Petrel Post

SANAE 58th Overwintering Team

Chapter 9

In this chapter you will meet our Communications / Electronics Engineer, Mr. Ewald Ferreira. He will tell you more about himself and his responsibilities.

Further in this chapter we will provide our weather and more….

"Lorenzen Piggen" Viewed from the SANAE IV Base (Zoomed), Antarctic Petrel in flight over the top of the mountain.

From left to right: Marvin, Jacques, Bongisipho, Jufter, Mpati, Travis, Sanele, Ewald and Salomé.

SANAE 58

Editor: None for this edition

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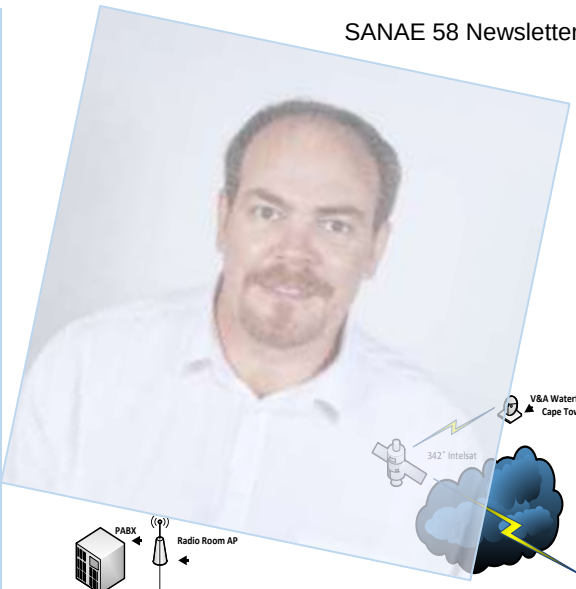
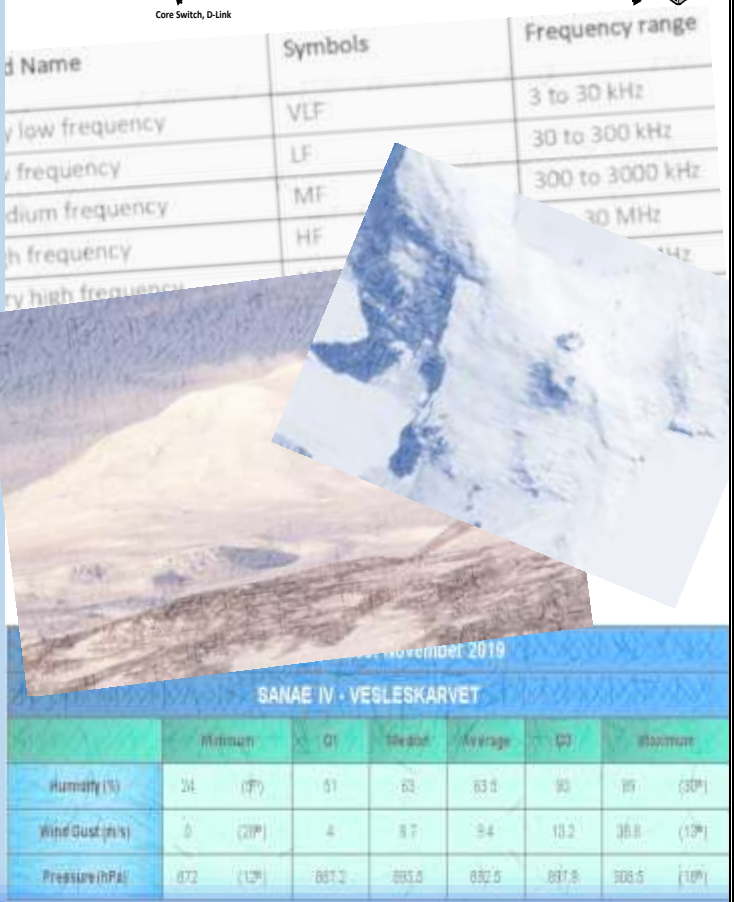
In this issue:





Did you know?

The World's Oldest Sperm Was Found in Antarctica

Scientists from Sweden found a 50 million-year-old fossilized clitellate worm cocoon in Antarctica in 2015. This worm cocoon contained the world's oldest sperm. This worm's sperm is very short-lived and extremely hard to find but this one got trapped in the jelly-like cocoon before it hardened and was thus preserved for millions of years.

