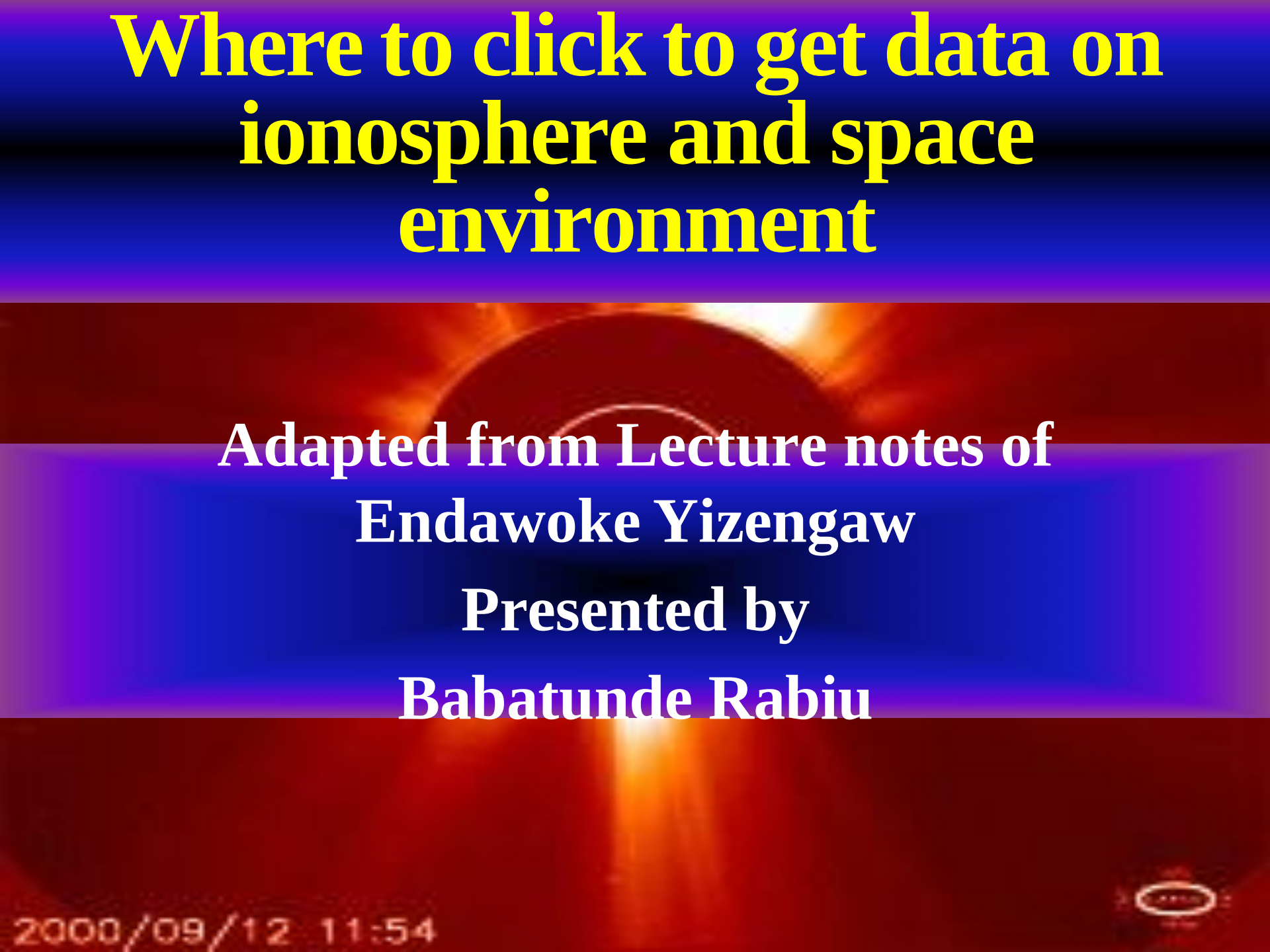
Where to click to get data on ionosphere and space environment

Adapted from Lecture notes of
Endawoke Yizengaw

Presented by

Babatunde Rabiu



Babatunde Rabiu _
Papa Sandro Radicella
Endawoke Yizengaw

How is the Sun doing?

All real time information about the Sun, such as sunspots, CME (whether it is coming to us or not and the time it takes to reach us, Co-rotating corona holes, some impacts that we observe on the ground because of the Sun misbehavior.

In general, all space weather related phenomenon is featured here on the real time base.

http://www.spaceweather.com/

Where can we get more picture of the Sun?

The CME and CIR structures of Sun is continously monitored by the sophisticated camera deployed onboard SOHO, STEREO A & B, and SDO space crafts and more pictures and movies can be found from

SOHO Data-Base

http://sohowww.nascom.nasa.gov/data/

STEREO Data-Base

http://www.nasa.gov/mission_pages/stereo/main/

Solar Dynamics Observatory (SDO)

http://sdo.gsfc.nasa.gov/

Where can we get about solar wind data?

