receivers and an ozone radiometer. SuperDARN (Super Dual Auroral Radar Network) is an international effort to study the ionosphere in more detail. The GNSS instruments are also used to measure inconsistencies and variations in the ionosphere, deduced from the strength and delay in GNSS satellite signals. These disturbances in the ionosphere are closely related to the earth's magnetic field, since the ionosphere is a charged gas (plasma). The ozone radiometer aims a little lower and measures the local density of ozone in, well, the ozone layer.

The SuperDARN radar works at around 12.5MHz, emitting pulses and waiting for them to return. The transmitted electromagnetic pulses are bent by and travels along the ionosphere, bouncing off irregularities

it happens upon. From the strength and phase offset of the returned signals, the size, direction and velocity of these irregularities can be deduced. They serve as “clouds” mapping the movement of the ionospheric plasma. Using data from 35 different SuperDARN radars around the world, a global convection map of the ionosphere can be constructed. This data is invaluable, seeing as we don’t have any other scientific instruments or methods capable of measuring the ionosphere in this much detail.



2. The SuperDARN HF Radar has a main array with 16 antennas and a secondary array with 4 more antennas.



3. An example of a convection map over the Northern Hemisphere, generated using the combined data of multiple HF Radars.

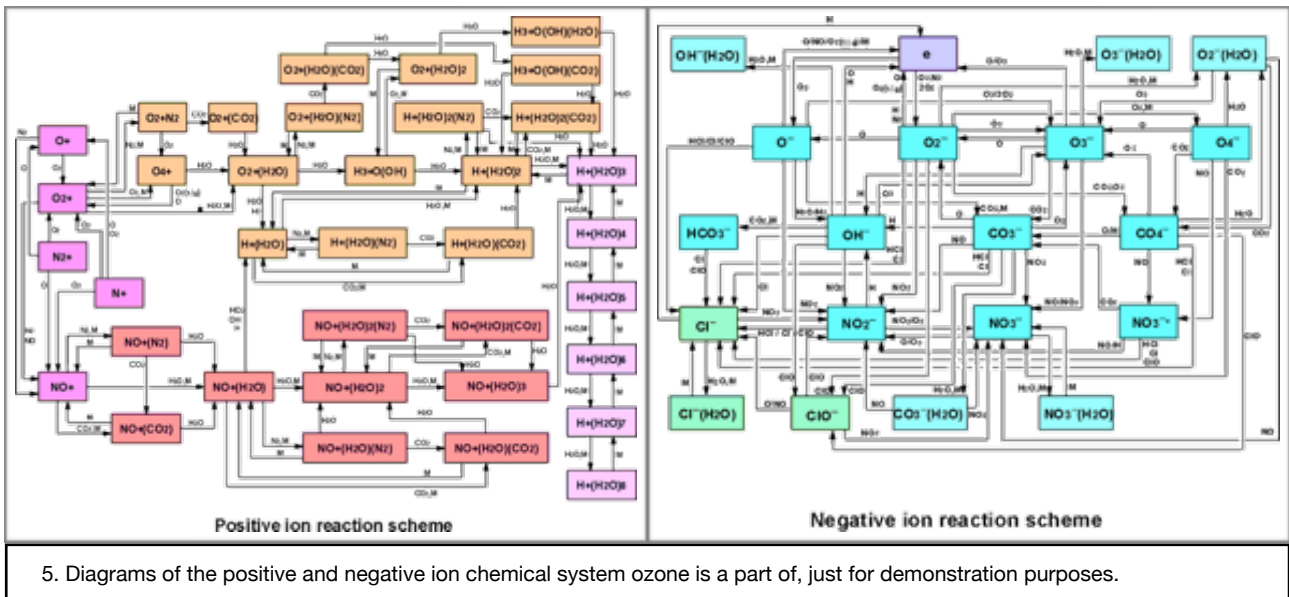


4. Each antenna is driven by a digital transceiver box, responsible for transmitting and receiving the signals controlled by a server.

There are five GNSS receivers as well, constantly listening to all navigation satellite signals it can find. They are quite like the GPS receivers in your phone or car, but orders of magnitude more sensitive. These satellite signals must travel through the ionosphere before arriving at the GNSS antennas here on Earth. If there are any irregularities or variations in the path of the signal, it can be inferred from the distortion of the signal. Indeed, these exact same irregularities and variations is the cause of inaccuracies in your GPS location, your

satellite television signal being scrambled, HF radio signals being able to bounce and bend, reaching around the world and many other such phenomena.

The ozone radiometer, part of an international project, also listens to satellite signals, but television satellites this time, transmitting at around 11 GHz. This is, coincidentally, the same frequency absorbed by ozone atoms. That means that, the stronger the signal is that we receive, the less ozone there was in its path. Since ozone is such an effective greenhouse gas, this data is important for global warming research and more. Ozone, as it turns out, is part of a large and intricate chemical system in our atmosphere. Thus, knowing more about the concentration of ozone also tells us a whole bunch about other chemicals in that region of the atmosphere. The ozone radiometer consists of a satellite dish, a receiver and a server computer located in the satellite dome visible in figure 2.



# Movember



For those that don't know, Movember is a global fundraising campaign that runs for the month of November in aid of men's health. They have a strong focus on testicular and prostate cancer, as well as mental health and suicide amongst men, which is significantly higher globally than amongst women. Part of the campaign is also awareness of these issues, which is achieved largely by men growing a moustache, hence Mo-vement!

As a team S57 has decided to participate in Movember. We have started a FaceBook page and a team page on the Movember website. We have also all chipped in and contributed money as a team to the campaign through the Movember website. The links to these pages are below. There will be updates on our activities and our moustaches posted on these sites!

<https://moteam.co/sanae-57-and-the-mo>

<https://www.facebook.com/SANAE-57-and-the-Mo-202392777321891/>

Please share these links with friends and family, like and follow us, join our team, and consider donating through our Movember site. We highly appreciate any support towards this important campaign!

# Our Sponsors

A huge thanks to our sponsors who generously donated some of their quality products to the overwintering team to make our winter more homely!