Neringa Utaraitė. 2018. Bored panda. 27 Unbelievable Facts About Antarctica That Are 100% True.
Available at: https://www.boredpanda.com/interesting-antarctica-facts-south-pole/?utm_source=google&utm_medium=organic&utm_campaign=organic

MEET OUR COMMUNICATIONS / ELECTRONICS ENGINEER: EWALD FERREIRA

Ewald Ferreira (DEA Communications / Electronics Engineer)

I am known as **Ewald (Ewie)** and my role here is that of **Communications Engineer** for the South African National Antarctic Program *(SANAP)* at SANAE IV station in Antarctica, for the 3rd time.

During our annual "take-overs" mostly, and to a lesser extent during the course of the "overwintering" expedition, I do radio schedules and position monitoring with aircraft, vehicles and field personnel, maintain RF equipment, administer the ICT networks, look after recreational and video equipment and talk abundantly where and when I can, but my main function is to make sure that everyone here can communicate with each other by any means necessary and of course, make contact back to their homeland and loved ones. It is important to me and a very worthy responsibility.

Why it is called an "overwintering" expedition of course is the fact that Antarctica is only accessible for a few months of the year in summer *(The official take-over period)* during which all treaty-member-countries move in with 24 hour days at their disposal to exchange rations, do maintenance on several bases around the continent, launch scientific projects plus relieve personnel, and there is a lot going on: ships and feeder planes are plentiful and everywhere and SANAE IV also acts as the central hub of search and rescue *(SAR)* for Queen Maud land along with providing vertical-lift-capable aircraft, a haven and a fuel stop. After this period starting around beginning November and ending around middle March, no-one can get to you because of the continent almost doubling in size toward the middle of winter *(bigger than Europe)* with pack-ice forming around it and weather conditions not allowing any flights, so when your only "lift" leaves without you, you're over wintering - 'cos you will not see that ship again till the next take-over period, some 9 months forward "into the future". So our tele-communication equipment and general communications equipment needs to run and run good! Because for around 9 months, it will be the life-line of our emotional existence. So this is me and I would like to involve you in my journey, if you would let me take the podium just for a bit.

About Myself

I was born in South West Africa *(Namibia)*, moved around a bit as a child and eventually matriculated from Sand Du Plessis High school in Bloemfontein FS. After leaving school in 1989 I went to the military the year after, did a three-year National S4 Diploma in Electronics Engineering with additional subjects on Power Electronics at the Technickon Free-State from 1992 *(which is now known as the University of Technology FS)* and did several courses in Microsoft operating systems and Cisco devices plus several more work-related courses in numerous fields of study

I started my professional career with Eskom in 1995, then Telkom, then the UK was up in 1999 and then Antarctica after that, back in 2002. I have fairly recently also owned and run a mobile events and IT Company called "Xtreme Effect" till around 2009-end, supplying sound engineering services, sound reinforcement & lighting, IT solutions plus retail services; and, needless to say, my love for technology is still in pursuit. I have been contracting as a Communications Engineer to date with the 61stand 72nd relief expeditions to Sub-Antarctic Marion Island till May 2016; SANAE 42nd in 2002 as mentioned above and of late, the 56th and 58th relief expeditions to SANAE VI base in Antarctica for SANAP, a sub-division of the Department of Environment, Forestry and Fisheries *(DEFF)*. Now through the vastness of my career and in my quest for development, pretty much since the beginning of secondary school, I could never really anticipate how much one's personal life eventually revolves around one's career aspirations and work cultures till I experienced the South African Antarctic programme, and these expeditions really gave me a new perspective on life.

In the past, it seemed as if almost the first thing I pondered on, experienced or did every morning in the work environment or even privately was tailored around a specific chain of thought that originated either from a field of study, related things at work, experiences around current technologies, or a "world of wonder" on my mobile device. Now to be precise on what matters in one's personal life is not stereotypical, obviously not all work and no play but I never used to think that it was possible to shake the habit of what I used to near-saturate my brain with every day. With life here, you really do get to experience and appreciate finer things like comraderie, compassion and just life.