Solar wind speed, density, temperature, magnetic field (IMF), ram and dynamic pressure, and more

ACE space craft (Real time ACE data)

http://www.srl.caltech.edu/ACE/ASC/level2/

http://www.swpc.noaa.gov/products/ace-real-time-solar-wind (Real time)

WIND space crafts

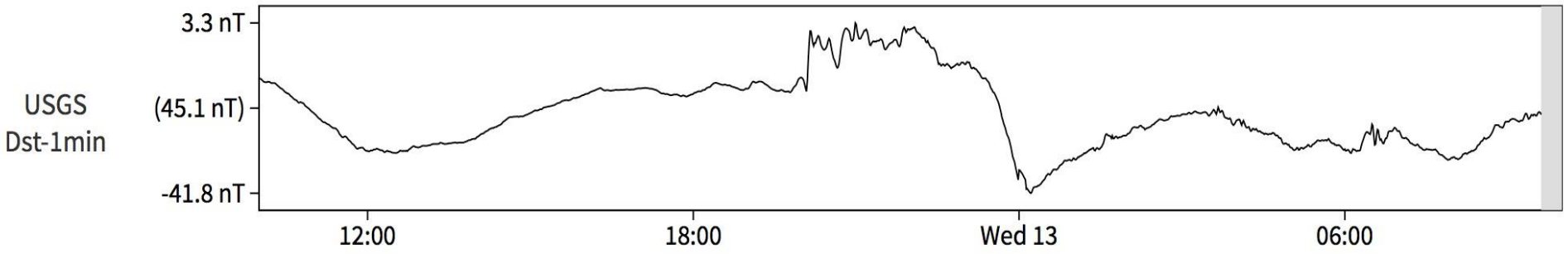
http://wind.nasa.gov/data.php

Geomagnetic indices

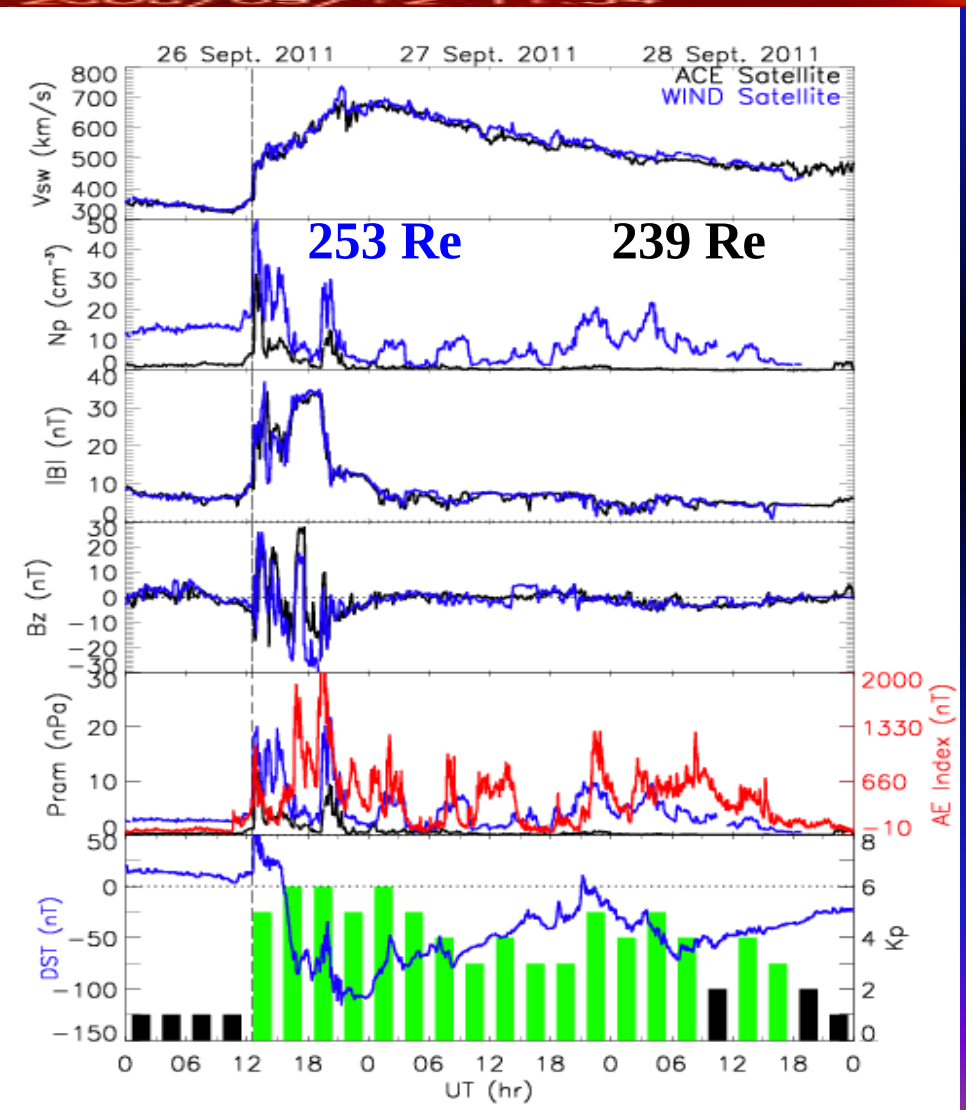
Dst, ASY/SYM, KP, AE, AL, and AU indices; International Quiet & Disturbed days

