

# SANSA Contributions to Space Weather Monitoring

## Introduction to SANSA Space Science

SANSA, through the Space Science programme, is part of the worldwide network of magnetic observatories. SANSA is responsible for research, infrastructure and data for monitoring the near-Earth space environment.

The scope of activities includes fundamental and applied space physics research, post-graduate student training, science advancement, space weather monitoring, and the provision of magnetic technology services.



SANSA Space Science is located in coastal town of Hermanus in the Western Cape, about 120km from Cape Town. The absence of heavy industry and electric railway systems make it an ideal, magnetically quiet location.

## Monitoring Space Weather

SANSA is host to the only Space Weather Regional Warning Centre in Africa, which operates as part of the International Space Environment Service (ISES).

SANSA closely monitors the space environment over the Southern Africa region, Indian and Atlantic Oceans as well as the South Pole with instruments situated throughout South Africa as well as Namibia, Antarctica, Marion Island and Gough Island

## Specialised Equipment at SANSA

SANSA is host to a wide range of state-of-the-art equipment and infrastructure for studying the near-Earth space environment. In addition to distributed networks of instrumentation utilised for research purposes, SANSA also operates specialised magnetic technology facilities. This includes a non-magnetic temperature chamber, a zero-field magnetic shielding chamber, a magnetic test bench, DQ declinometers, two 4T30 theodolites and a high temperature Superconducting Quantum Interference Device (SQUID), operating in a magnetically quiet environment.



SANSA's Space Weather Centre in Hermanus, Western Cape.

## Antarctica and Islands Research

SANSA is part of the South African National Antarctic Programme (SANAP) and conducts several on-going space science and space weather related research projects in Antarctica, Marion Island and Gough Island. SANSA sends 2 overwintering engineers per year who spend 5 months in Hermanus + 1 month survival training in Cape Town. Engineers spend 14 months in Antarctica and Marion Island.



SuperDARN radar team (left), SANAP overwintering team (right)

## International Hosting & Collaborations

SANSA hosts several instruments as part of its international collaborations.

Some of these instruments include:

- AWESOME
- e-Callisto
- MAGDAS
- SCINDA
- SOFIE
- And others!



The antennas for e-Callisto antenna (left), and SOFIE (right) – two new instruments that are being hosted at SANSA since 2014.

## SuperDARN Radar

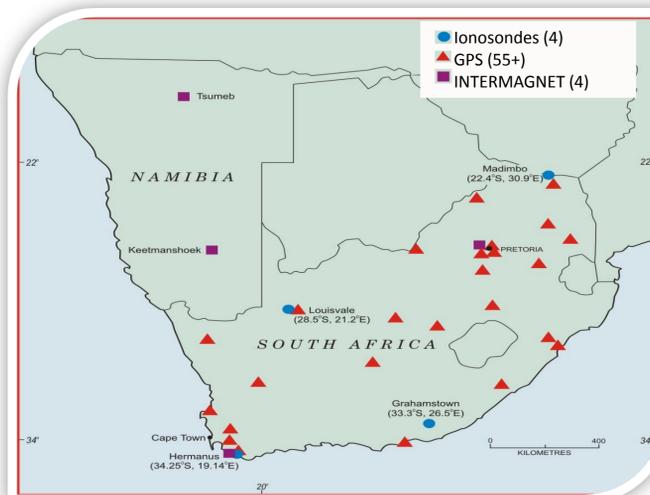
The South African Southern Hemisphere Auroral Radar Experiment (SHARE) radar at SANAE IV has been part of SuperDARN (Super Dual Auroral Radar Network) since 1997 and is one of SANSA's flagship projects. SuperDARN is an international Radar network for studying the Earth's upper atmosphere, ionosphere and connection into space, with radars observing the northern and southern auroral regions. During the Austral Summer of 2013/14, the South African National Space Agency (SANSA) became the second organization to install the T3 implementation of the all-digital HF Radar in the SuperDARN network. The new radar, which replaced the previous radar at SANAE IV, was based on a Australian design from La Trobe University. The new radar was fully built and tested in-house at SANSA Space. SANAE IV's strategic location close to the South Atlantic Anomaly makes the data invaluable for geo-space observations.

## Instrumentation Networks

SANSA actively participates in several international networks of space science instrumentation.

Some of these include:

- DIDBASE (Ionosonde)
- SuperDARN (HF Radar)
- INTERMAGNET (Magnetometers)
- PLASMON (VLF)
- IGS (GPS)
- AFRICA ARRAY (GPS)
- And others!



A map of Southern Africa showing the locations of some of SANSA's space weather monitoring instruments.



The 16-element main array (top left), the new fully digital radar hardware mounted in three racks (top right), one of the HF transceiver boxes (bottom left) and the internals of the power amplifier (bottom right) are located at SANAE IV in Antarctica