For the most of my corporate career and support model on these scientific expeditions, I have always been part of multi-cultural teams in one way or the other and we have always operated as a unit: a diversified team of professionals and specialists but over here we really strive more to work as a group of friends. We share our workspace just as we share our home and I believe that having diverse cultures and religions is an integrate part of our operations. I believe that communication is paramount and that we should learn to make amends and be forthcoming through conversation *(not on social media; in the absence of a phone)*, learn humour, live and let live, extend basic respect for something you don't understand or could appreciate. Over here, I try to live in harmony with maybe just a touch of trickiness and rigid standings, but although even I am still a "youngster", I believe that one's level of maturity should succumb the urge to act out your childish tendencies every so often. I push for it but life is not always a balance now is it? And people are definitely not even close to the same in any aspect, unless the "general mainstream-media" tells them they are

Hobbies and a day in the life

My hobbies ultimately revolve around technology, audio, the personal computer and of course the very world at our fingertips with the knowledge obtainable through our modern search engines and such, on the Internet. All the different experiences surrounding technologies of this nature provide an endless source of information and wonder, and we are exploding in this field with communications today. Our data link here is very limited unfortunately in comparison with today's standards, but bandwidth through a satellite connection is immensely expensive, and for the moment our "up" and "downlink" toward the South African continent is sufficient. To tell you the truth, the link on its own is a modern day miracle; as our geographical location indicates, we are not in the footprint of even one satellite transceiver so in a sense, we rely on RF propagation from the ice and water surfaces: astounding to say the least.

I for instance love the physical repair or assembly of audio-power-amplification modules, it really does "amplify" the end-result if the design is good, and with the introduction of certain pre-amplification techniques and filtering stages, design and technologies surrounding them and the original high-level production of an audio signal, the very source is refined and rounded to such extreme accuracies and capabilities, that it is almost an improvement of the original signal when it is reproduced through sound reinforcement. With radio communications, the signal is reproduced on the other side of a RF radio link in the same manner. The same principle applies with every other RF technology out there and it is no different here: it is all about the production of a quality signal that contains information, and the flawless reception thereof.

I love IT *(Information Technology)*, when you teach a computing technology or development and you experience the effect it has; when somebody finally grasps problems around misconceptions of the PC or network infrastructure, to understand at last why you bought the stupid thing in the first place, why you have been struggling with some feature just because you did not understand what the processes really entail. When you experience the power of multi-core processing or conquer the age-old recourse problem on your server farm, the network infrastructure or your personal computer after that upgrade or repair that you were waiting so anxiously for, it is indeed very rewarding in numerous ways. In modern terms: "That stuff is mental".

If you take a peek at telecommunication RF Technologies: Unbelievable, I say, looking at 3rd, 4th and even 5th generation cellular technologies nowadays, IP header compression, encryption, VPN, Wi-Fi, satellite links, radio, audio and modulation techniques on a hand-held device with a high-definition display… where is it going to end? Difficult even to comprehend where this has all started but certainly, worse to imagine a modern day world without radio frequencies and where would we, the South African National Antarctic Programme *(SANAP)* be now, if it were not for such emerging technologies?

I love Karaoke's, I love singing and music, same with personal computing. ICT *(Information & Communication Technology)*, RF technologies and sound engineering has always been a passion to me! The addition of sounds and sound effects to a visual medium really highlights the core of visual stimuli and audio enhancement effects and It absolutely qualifies as the "ultimate" *(most epic)* reward enhancer, when, along with the usage of Mpeg Layer 3/4 & WMA compression, a horde of audio codecs, virtual studio software programmes and state of the art digital sound reproduction modules, lurks the inevitably necessary mix between analogue and digital mediums. And a phenomenal contribution it is, both to what you see and what you experience with your other senses. Further developments in the emerging markets of digital sounds and ***"FX"*** effects versus analogue enhancement techniques in return, allow for ever evolving electronics, speaker and accompanying cabinet designs and true, real-time responses on amplification, frequency management and protection.

I do believe that an enormous part of entertainment and video streaming technologies fortunately consists of just this merging factor between digital and analogue channels, between what you see, what you hear and your "moment of truth" around what you experience when it is all put together, and you go streaming a toned-down version of what is happening around you, all over the world with a small little camera and microphone on your phone, no wires attached and the versatility it offers when "they" can walk around your house or the office holding a device with a 7"screen and you can say hallo to everyone, everywhere whilst looking them in the eye and visualizing their surroundings.

