



Ministry of Higher Education and Scientific Research



Studying the Ionosphere using Ionosonde Observations' Data: Some Plans of Space Weather Observations in Sudan

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(ISWI): The Sun, Space Weather and Geosphere**

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Mohammed Yahya Alradi Eldaw

National Center for Research(NCR)

Institute of Space Research and Aerospace(ISRA)

Email: mohammedyahyaact@gmail.com&

mohammed.yahya@ncr.gov.sd



Outlines

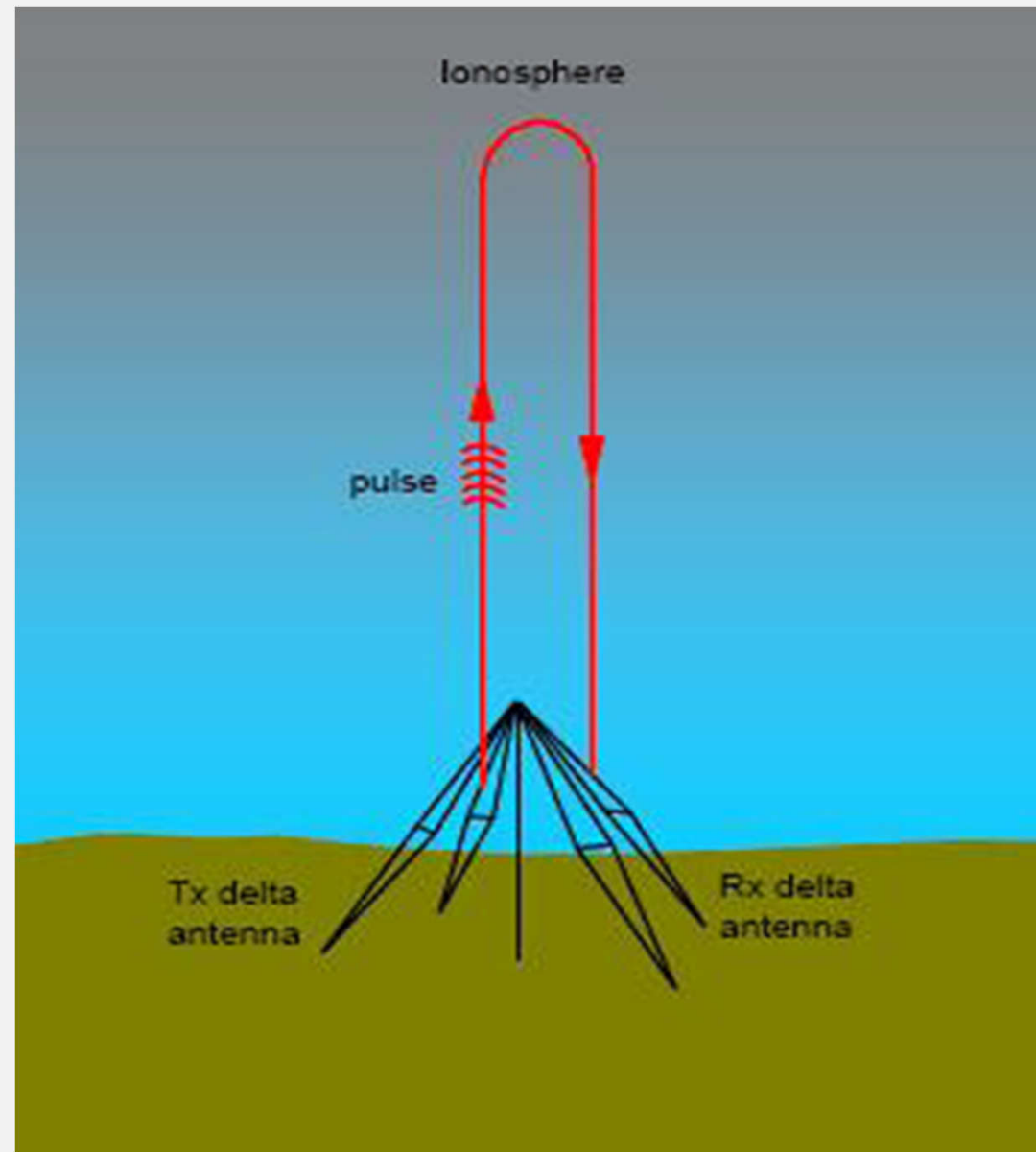
- Introduction
- Ionosonde data research uses
- Case study
- Methodology
- Conclusion
- Future Work

Introduction

Ionosonde is the instrument which is used for measurement of electron density against height. It uses principles of Ionospheric reflection and radar theory.

