



Space Weather and Amateur Radio

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Agenda

The Solar Cycle

Solar Flares, Coronal Mass Ejections,
Coronal Holes and Auroras.

The Ionosphere and the Layers

Indices and what we are looking at

The effects of all of this on Propagation





Introduction

The Sun is very important to us here on our planet. It provides a heating so that life exists here. If we were just a bit closer or a bit further away, life would probably not exist.

Our planet Earth is also special. Its magnetic core offers a field that provides a shield from our Sun that blocks a majority of the dangerous energy it emits.

Both of these items play key roles in propagation when we operate on our HF, LF and ELF bands.

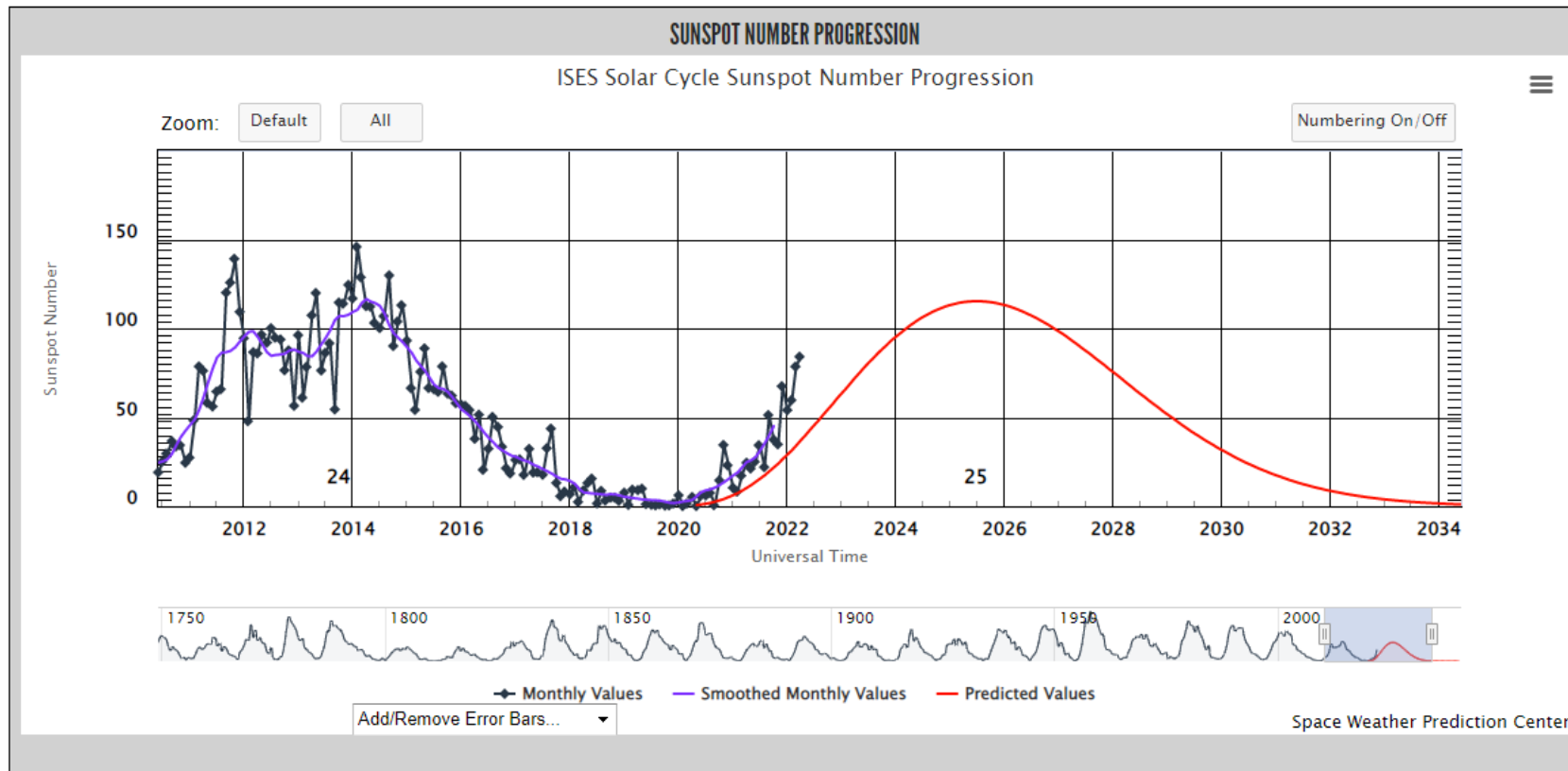
The Solar Cycle



The solar cycle is a nearly 11-year periodic cycle. It is based on the formation of sunspots.