So, we get up every morning, login to the computer networks and do checks on all the bits and pieces that form part of our communication and data link. Temperature is very important with electronics and the more consistent it is, the longer your component lifespan and longevity of the equipment will be. We have a Satellite Dome that houses the satellite dish and modem: winds can get to over 200km/h here so the dish is not going to stay put if it is not sheltered. Along with strong winds and freezing temperatures, we have a tremendous problem with static electricity, so we do not extend any copper cable for longer than absolutely necessary and if there are any connections running outside, we really do prefer using optic-fibre cables, rather than copper. Outside, we have a diesel bunker and a snow melting unit that is controlled via a software based, base management system *(BMS)* inside the Base, which links onto programmable logic control *(PLC)* units and distribution points via optic fibre cables; we also have links running to external containers for sciences and other projects, so all of these connections are checked regularly and there is a lot of switching and transducing gear that comes onto "the radar" every so often as well.

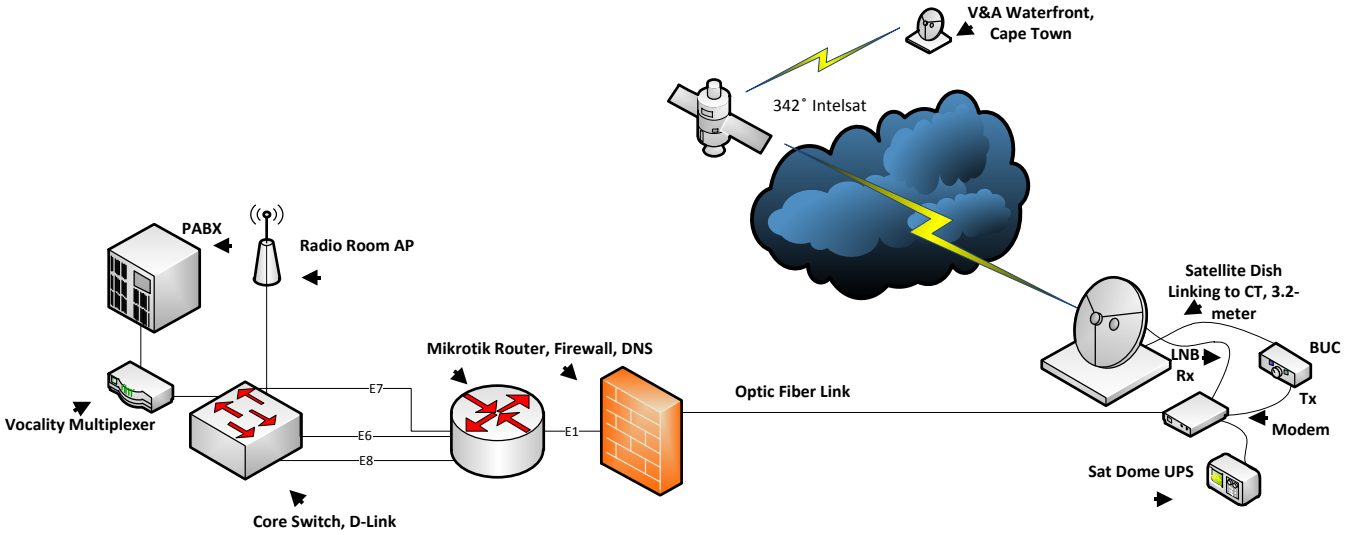
We eat a lot, socialize more often than not and converse, share ideas and discuss improvements. Sometimes, there are not much common ground, if at all, but the one thing we all agree to and respond to is a social atmosphere. I have brought along my own PA system which I use in abundance. We do karaoke's and enjoy as many events as we can master, but always the main responsibility for me on any of these expeditions is the running of all systems and a happy team. If any equipment breaks, you are there to fix it at practically any hour of the day *(weather permitting)*, taking the pressure and making it happen: there are no alternatives.

Responsibilities

Down here, the phones and mobile devices work just fine without the cellular components and most applications work with just Wi-Fi, but we do not receive SMS's or cellular calls and we don't care much for it either. The only problem is that even here the damn smart devices are trying to pin point your location, don't you just hate that?

The regular Smartphone or any mobile device connects to Wi-Fi, Wi-Fi to switch, switch to router, router to modem, modem to satellite 3.2-meter parabolic dish and out to space; it is received on a transponder via 342˚ East Intelsat, down to the dish at the V&A Waterfront, in at the quadruple demodulator *(handling modulation from 3 different stations)*, from there to the Cape Town modem, modem to border router and out to TENET Internet service provider. Food for thought, truly unbelievable?