Ionosonde data is became very important to understand the mechanism of E layer Sporadic.

Installing Ionosonde station will contribute to the global maps of the total electron content(TEC) of Ionosphere.



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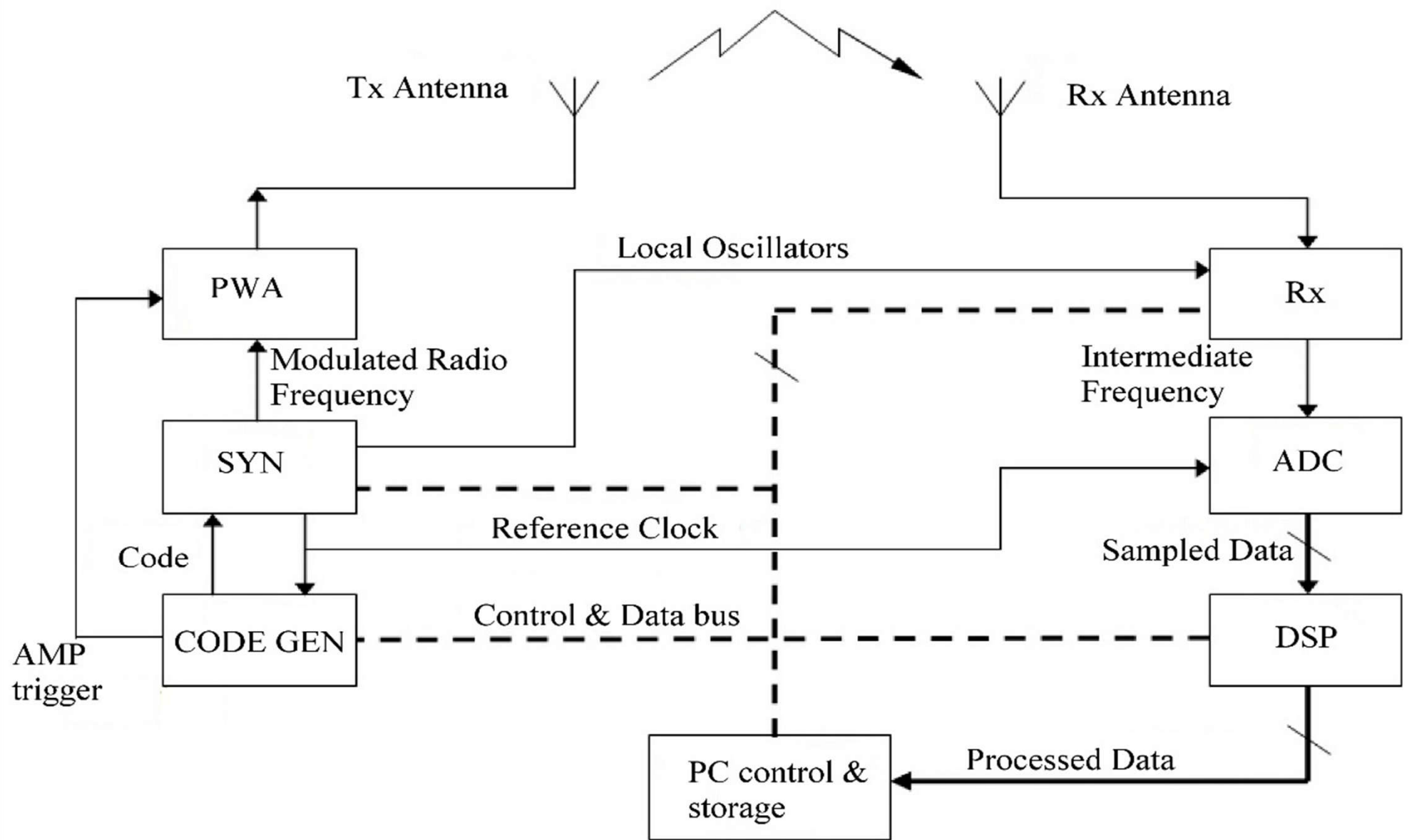
In this future plan, I shall propose installing Ionosonde station may be select from high latitude and mid-latitude regions.

By the help of this station, regional ionosphere maps will be generate for both quiet and stormy days by using models and tools through helping software MATLAB.