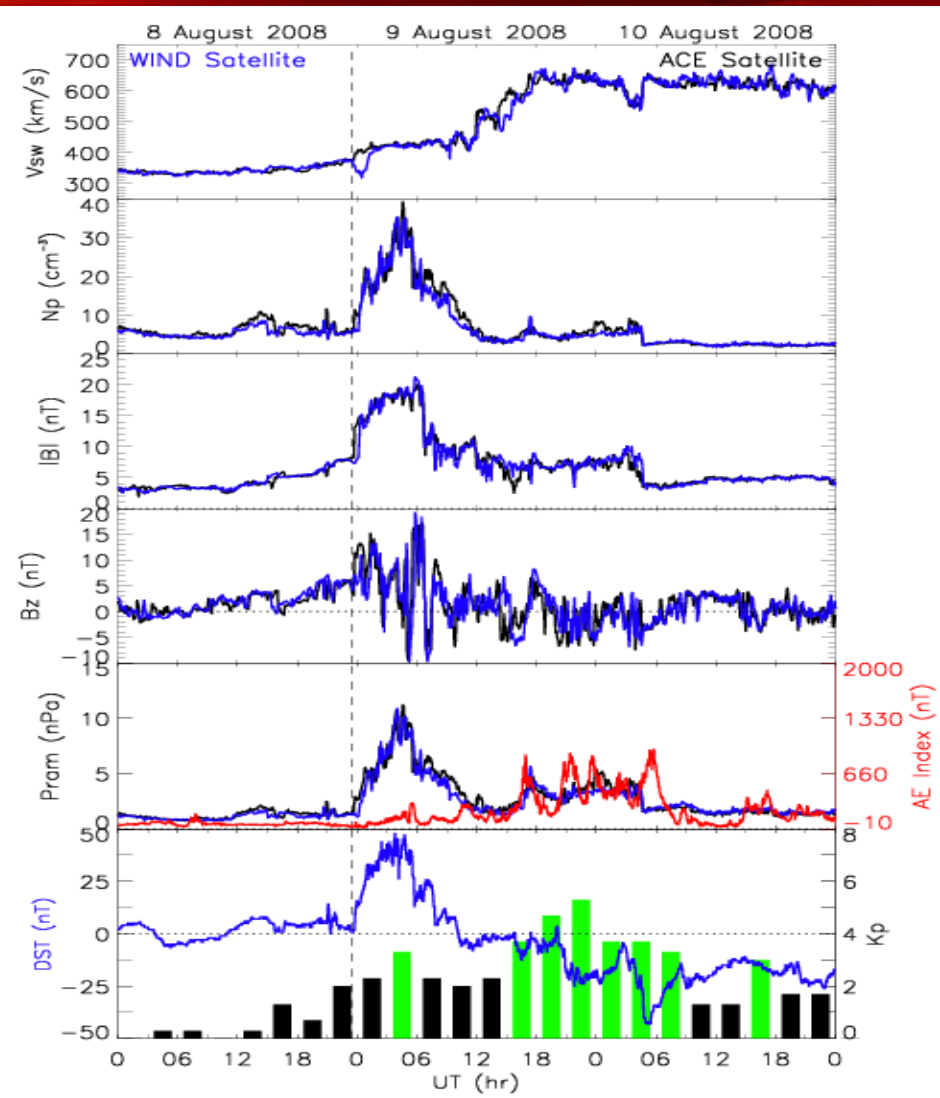
- **Kyoto University**
http://wdc.kugi.kyoto-u.ac.jp/wdc/Sec3.html
-**World data center (Russia)**
http://www.wdcb.ru/stp/data/geomagni.ind/

USGS Dst index
https://geomag.usgs.gov/plots/dst.php



Examples of solar wind and magnetic indices





Where to find magnetometer data?

Magnetometer Data Sets

Intermagnet magnetometer Network

http://www.intermagnet.org/Welcom_e.php

AMBER Magnetometer Data

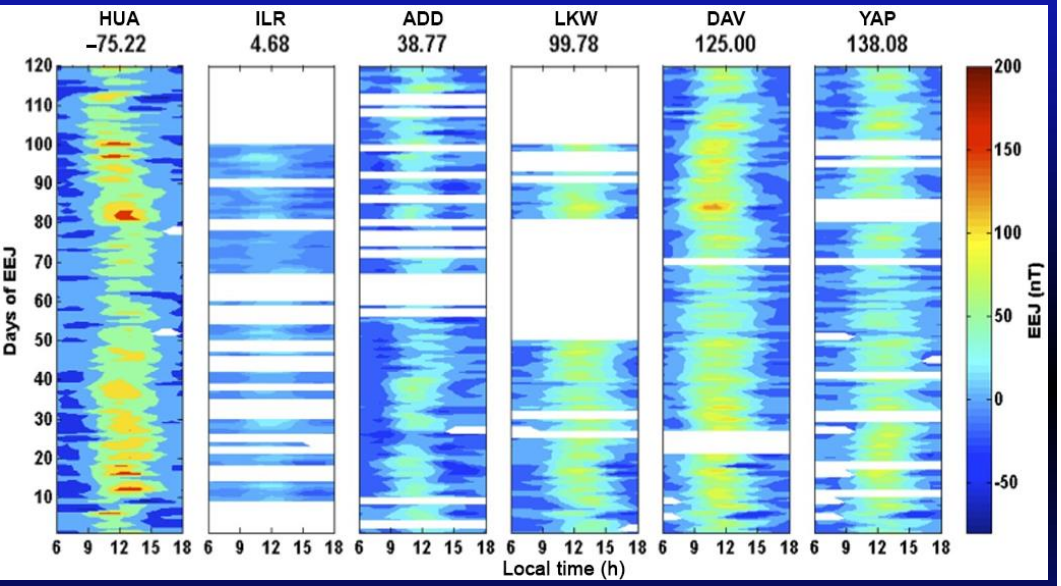
http://magnetometers.bc.edu/index.php/amber2