The SatDome



This is how the basic lay-out looks at SANAE IV Base. We have access points throughout the base here and practically wherever you are, your device is being serviced through one of these points, which then feeds back to a core switch in a common server room. We also have an analogue PABX system with telephone extensions to all rooms, labs, some public places and selected offices. This PABX system is linked to a multiplexer system which converts analogue voice to digital bit-streams, and these bit-streams are then added onto general Tx and Rx traffic. So whenever we pick up a line from the outside by pressing the preverbal "0", we are linked through to this multiplexer/DE multiplexer *(MUX/DEMUX)* system, which links onto a similar unit in Cape Town, linking us on to the Telkom exchange some 4000+ kilometers away on the African Continent. Now, after all this switching and conversion through local LAN, WAN and satellite transponders, the delay is still but a few milliseconds, more than what my small mind can ever comprehend - and a clear connection it is as well, through Comtech technologies and Intelsat.

Further responsibilities, as you can derive from the sketch, include a local VSAT System consisting of a L-Band Comtech modem, IBUC *{Integrated Block Up Converter (C-Band Amplifier and IF step-up converter)}* and LNB *(Low Noise Block and IF step-down converter)* connecting to the satellite dish some 3.2-meters in diameter, linking us onto a satellite network.

Whether it is audio *(Analogue Voice, Music or Nature sounds for instance)* or digital *(Binary bits that carry decimal values or character sets)*, for us to be able to reach these sorts of distances with RF *(Radio Frequency)* technologies and have the bandwidth that we are all enjoying, the signals *(at the modem, the digital inputs received from the router master port, sprouting from the likes of the voice multiplexer plus other sources to the router, are converted to several analogue signals)* need to be superimposed onto similar signals called carriers, in a different and higher frequency range/band, then stepped up, amplified and transmitted in a certain polarization *(Modem stage is L-band)*. With the transmit stage, the original conversion and polarization happens in several stages inside the modem and then out to the Tx outputs. From the IP module interface receiving Binary bits, the binary inputs are multiplexed onto analogue signals representing the Binary bits, modulated with QPSK techniques onto higher frequency carrier signals around 1000MHz, and sent to the Tx outputs as electromagnetic impulses or planes. The modulated signal frequencies which are now in the IF *(Intermediate Frequency)* band are then further increased to C-Band *(around 6 GHz)* in the IBUC, amplified, concentrated via the feedhorn, projected down to and reflected from the parabolic surface of the satellite dish and transmitted to a geostationary communication satellite. Several of these frequency streams are transmitted in parallel with a few hertz tolerances on each side shouldering each frequency stream, which allows for a parallel transmission of quite a few modulated "bit-streams" in a frequency span of as much as 30Hz. This 30Hz is then known as the bandwidth and the transmission can be classified as actual parallel data transfer. On the Receive stages, the exact opposite happens: parallel signals are received from the satellite, picked up by the parabolic dish and guided through a precision wave guide to eliminate noise and impurities on the signal.

The C-Band signal is then converted to IF-Band at the LNB, sent through to the modem where the signals are demodulated and DE multiplexed into a digital bit stream with individual data packages, then sent off to the router to be distributed and routed via set tables. Try wrap your head around this and tell me you are not absolutely astonished or even flabbergasted!

The reason for this whole process is that with audio we cannot transmit in the same frequency measure in which we are talking because all the noises we hear around us, including music, are in the same frequency band as vocal responses from a human, so if we transmit in this low-frequency spectrum, we will need very large antennas to resonate on the frequency one speaks at *(Antenna strands the length of 10's of kilometres)* and we will receive all the surrounding noise plus suffer interferences from practically everything around us - every single soundwave, every single rumble and even electricity supplies running at 50Hz. So, in the case of wanting to transmit vocals in speech or song for instance, over considerable distances, we need to start by isolating vocal responses with using a cardioid microphone *(Telephone, PA mic or cell phone)*, modulate that signal onto higher frequency signals *(Most popular modulation types for audio are FM and AM but several Modulation techniques in use today, which we will not cover in this explanation)* and send those higher frequency signals to where we need them to go via a range of antennas or transmission networks *(Either in a circular area around such broadcasting antenna or aligned in a certain aiming scope, with a receiving antenna on the other end aiming straight back at you)*, because surrounding noises and other interferences will then have a lesser influence on the information that the signal carries. Higher frequencies resonate better on smaller antennas, can travel further with the help of RF amplifiers, are far less prone to noise and atmospheric disturbances and they can be transmitted across vast distances with pin-point accuracies in a vast array of frequency bands which determine reliability, signal integrity, thermal interferences and even data security. In audio transmissions, it is also necessary to understand what is perceived to be audible and how the human ear responds. In digital transmissions, modulation is done with two or more similar signals referencing each other, and then the differences are used to determine either a group of bits like 2 or 4, or a single bit. These bit ranges are then compiled in byte sizes at the demodulation stages *(Modem = Modulator/Demodulator)* and used in character sets or decimal values, for digitisation of the information.