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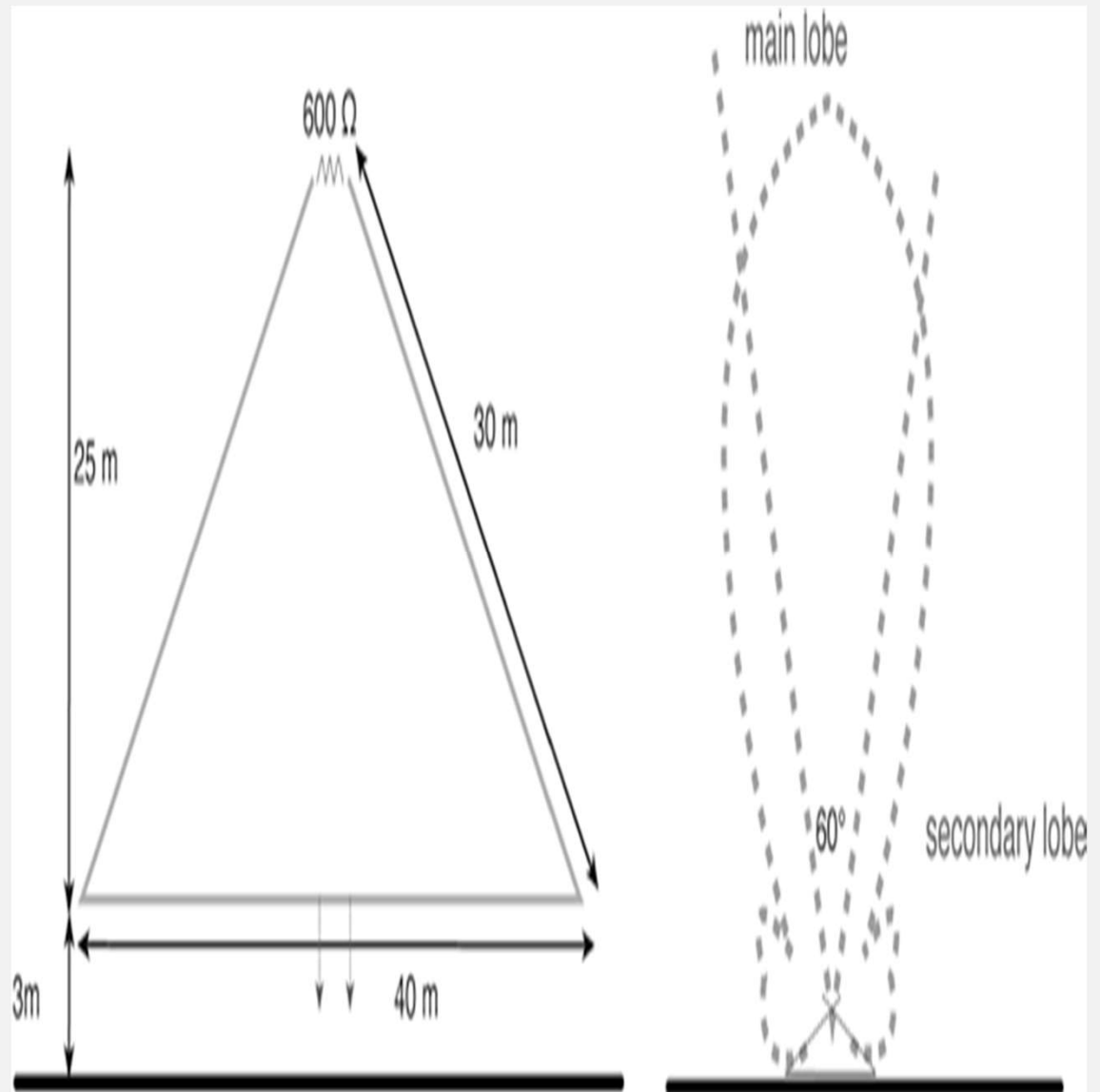
Fig. 1 Simplified diagram show AIS-INGV Ionosonde, showing the main functional subsystems: PWA is the power amplifier, Rx is the receiver, SYN is frequency synthesiser, ADC is the a Analog to Digital Converter, GEN is the code generator, DSP is Digital Signal Processor(for details on their operation.