SuperMag Magnetometer Data

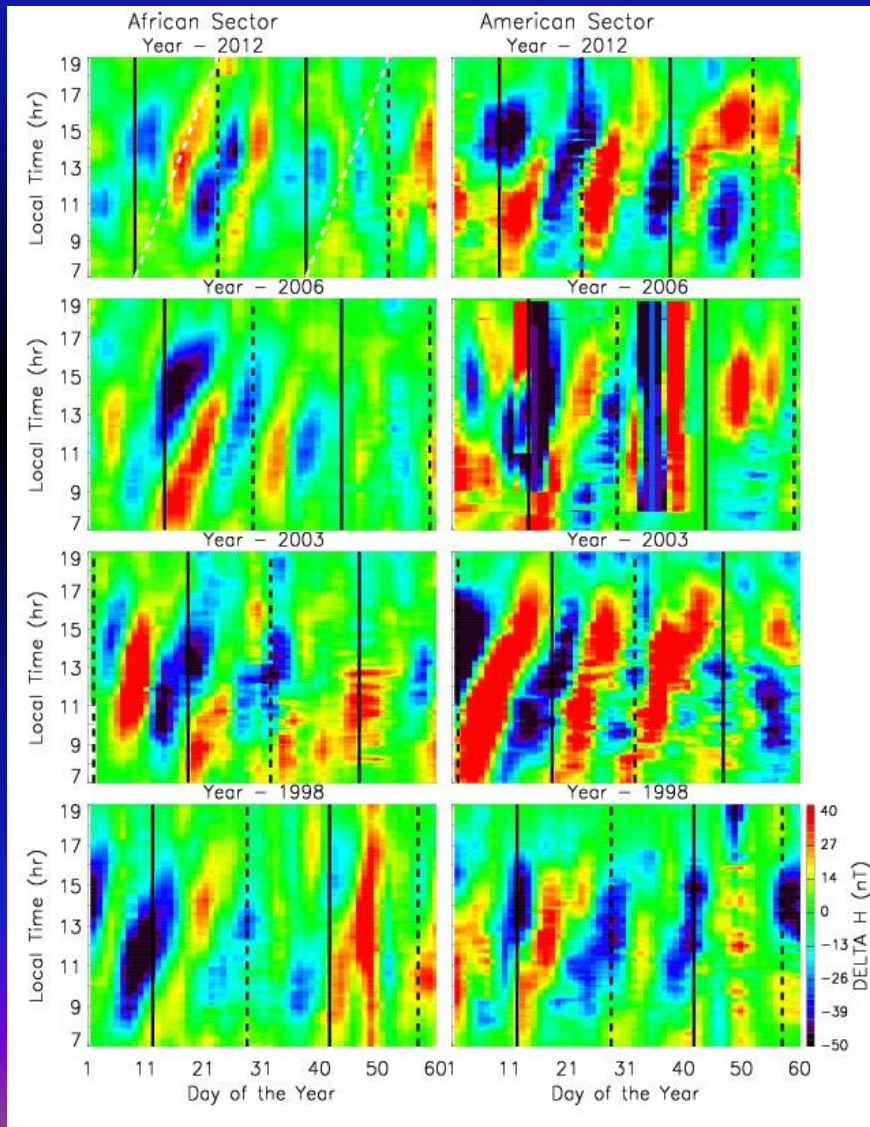
Supermag magnetometer Network

http://supermag.jhuapl.edu/mag/

What can you do with magnetometer data?



Rabiu et al, 2016, 2017



GNSS RINEX databases

SOPAC GPS RINEX Database

http://sopac-old.ucsd.edu/dataBrowser.shtml

NASA GPS RINEX Database

https://cddis.nasa.gov/Data_and_Derived_Products/GNSS/RINEX_Version_3.html

Nigerian GNSS RINEX Database

https://teronet.nignet.net/

South Africa GPS RINEX Database

http://geodesy.hartrao.ac.za/site/en/data-and-products.html

UNAVCO GPS RINEX Database

http://facility.unavco.org/data/gnss/perm_sta.php

Where can we get calculated GPS TEC?

Madrigal data base (developed by MIT group) provide global calculated GPS TEC, interpolated 1 x 1 degree latitude and longitudes. The calculated TEC is averaged every 5 minutes.

Madrigal data base

http://millstonehill.haystack.mit.edu/

ICTP data base

https://arplsrv.ictp.it/

https://t-ict4d.ictp.it/nequick2/gnss-tec-calibration

Data from other COSMIC satellites?