It is also important to note that in RF communications, up and till a certain "critical frequency" measure of wavelength *(just above 30 MHz)*, waves do not penetrate the atmosphere *(Ionosphere to be exact)* and will not leave planet earth. The waves are rather reflected back down to the earth's surface where they will be bounced off again and depending on atmospheric conditions, they can reach tremendous distances with very little loss, travelling in this zig-zag formation. So perceptively; In the lower-end of the MHz spectrum, waves pretty much travel along the earth's surface, can cross mountains and valleys and are referred to mostly as the bottom-end of the HF *(High Frequency)* band. The shorter the wave-lengths become *(the higher the frequency toward the top-end of the HF band)*, the waves will start to reach the ionosphere and provided you have not reached the "critical frequency", the waves will be bent-down or reflected toward the earth's surface again and if conditions are favourable, will be bouncing up and down in this fashion between the ground and the ionosphere till it reaches the intended destination. With careful consideration of the frequency, that could be half-way around the globe or even further but time of day and season also plays a big role.

Band Name	Symbols	Frequency range
Very low frequency	VLF	3 to 30 kHz
Low frequency	LF	30 to 300 kHz
Medium frequency	MF	300 to 3000 kHz
High frequency	HF	3 to 30 MHz
Very high frequency	VHF	30 to 300 MHz
Ultra high frequency	UHF	300 to 3000 MHz
Super high frequency	SHF	3 to 30 GHz
Extremely high frequency	EHF	30 to 300 GHz
Terahertz (ITU, 2015b)	THz	300 to 3000 GHz

These lower-band frequencies do not need to have line of sight as mentioned above and are very effective in mountainous areas and uneven surfaces. Higher frequencies do not make use of propagation in this sense, will pass through the atmosphere if aimed there, does need line of sight and is then classified as VHF *(Very High Frequency)* or microwave UHF *(Ultra High Frequency)* band frequencies. Frequencies lower than the HF band such as those in the VLF, LF, MF and even lower bands are not used in RF communications, but for your information are pretty much present everywhere and are more often than not the cause of a noise floor in RF transmissions. Vocals, for interest sake are in a spectrum called VF *(Voice Frequency)* or in some rare cases in the ELF *(Extremely Low Frequency)* band with baritones lower than 300 Hz, maybe Luther Vandross or Leonard Cohen could tell us more about those?

I am also responsible for AV systems maintenance here, PABX configurations and maintenance, safety mechanisms such as personal locator beacons (PLB), GPS's and fire alarm systems, PA system maintenance, Wi-Fi access point configurations and installations, plus point to point links & placements and network plus server administration. And apart from my main responsibilities, I actively take part in team-recreational activities, arrange and host *(and have been hosting)* many social occasions *(Karaoke evenings and other events)* as well, in an attempt to advance social well-being in our isolated circumstances. We all assist actively in Base clean-up duties and waste handling on a weekly basis and we all take pride in what we do. I live by my standards and integrities, my job is my pride and I am hoping to carry a legacy to all future communications and electronics engineers that are still to experience this way of life and the Antarctic continent.

This might seem insignificant to most out there but the fact of the matter is, Antarcticans are a family! We have very few people on this continent during winter-time and there are no land claims, no territories and no enemies. The Mid-winter terms and celebrations all started here; we send out invitations to all the bases for our Mid-winter festivities and we embrace the opportunity to share this magic and to get the stamp, because someday in the future when we look back at our lives, this time will and shall forever stand out for us. Thus, we dub this a season: not an episode, not a chapter, not a page; and a life changing experience, not just another tick of the box. This place will stay with you forever and your story will never fail to turn the head of your fellow man, but as destructive as humans are, we hope that it will stay pristine and exist for all future generations

OUR WEATHER

Marvin Rankudu (Senior Meteorological Technician / SAWS Representative)

Table 1. SANAE IV weather statistics, as recorded for the month of Nov. 2019.