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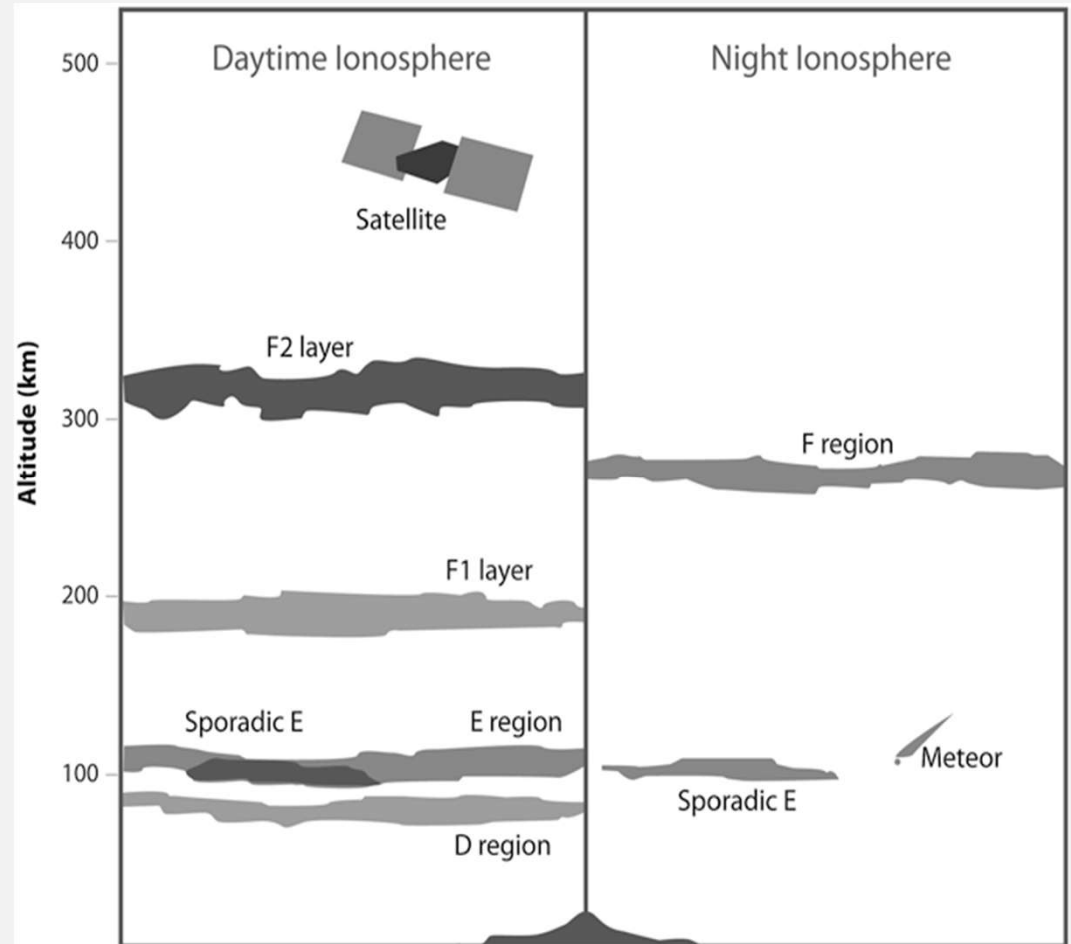
Antenna System

Fig. 2. On the left, a simple scheme and dimensions of a transmitting delta array with a $600\ \Omega$ resistor at the top, and on the right, the graph of directional gain.