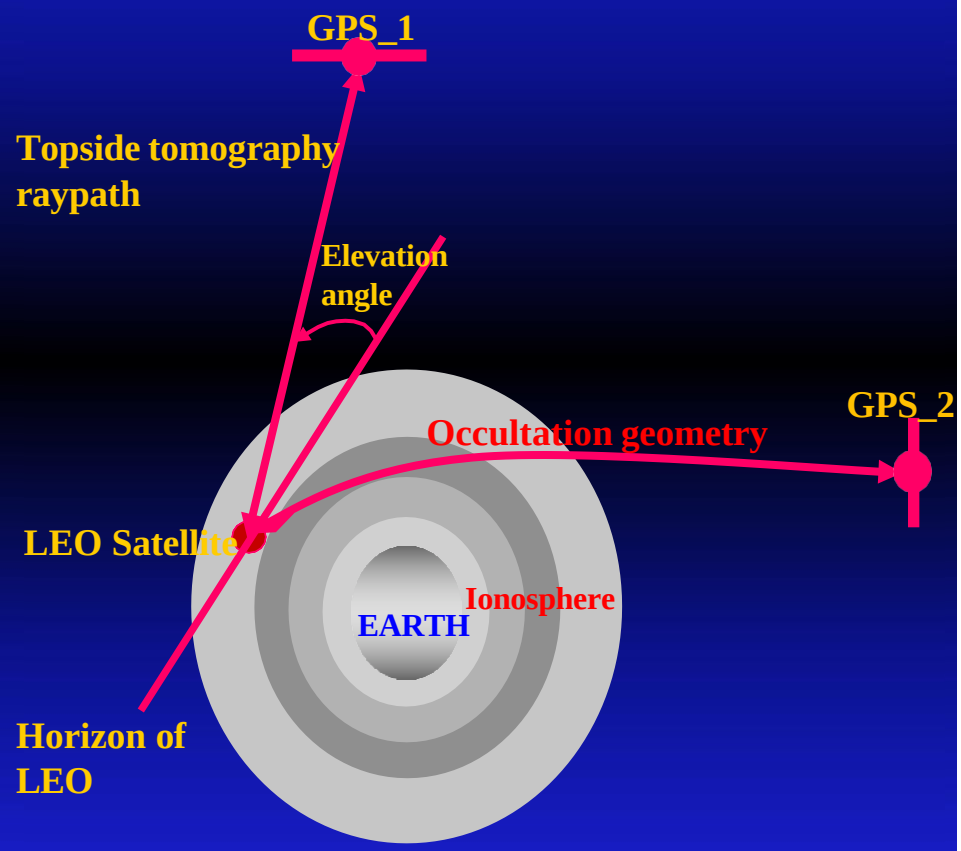
COSMIC 1 data base

https://www.cosmic.ucar.edu/what-we-do/cosmic-1/data

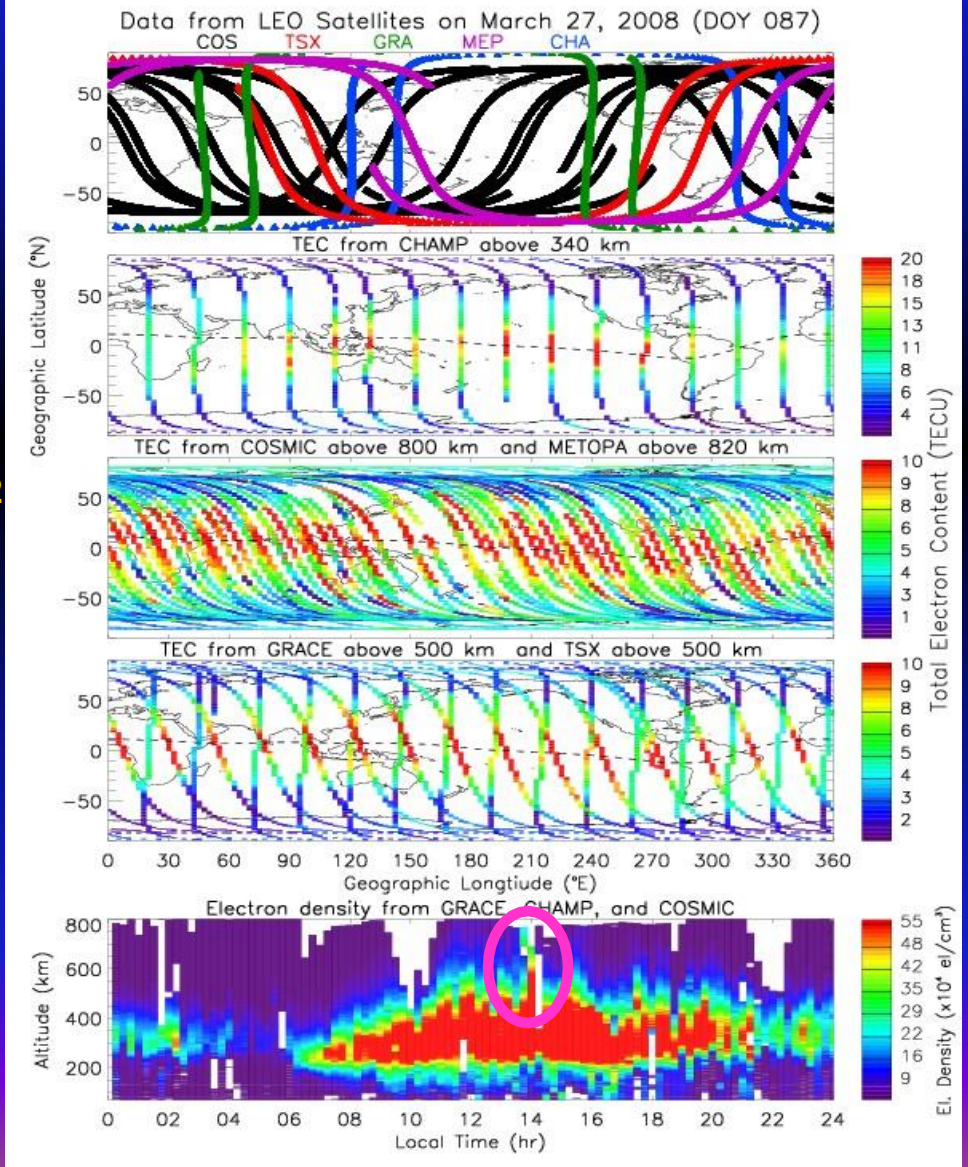