Weather Statistics: November 2019								
SANAE IV - VESLESKARVET								
	Minimum		Q1	Median	Average	Q3	Maximum	
Humidity (%)	24	(5th)	51	63	63.5	80	89	(30th)
Wind Gust (m/s)	0	(28th)	4	8.7	9.4	13.2	38.8	(13th)
Pressure (hPa)	872	(12th)	887.2	893.5	892.5	897.9	908.5	(18th)

°C, degrees Celsius; Q1, first quartile or 25th percentile; Q3, third quartile or 75th percentile; %, percentage; m/s, meter per second; hPa, hectopascal

ANTARCTICA MATTERS: VOLCANOES

Salomé Odendaal (DEA Team Medical Doctor)

Currently, Antarctica's most active volcano and the southernmost active volcano in the world is the Mount Erebus volcano. It overlooks the largest Antarctic settlement, namely McMurdo research station (operated by the United States) on Ross Island, which stands about 40 kilometres away from it.

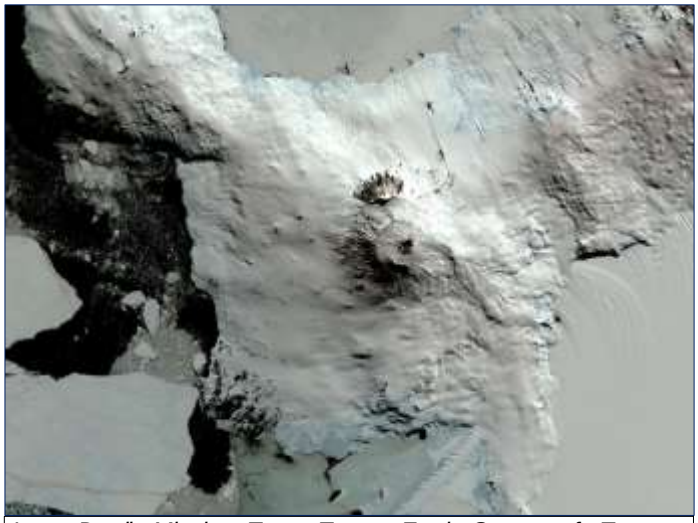


Image Details: Mission: Terra, Target: Earth, Spacecraft: Terra, Instrument: Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER). Credit: NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team. Available at: https://www.jpl.nasa.gov/spaceimages/details.php?id=PIA20239

Mt. Erebus was discovered in 1841 by polar explorer Sir James Clark Ross. It was easy to identify Mt. Erebus as a volcano as it was erupting at the time. Ross Island, where Mt. Erebus is located, and the Ross Ice Shelf were named after him. Polar explorer Ernest Shackleton made the first ascent of Mt. Erebus between 1907-1909 during the Nimrod Expedition.

The 3794-meter-high, above sea level, Erebus is the largest of three major volcanoes forming the roughly triangular Ross Island. An elliptical 500 x 600 m wide, 110-m-deep crater truncates the summit. The crater contains an active lava lake (swirling pool of magma) within a 250-m-wide, 100-m-deep inner crater. The lava lake is approximately 927 °C and is one of only five such lava lakes that exist in the world.

While the inside of Mt. Erebus may be extremely hot, outside is still the freezing temperatures of Antarctica. Ice caves are riddling the side of this snow-covered volcano, as they are carved out by the escaping volcanic gases. The ice caves stay a consistent 0 degrees Celsius, making them a likely spot for undiscovered extremophiles. Scientists are still observing the volcano through the Mount Erebus Volcano Observatory and field campaigns to look for extreme life forms. The volcanic gases heat their way through these ice caves and escape into the air to form approximately 18-meter chimneys of ice ("fumaroles") with deadly volcanic gases pouring out from their tips.

Mount Erebus, Ross Island, Antarctica. 1972. Credit: U.S. Geological Survey (USGS), Department of the Interior/USGS. Author: Richard Waitt, U.S. Geological Survey

Erebus is one of only a few consistently active volcanos in the world. Rather than lying dormant and then spectacularly erupting once every few hundred years (though it does that on occasion), Mt. Erebus is always active, bubbling, releasing gas and flinging ten feet wide "volcanic bombs" (hunks of molten rock which sometimes explode on landing) through the air. It has shown increased activity from the mid-1970s

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A dartboard and charcoal for the year as ours was “forgotten” back home.
Thanks guys, you made every braai day this year happen for us.

We would like to thank each of our sponsors for making our year that much more durable and comfortable.