

# Report of Regional Warning Centre for Africa

## South African National Space Agency (SANSa)

### August 2014

#### 1. Introduction

The Space Weather Regional Warning Centre for Africa is operated by the South African National Space Agency (SANSa) through its Space Science Directorate located in Hermanus, South Africa. The centre provides forecasts and warnings related to the regional impact of space weather on technological systems, as well as public awareness and education on space weather. Due to the requirements of the region, the centre has focused on High Frequency (HF) propagation prediction, however, future prospects include Geomagnetically Induced Currents in power line systems, and aviation impacts.

#### 2. Recent accomplishments

##### A. Space Weather Course for Industry

A new Space Weather Course for industry was developed and launched in May 2014. The first course was provided to a group from a directorate of the Department of Defence and took place during the period 12 - 16 May 2014. The RWC for Africa plans to provide this Space Weather Course to industries who are affected by adverse space weather conditions, and who wish to develop an awareness of space weather amongst their teams. SANSa is working closely with industry in this regard.



Figure 1: An industry group photo with some SANSa staff who were involved in the course.

## B. HF Communications Tool

As an added value item, the RWC Africa team have been working closely with industry to develop tools that allow them to make more optimal use of space weather information. A software tool was developed for a client to easily generate and electronically distribute HF Communications plans. The tool is in a testing stage with the client to improve the user experience and is expected to be completed this financial year.

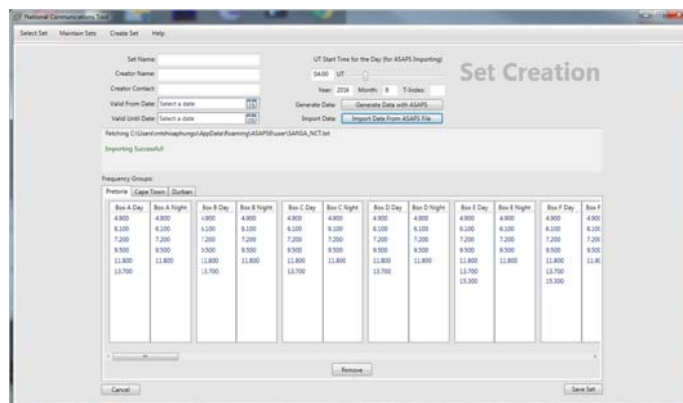


Figure 2: An image shows an example of the software tool.

## C. Space Weather (SW) Information day

SANSa successfully hosted a Space Weather Information day aimed at creating an awareness of space weather amongst existing and prospective clients, and government departments. The information day was held on the 8<sup>th</sup> April 2014 in Pretoria, the capital city of South Africa. At this event, the space weather team reached a number of industries, including the power industry, the aviation sector, as well as a few government departments. It is intended that a second information day will be held in Cape Town before the end of 2014.



Figure 3: Industry personnel at the space weather information day.

#### D. Automatic Warning/Alert System

A system has been designed to automatically send warning/alert messages to the space weather team when an adverse space weather conditions has been reached. This serves as a tool to prompt the team to act on the event more effectively and accordingly, and allows the centre to maintain a 24 hour on-call system.

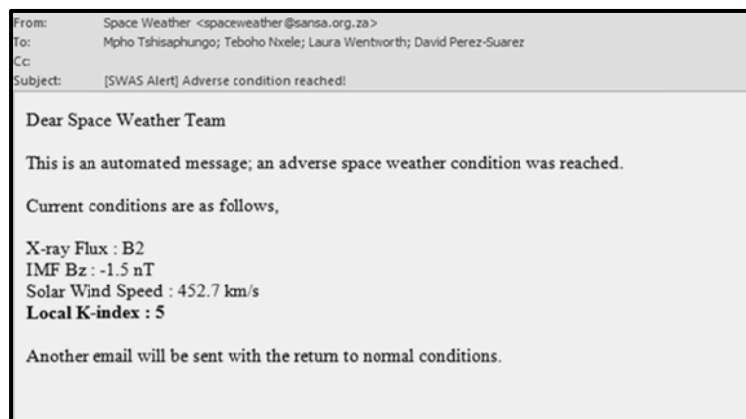


Figure 4: Automated message to the space weather team showing local geomagnetic storm conditions.

#### E. e-Callisto

Several challenges have been experienced with the Hermanus e-Callisto instrument, including several problems identified with the receiver. The problems have now been identified and a new receiver will be installed in Hermanus shortly. Unfortunately, there is currently no quality data available from the Hermanus e-Callisto instrument.



Figure 5: e-Callisto receiver and antenna

### **3. Highest priority product goals**

- A. Space Weather Forecast verification methods
- B. Data portal for Space Weather forecasting

### **4. Highest priority data needs**

- A. Regional GPS real-time data access to the centre.

### **5. Recent information on user impacts**

- A. Not much has been done in this area to assess user impact, and currently there is no mechanism for feedback in place. However, the some particular products and services are evaluated, for example, the courses provided. In addition, there is a feedback form on the SANSa space weather website and the website is registered on google analytics to see the user access.

SANSa is planning a customer feedback and user impact analysis process and space weather will be included.

### **6. Forecast verification summary**

#### **A. HF Predictions**

Ionosonde data from three South African stations are used to measure the accuracy of the HF frequency predictions. The three stations are namely Grahamstown, Hemanus and Louisvale. The figure below shows a daily variation of frequencies in the month of June 2014. It is noted in this figure that from day 9 through to 17 an over prediction for all stations was experienced. There was also a lot of data gaps from 18 to 30 June from the Louisvale ionosonde station. The overall prediction as compared to measured is, however, reasonable. This is one way of measuring our confidence level in providing HF prediction frequencies.