COSMIC 2 data base

https://www.cosmic.ucar.edu/what-we-do/cosmic-2/data

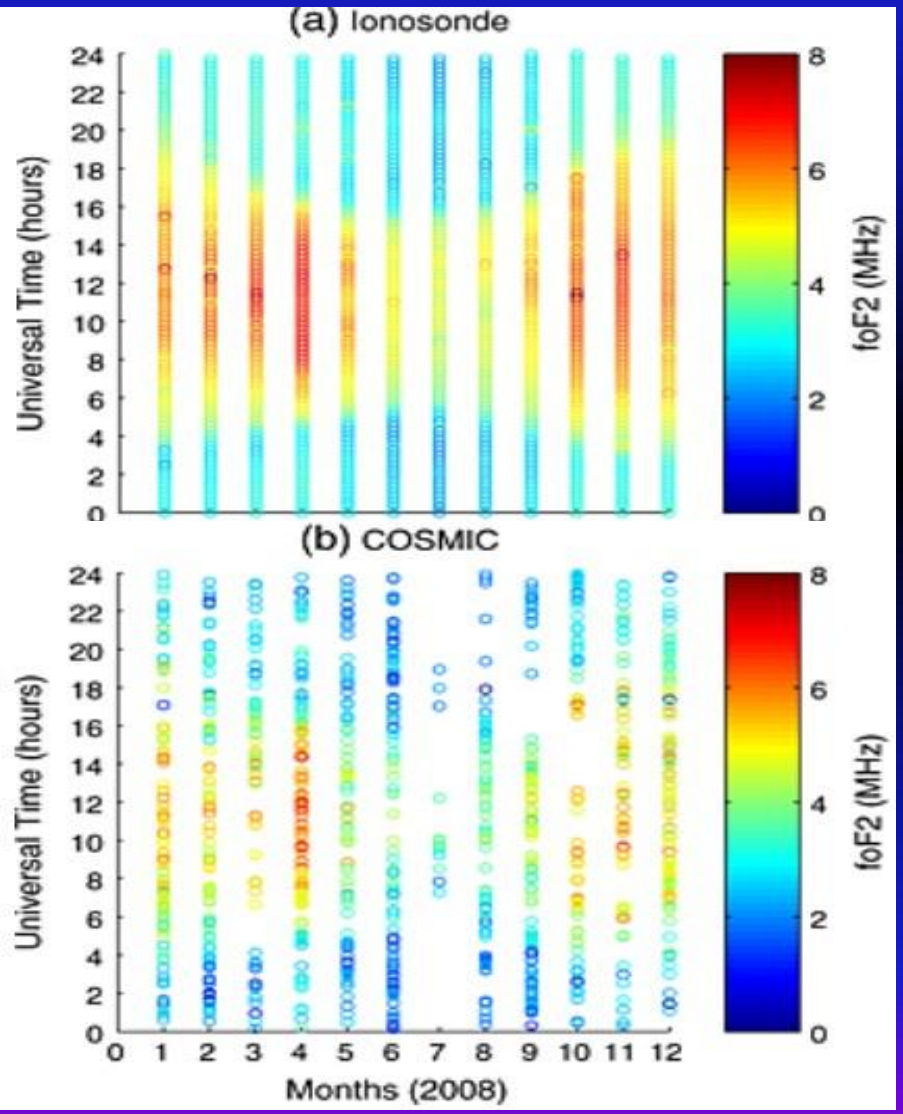
The two most important type of LEO GPS observations

