Section 6: Alternatives and Opportunities

Topic 27

Propagation, Space, Weather, Solar

Objectives

Welcome to Topic 27.

This topic offers ways to develop and perfect the skills you have learned in this course.

Student Preparation required:

None.

Introduction

Radio waves, like light waves and all other forms of electromagnetic radiation, normally travel in straight lines. Obviously, this does not happen all the time, because long-distance communication depends on radio waves traveling beyond the horizon. How radio waves propagate in ways other than straight-line paths is a complicated subject, but one that need not be a mystery.

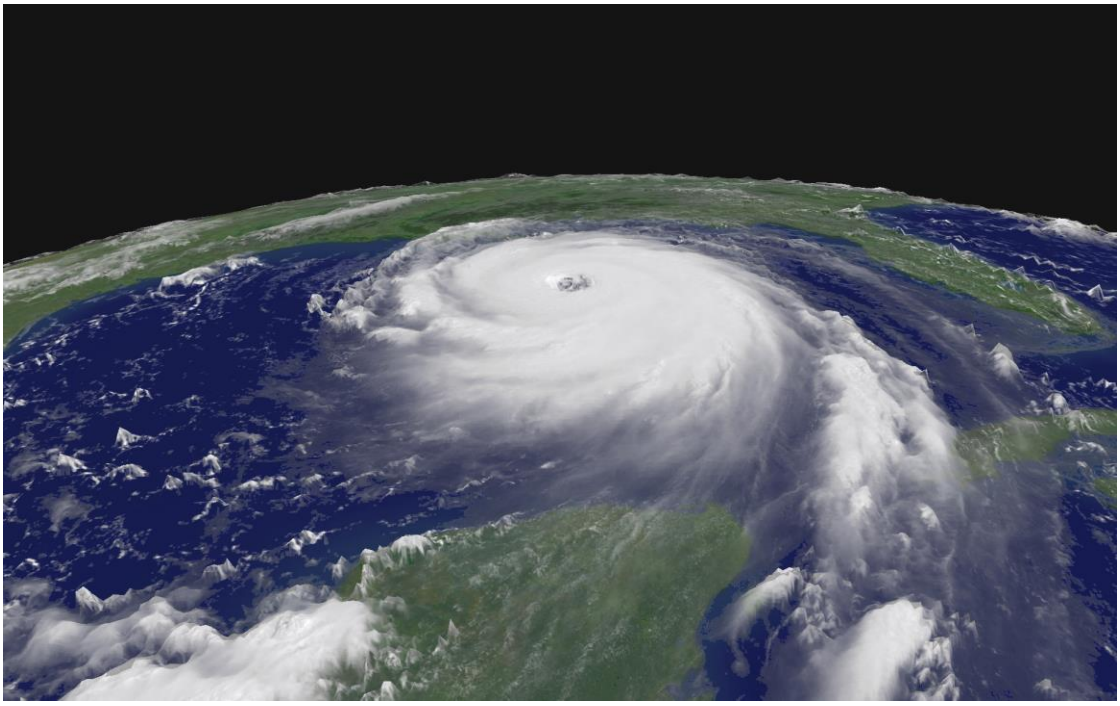
This topic provides a basic understanding of the principles of electromagnetic radiation, the structure of the Earth's atmosphere, and solar-terrestrial interactions necessary for a working knowledge of radio propagation. More detailed discussions and the underlying mathematics of radio propagation physics can be found in the Reference Links section.

The sun, being the largest body in our solar system, has a great effect on propagation as its "exhaust" interacts with our Earth's atmosphere and magnetic field. A rudimentary knowledge of sunspots, solar flares, and coronal mass ejections will help the amateur take advantage of these effects to enhance his or her pleasure or understand his or her plight. A good basic understanding of this can be found at the following online sources:

- http://www.arrl.org/the-sun-the-earth-the-ionosphere
- http://www.arrl.org/propagation-of-rf-signals
- http://www.arrl.org/propagation
- http://www.voacap.com/hf/index.html

Operating on the VHF/UHF bands is straightforward for most modes of operation, as it is propagation via line-of-sight (the receiver antenna can "see" the transmitter antenna), and line-of-sight propagation is not affected to any significant degree by the sun. FM repeaters located in higher elevations offer advantages because of their locations and generally higher power outputs.

Operating on the HF bands is a bit more inconsistent, because propagation depends on a number of factors that are dependent on that bright globe in the sky known as the sun. The main influence on the Earth's ionosphere is the sun, and the magnetic field of the Earth can get into the act very quickly as well in determining how HF signals are propagated from one place to another when there are disturbances on the sun (coronal mass ejections). Other disturbances on the sun (solar radiation storms and radio blackouts) directly affect the ionosphere.



Providing emergency communications on the HF bands is unpredictable from day to day, and even from hour to hour. Knowing which bands to use is a science in itself and is best learned by observing propagation charts and by actual experience. By observing propagation conditions throughout a day, throughout a month, and over the course of a solar cycle, you will gain this experience. It is good practice to get on the air and listen to the signals in your receiver to gain some knowledge of where the signals originate and note the time of day and propagation reports. At the time of this writing, the solar cycle (Solar Cycle 24) is heading for its minimum (the least number of sunspots). Because of this, the higher frequency bands (15, 12, 10 meters) are quiet much of the time, leaving the 80-, 40-, and 20-meter bands as the mainstay bands. When sunspots start appearing again (in the early 2020 – 2030 decade), the higher bands will come to life with many more signals from around the world.

Reference Links

Space Weather
www.spaceweather.com/

Space Weather Current Conditions
www.swpc.noaa.gov/products/geophysical-alert-wwv-text

Space Weather D-Region Absorption Predictions
www.swpc.noaa.gov/products/d-region-absorption-predictions-d-rap

Space Weather Dashboard
www.swpc.noaa.gov/communities/radio-communications

Space Weather Overview
www.swpc.noaa.gov/products/space-weather-overview

Space Weather Prediction Center (NOAA)
www.swpc.noaa.gov