Staring at the sun

Dr Mpho Tshisaphungo heads up the operational Space Weather Centre and is seen here in the operations room. The screens on display show near-real-time data of the sun and the effects it has on the upper atmosphere.

Africa's first operational space weather centre was recently launched in Hermanus

The South African National Space Agency (SANSA) recently launched the continent's very first 24/7 Space Weather Centre in Hermanus in the Western Cape, creating an important hub for space observations of solar storms and related atmospheric anomalies.

A team of scientists and practitioners in the beautiful coastal town of Hermanus, are watching the sun and the Earth's upper atmosphere around the clock to warn of imminent solar storms that might impact Earth's technological systems.

They are operating Africa's first 24/7 Space Weather Centre, which was launched in November 2022 by the Minister of Science and Innovation, Dr Blade Nzimande. This new capability was developed by the South African National Space Agency (SANSA) over the past three years and has brought international prestige to the South African space science community.

Solar flares and winds

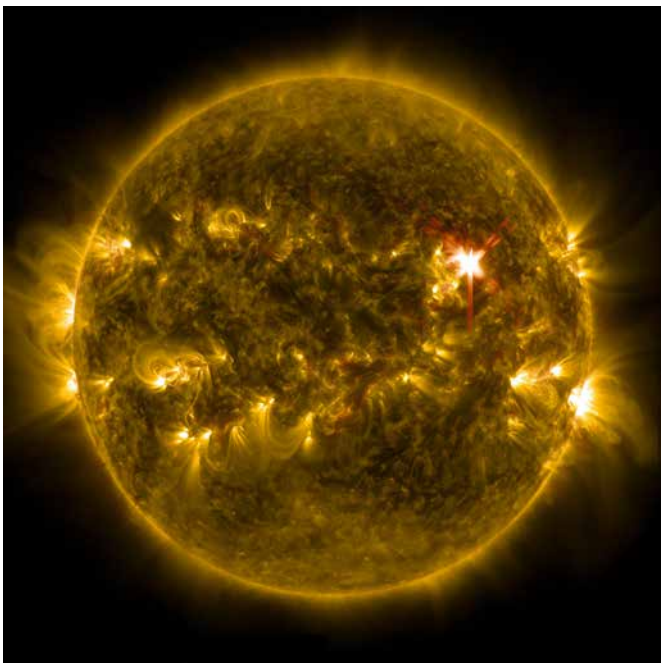
Space weather refers to the conditions in space emanating from the sun that can impact the performance and reliability of space-borne and ground-based technological systems such as communication, navigation, and power grids.

When solar flares, coronal mass ejections, and solar wind interact with the Earth's magnetic field, it can have a significant negative impact on our technological systems. Industries such as aviation rely on communication and navigation capabilities to operate in a safe and compliant manner and need to know when solar storms will impact these systems.

Similar to terrestrial weather forecasting, space weather forecasters use near-real-time data and models to forecast space weather conditions and publish daily bulletins and warnings to enable various industries to mitigate the impacts of space weather. Prof. Mike Kosch, SANSA Chief Scientist, says space weather forecasting is still in its infancy.

"With only a few space-based remote sensors, space weather forecasting is much like terrestrial weather forecasting was 100 years ago."

The Department of Science and Innovation (DSI) has made significant investments in establishing a world-class space weather capability that will benefit not only South Africa but the rest of Africa as well.



"The operational capability has been developed over the past three years, and to date, the DSI has invested over R70.89 million for the establishment of the 24/7 space weather capability," said the Minister during the launch. The total investment in this capability amounts to R107.5 million over the three years.

SANSA's Hermanus facility has been in existence since 1940 and started out as a magnetic observatory. In 2007, the facility started monitoring space weather with one forecaster from a single office and joined the International Space Environment Services (ISES). The first Space Weather Regional Warning Centre for Africa was then opened in 2010, and this centre was upgraded in 2018.

Purpose-built

The new space weather centre was designed with its purpose in mind and has large elliptical shapes throughout that was inspired by the shapes of the Earth's magnetic field lines. The building features state of the art ICT infrastructure, the space weather operations room, a 100-seater

Space weather forecasters in the operations room. From left is Boitumelo Makobe, Salma Khan, Teboho Nxele and Nkosinathi Masango.

SANSA

The new SANSA Space Weather Centre and associated capability was launched on 3 November 2022 and has been operating on a 24/7 basis since October 2022. The capability is operated from a new state-of-the-art building on the SANSA campus in Hermanus.

auditorium, meetings rooms, offices and facilities for the forecasters such as sleeping pods and a full bathroom.

In addition, SANSA also built an on-site guest house for international researchers, expanded its student residence and built a generator house to ensure continued operations during load shedding.

The Space Weather team has also grown significantly with this project as the centre has to operate on a 24/7 basis to support industries such as aviation. SANSA now employs eight space weather forecasters, seven of whom are women. As there are no tertiary qualifications for space weather forecasting in South Africa, SANSA employed graduates with a background in physics and meteorology and provided a one-year in-house training programme. This training included a working trip to the UK Met Office where the trainees received hands-on experience in a 24/7 operational space weather centre.

Leading this group is Dr Mpho Tshisaphungo who has started SANSA's space weather journey since day one. Another new addition is the SANSA SARCHi Research Chair in Space Weather, Dr Martin Snow, who is pioneering solar physics in South Africa and already has five new students for the 2023 academic year. Snow says his efforts are directed towards predicting when solar storms may occur as well as how long it takes for the storm to cross the void to arrive at Earth.

"Knowing this significantly improves our ability to forecast the impact of solar storms."

Dr Lee-Anne McKinnell, Managing Director of Space Science for SANSA, says this space weather capability development represents the value of science, technology, and innovation in building new applications and technologies in South Africa, and in solving global challenges through the research-to-operations value chain.

Article written by Daleen Fouché, communications practitioner for the South African National Space Agency (SANSA).