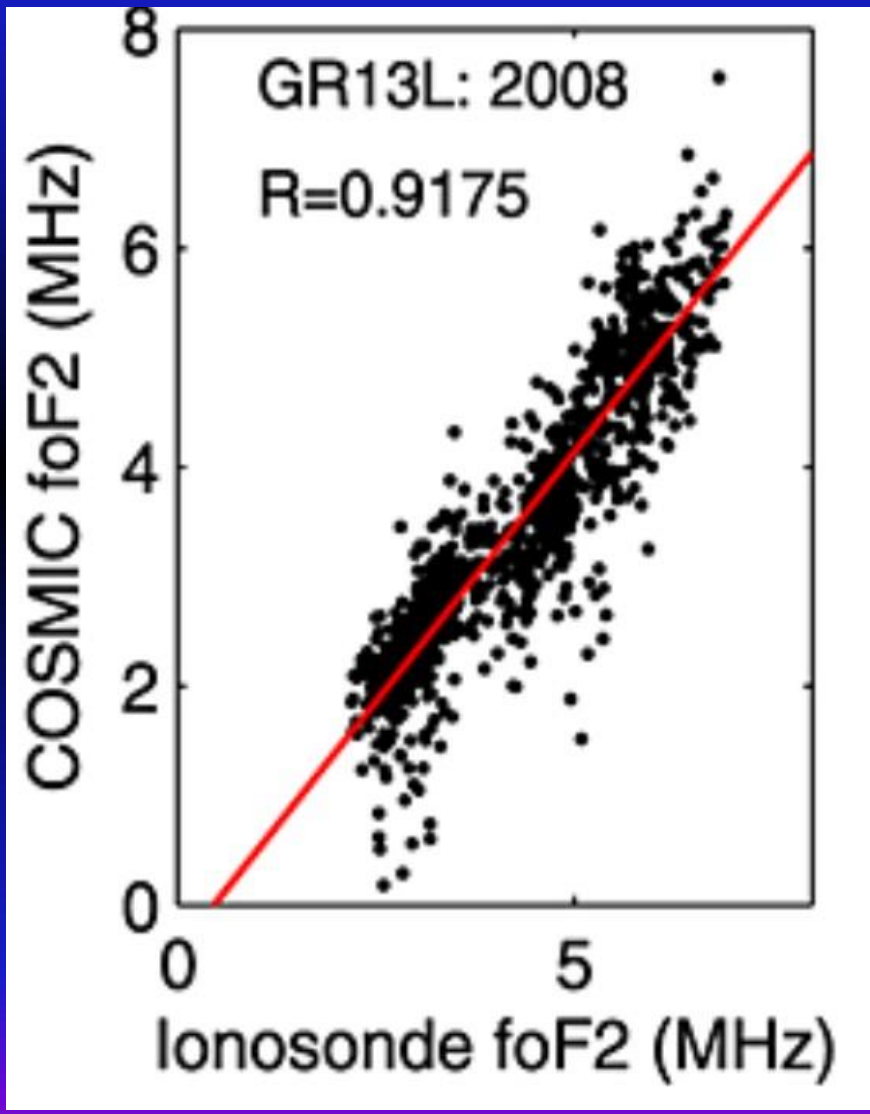


Yizengaw and Carter, 2016



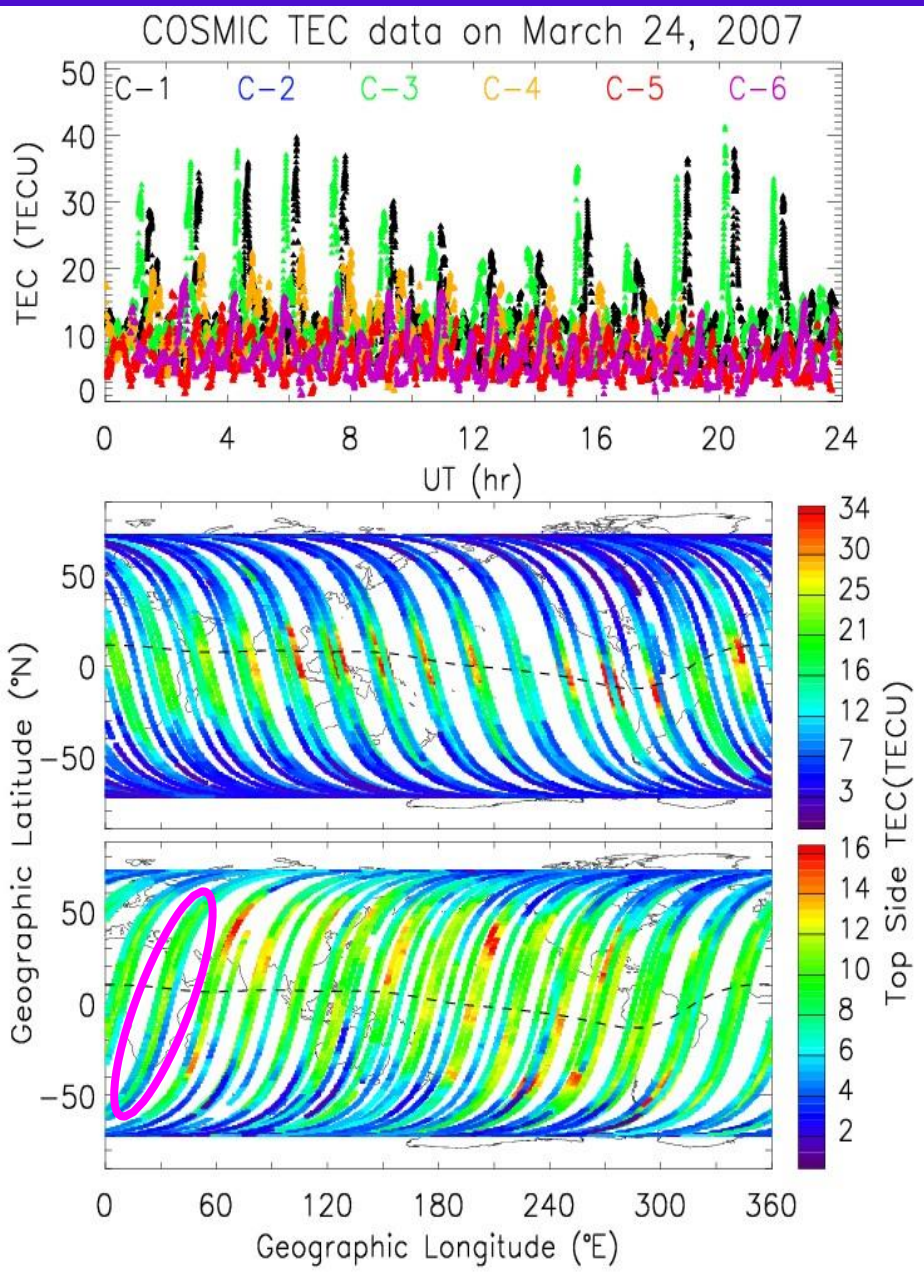
Validation of LEO Occultation Profiles with Ionosonde Measurements