Solar Cycle 24 and 25

Solar Cycle



Solar Weather and the stuff that causes it

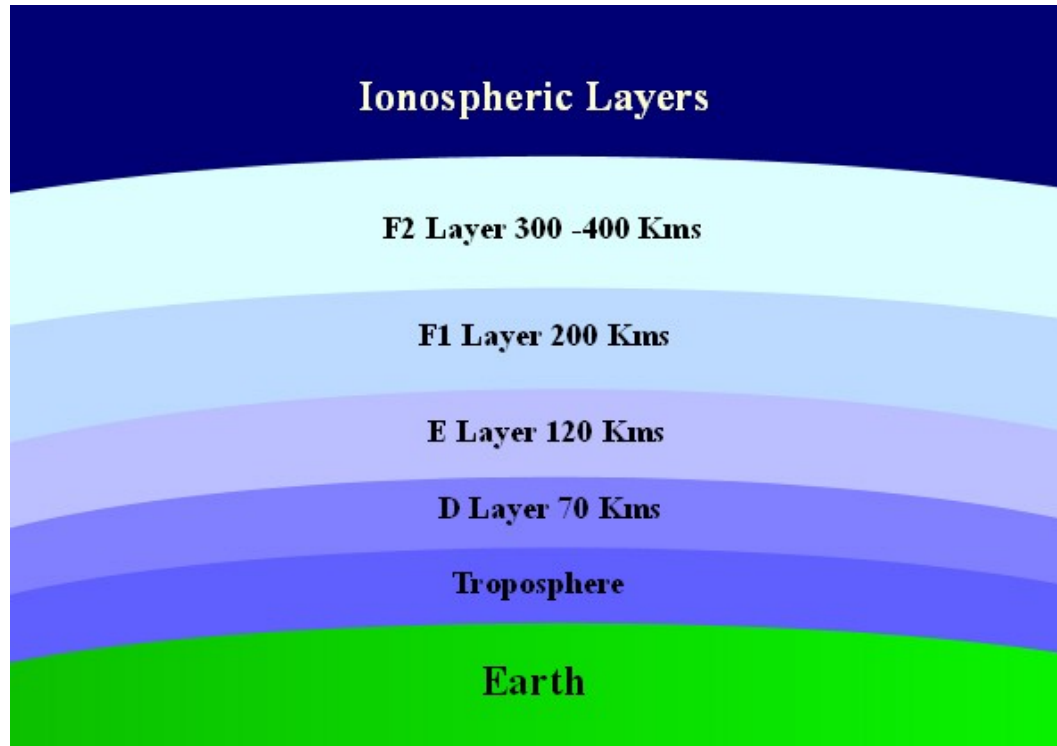
- Solar Flares – Solar Flares are explosions from the surface that emit intense electromagnetic radiation. Classes of Flares are A, B, C, M, and X.
- Coronal Mass Ejections – or CME for short – are associated with flares and are huge releases of plasma from the sun into the solar winds. These types of events can and will damage electrical systems and devices on the Earth.
- Coronal Holes – These are areas of cooler plasma on the surface that allow the solar winds to escape easier from the sun. Holes move closer to the Sun's poles as sunspot activity increases.
- Auroras – aka Northern Lights - are the results of the solar winds interacting with the Earth's magnetic fields at the poles.

The ionosphere and how solar activity affects propagation on the HF, LF and ELF bands.