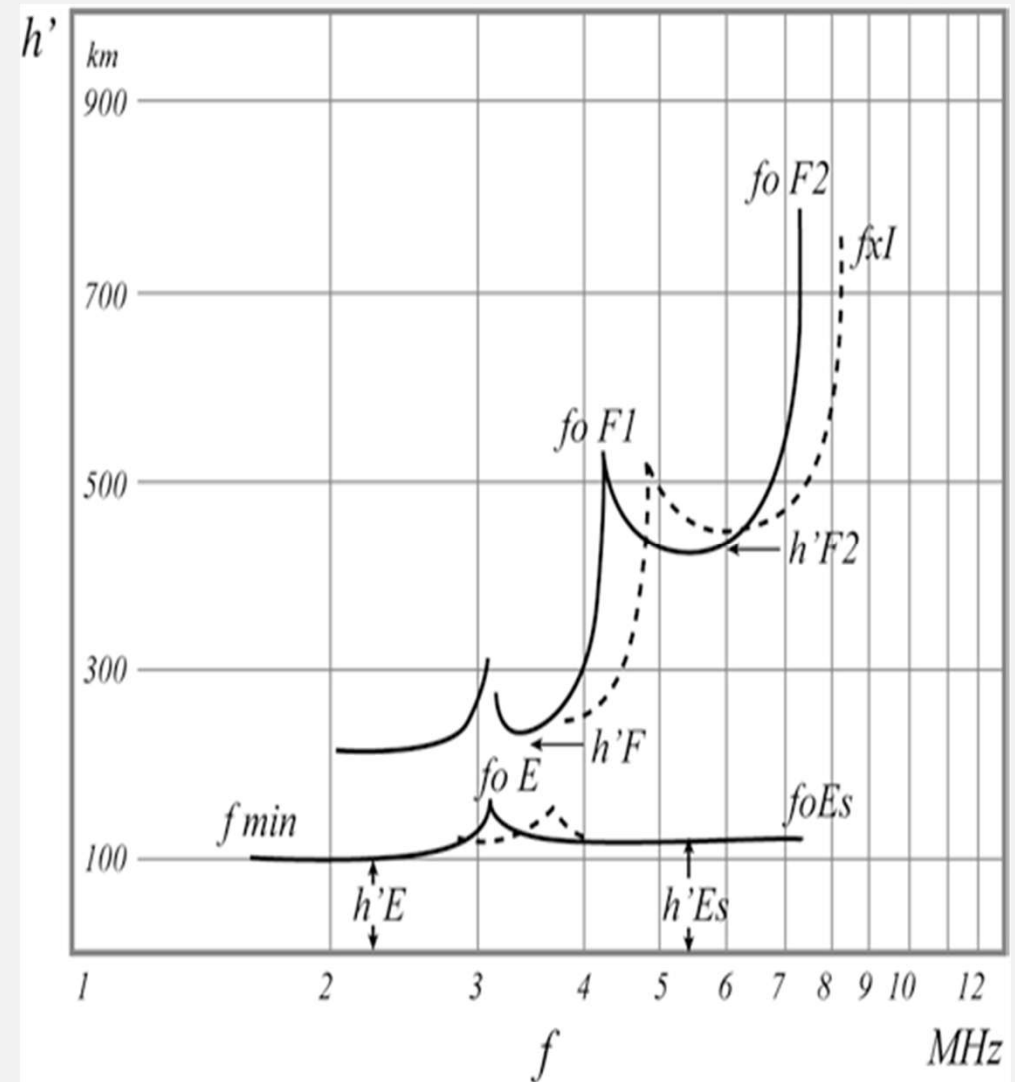
Structure of Terrestrial Ionosphere

Figure 3. Day and night structure of the terrestrial ionosphere.



Ionospheric characteristics

Fig. 4. Ideal daytime ionograms with routinely scaled characteristics of the ionospheric layers.



TEC MAPING

Ionospheric information may be obtained from Ionosode data for the specific area , moreover measuring of this specific area could be expressed by the concept of “coverage circle “ which can be obtained for each station.

TEC

TEC is defined by the integral of electron density in a 1 m² column along the signal transmission path.

TEC is a key parameter in the mitigation of Ionospheric effects on radio system.

TEC ...

The TEC measurements obtained from dual frequency GPS receivers are one of the most important methods of investigating the Earth's ionosphere.

IONOSONDE DATA RESEARCH USES

The importance of Ionosonde data in the future will be achieved after fixed in the country contributing to compare the data from ionosonde with all activities of sun of the upper atmospheric density, such as solar flux index F10.7

CONTIN...

Ap index all these factors used to understand the mechanisms of E layer sporadic and the behavior of the cloud of free electrons and protons at that area.

CASE STUDY IONOSONDE

Ionosonde is a device research Observation it will be develop in future in Sudan by a researcher at Institute of Space Research and Aerospace (ISRA). plan to observe the Ionospheric layers to understand the mechanism and the behavior of the electron and ions during sun activities.

METHODOLOGY

The daily data of Ionosonde will take from the station in future to use with comparing planetary magnetic index A_p and solar radio flux (F10.7) Total Electron Content (TEC) Maps.

RESULT

The result shall be doing in scientific research regarding to the Ionospheric disturbances like the effects of Space weather effect on GPS and any other space technologies which benefits from Ionosonde data through investigating the causes regarding to space weather event.

CONCLUSION

The Ionosphere phenomena is directly affected by the solar activity during the solar cycle and an essential point that there is no clear capability or mechanism for providing direct prediction.



CON...

So that to Establish Station of Ionosonde think good opportunity to do scientific research and making capacity building for young researchers and graduated Students.



CON...

One of the solutions is using data for determining the behavior and mechanism of free Electrons and free Ions in the different Ionospheric layers.

Thank you for Listening