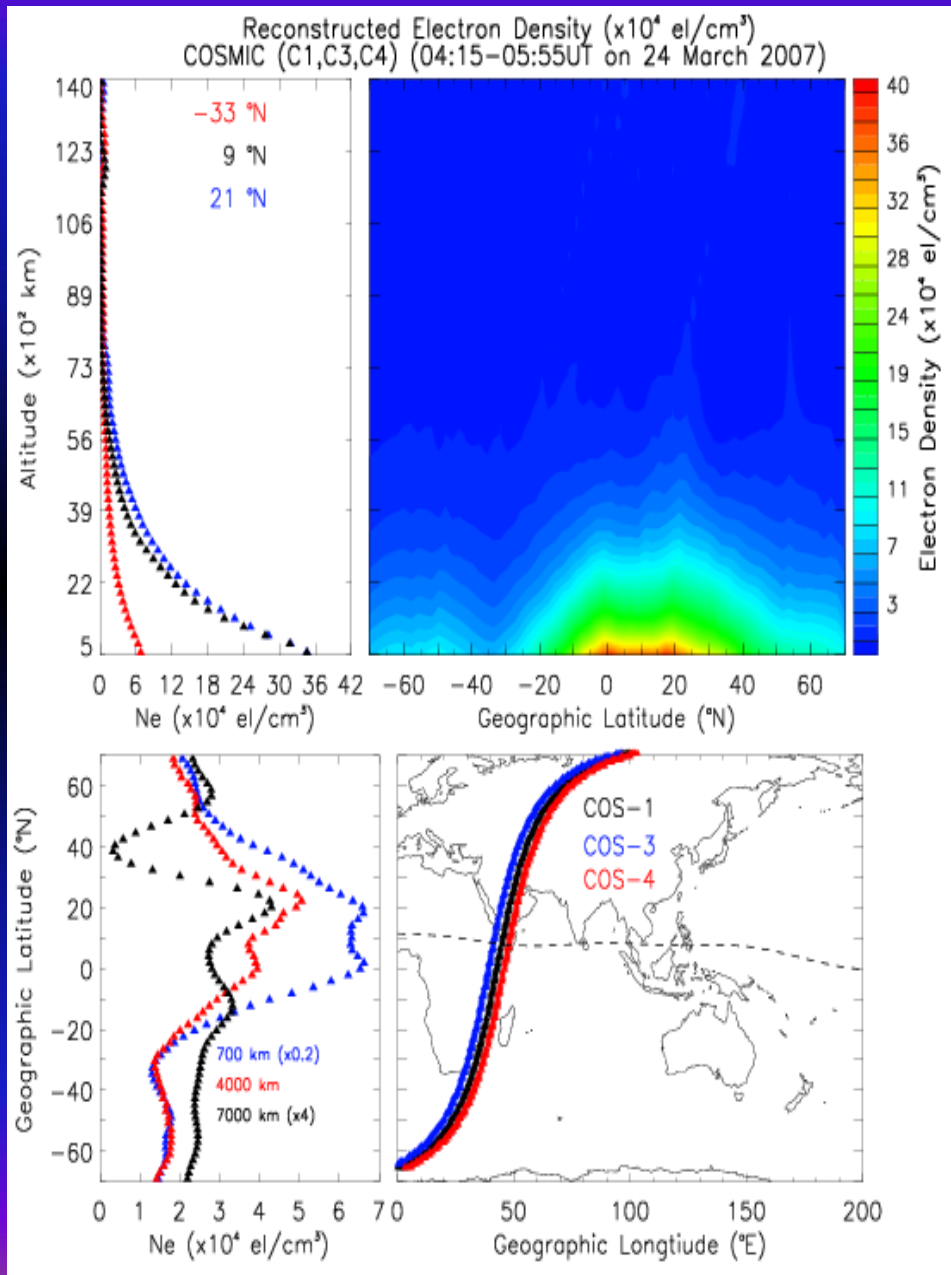




Habarulema and Yizengaw et al., JGR, 2014

Tomographic Application on Topside LEO TEC





More In situ density and drift observation also available from various space crafts, such as DMSP C/NOFS, and SWARM

NASA's all public Satellite database

http://cdaweb.gsfc.nasa.gov/cdaweb/istp_public/

SWARM triplet Satellite

https://earth.esa.int/eogateway/missions/swarm/description/

More space weather data can also be available

Here are some of the publicly available data bases.

Coordinated Data Analysis Web (CDAWeb)

http://cdaweb.gsfc.nasa.gov/cdaweb/istp_public/

OMNI data base

http://spdf.gsfc.nasa.gov/data_orbits.html

Where to find model run outputs?

Here are some of the publicly available model run data bases.

***Community Coordinated Modeling Center* (CCMC)**

http://ccmc.gsfc.nasa.gov/

The African GNSS TEC (AfriTEC) Model

https://carnasrda.com/tec_models/

www.carnasrda.com