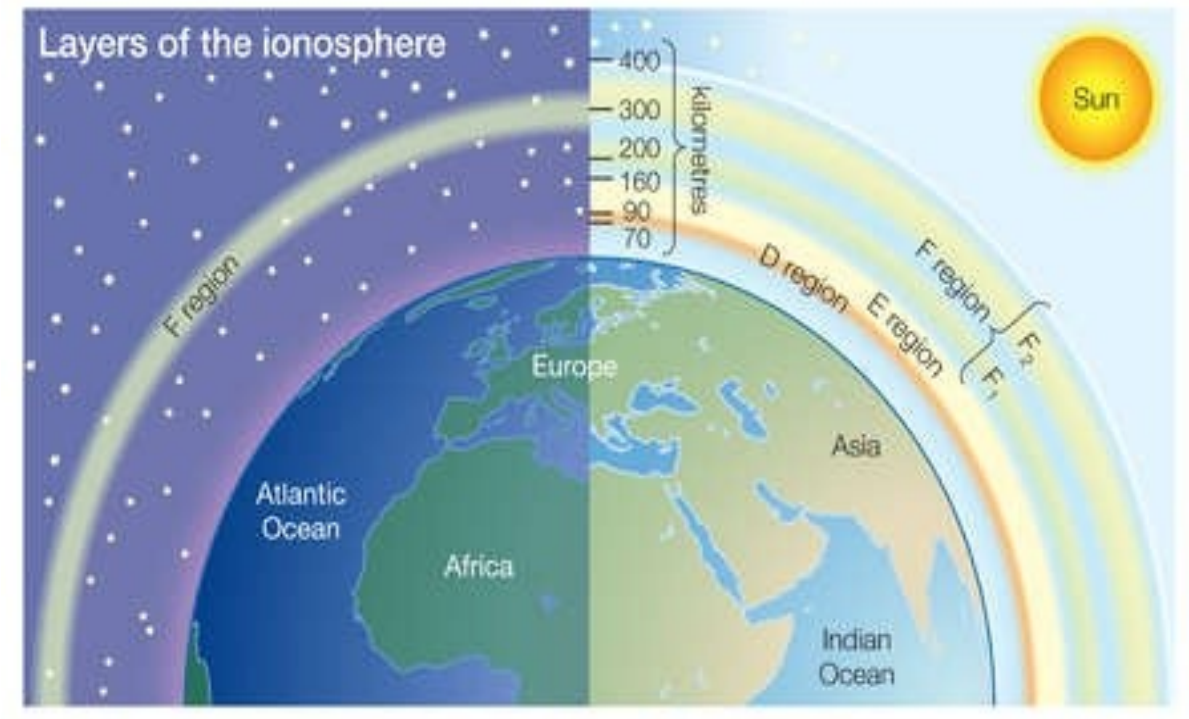
This is the info Hams need to know about solar weather and operating.

Basic Layering for Amateurs

IONOSPHERIC LAYERING



DAY AND NIGHT LAYERING



Indices and what we are looking at.

SOLAR FLUX INDEX SFI

- A measurement of power per unit area in the form of electromagnetic radiation.
- Higher numbers usually mean better propagation and more reflection

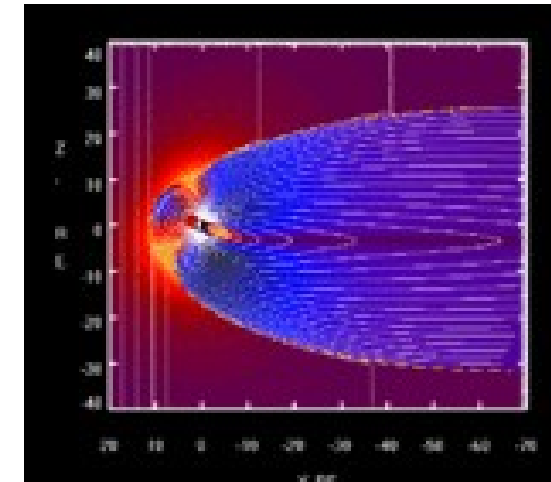
MAXIMUM & LOWEST OBSERVED FREQUENCY MOF/LOF

- Based on the speed of the solar winds and the IMF.
- These are the frequencies the ionosphere is allowing propagation to reflect back to the earth.

INTERPLANETARY MAGNETIC FIELD IMF

- Plasma from the Sun that is driven by the Solar Winds to fill the solar system..

A video simulation of Earth's magnetic field interacting with the (solar) interplanetary magnetic field (IMF)



More Indices.

PLANETARY K- INDEX

- Quantifies the disturbances in the Earth's magnetic field. Ranges from 1 to 9.
- 1 is calm where 5 is a geomagnetic storm.
- Measured using 13 geomagnetic observatories.

SOLAR WIND SPEED

- 2 speeds – Fast and Slow.
- Fast solar speed are emitted from coronal holes.
- The greater the speed, the more impact it has on HF communications.

PROTON FLUX

- Ranges from 0 to ?
- Is the density of protons hitting the ionosphere.
- The higher the numbers, the greater the impact and the affects on HF communications.

Websites for more info

- www.hamqsl.com/solar2.html
- www.swpc.noaa.gov
- www.spaceweatherlive.com – They have an app for your phone too
- <https://Spaceweather.com>
- <https://spaceweathernews.com>

Summary

Without our Sun, we would not be here and life would not exist. Without our Earth's magnetic field and protective atmosphere, we wouldn't have awesome amateur radio communications.

I've covered only a small amount of information in this presentation. I encourage you as operators to learn more about space weather and its affects on HF communications.

Sample Footer Text



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Thank You For Your Attention