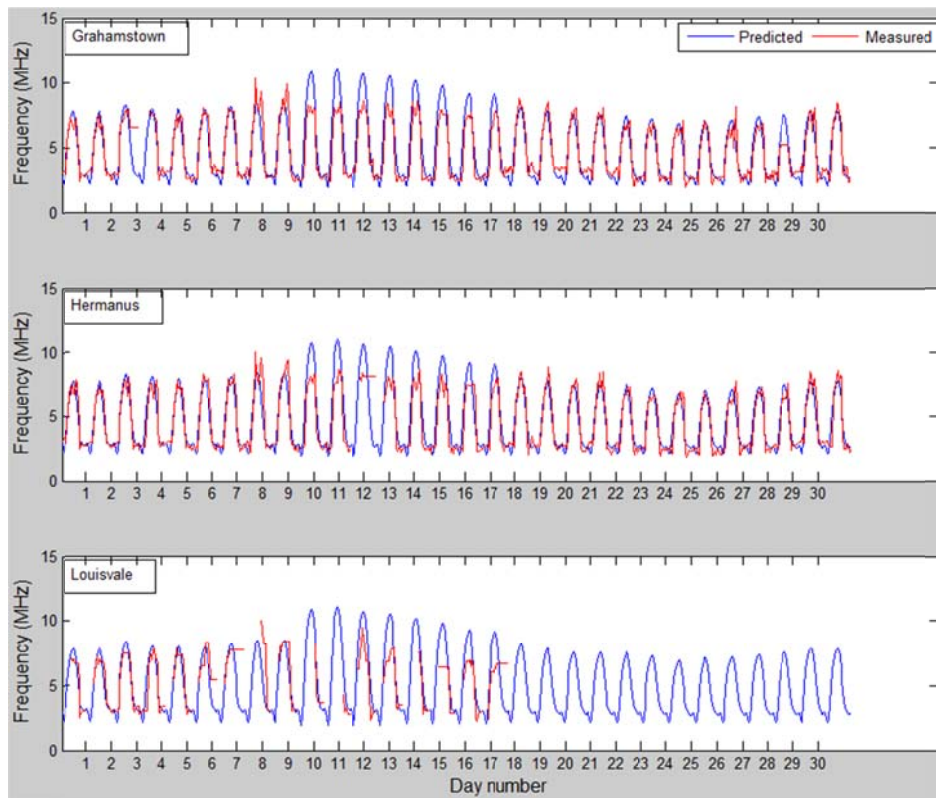


Figure 6: This figure shows a daily comparison between predicted and measured frequencies from three different ionosonde stations for the month of June 2014.

## B. CME Speed Calculations

A software program has been developed to calculate the CME speed using a 2-D method. The program only uses one LASCO image type at a time. In the figure below LASCO C3 was used for the CME speed calculation from SANSa compared to NASA which used a combination of LASCO C2 and C3 images.

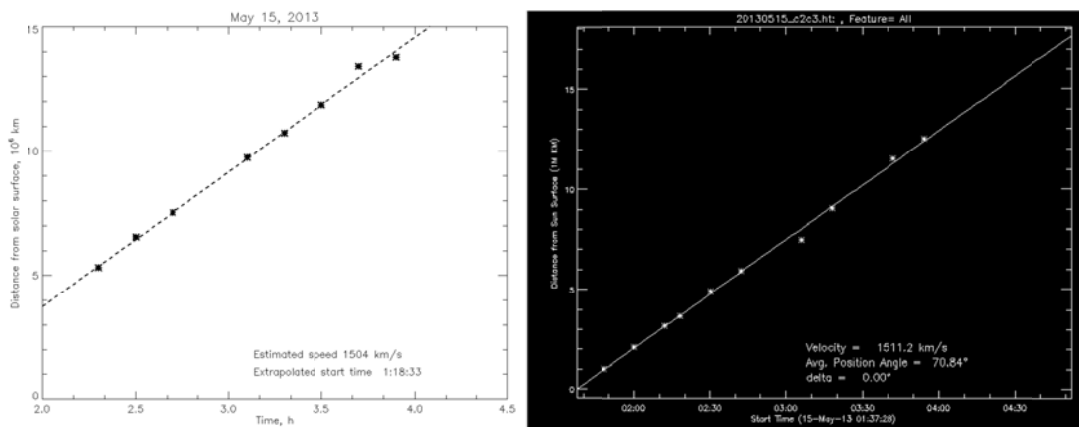


Figure 7 (a) SANSa CME speed calculations

(b) NASA CME speed calculations

The plan is to compare the SANSa model performance against models used in other regional warning centres, and to verify the estimated arrival time of CMEs with ACE data.

## **7. Regional Warning Center Coordination**

### **A. RWCs providing consistent information during extreme event.**

The SANSa RWC Space Weather team are of the opinion that standardizing RWC information is a great idea moving forward, however, it will need proper planning and careful implementation in order not to alienate the clients of individual RWCs. SANSa RWC for Africa suggests having/forming/starting a forum where the teams could discuss events and search back for past events, one thread for each event. The current configuration on the ISES website doesn't allow that, but it would be an extremely valuable collaboration tool.

Submitted to ISES by:

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