Natural Radio

News, Comments and Letters About Natural Radio

November 2002

Copyright © 2002 by Mark S. Karney

There was little activity for Fall Coordinated Listening (I didn't get a single report) so I guess that that activity has outlived its usefulness. Geomagnetic activity bypassed us for that weekend as well -- I didn't hear anything the first weekend, which may be part of the reason for no reports. October produced some great activity, though. I recorded some interesting chorus on the morning of October 1, but didn't hear a single whistler. Sean Korgan was hearing lots of whistlers in Colorado that morning which seems to be typical for the West. I don't believe that a theory has been proposed yet for why there are more whistlers out west. I guess it could be due to a phenomenon that produces more whistler ducts, or maybe to better ground propagation once the whistlers enter the earth-ionosphere waveguide.

I had an experience in September that might point the way to an investigation, but one event does not a theory make. My wife and I were relaxing at Illinois State Beach on Lake Michigan this Labor Day Weekend. This park has the shuttered Zion Nuclear Power Plant on the North end and a fossil fuel plant on the south end -- In short, the park is ringed by many HV transmission lines. Nevertheless, I had a few minutes as we were sitting in the parking lot, and put the E-field antenna out the window and turned on my whistler receiver. There was hum (less than I expected), but I was hearing weak whistlers over the hum. This was about ½ hour before sunset. I drove inland about 10 or 15 miles and listened again, shortly after sunset, and the whistlers were gone. Does being near the lake affect whistler propagation and strength. Only more experimentation will tell.

Solar & Geomagnetic Activity Resources Our Natural Radio hobby and in fact most radio communication is dependent or affected by the Sun. The sun constantly radiates massive amounts of energy and we are in the path.

Electromagnetic radiation, visible light, gamma rays, x-rays, ultraviolet, infrared and radio; traverse the 93 million miles in about 9 minutes. Particle radiation, as the Solar wind, may take several days to reach the earth.

Solar activity varies over a 22 year cycle. Sunspots directly relate to solar activity. There is a sunspot maximum approximately every eleven years at which point the Suns magnetic poles reverse.

The ionosphere is created by ionization from primarily the UV light from the sun. This makes shortwave communications possible over longer than line of sight distances. A sudden burst of radiation as in a Solar Flare can cause increased ionization that causes a radio blackout. This event is known as a SID or Sudden Ionospheric Disturbance.

Solar Flares and other events on the surface of the sun may give rise to coronal mass ejections or CME's that send large quanties of energetic particles out into space, sometimes in the direction of our planet. Coronal holes can also increase the speed and density of the solar wind in the direction of earth.

Our magnetic field and atmosphere shields us from many of these harmful rays and makes life on Earth possible. But these charged particles carry part of the sun's magnetic field with them, and if it happens to align in the southward direction with earth's field, the fields couple, the earth's geomagnetic field is disturbed and we have a geomagnetic storm.

Geomagnetic storms are of interest to the Natural Radio listener because they often produce Chorus. Visually, geomagnetic storms can produce aurora displays at latitudes farther south than normal.

Variations in the field are summed and given as the A index and the K index. These are available on the web and at 18 minutes past the hour on WWV. There are several satellites that monitor the sun and the geomagnetic field. Here are the websites that display this data for those of you are interested in keeping an eye on what's known as "Space Weather".

The Space Weather site at http://www.sec.noaa.gov/today.html, provides real-time data from the GOES "Geostationary Operational Environmental Satellite". The two GOES satellites are in geostationary orbit over the equator and are operational satellites whose primary mission is to monitor the weather in the U.S. (These are the satellites that provide the pictures from above on TV weather reports.) "Operational" distinguishes it from "experimental" satellites. GOES works around the clock so we do not miss seeing storms breaking out. GOES West located at 135° west longitude and GOES East at 75° west longitude.

More interesting to us is the Space Environment monitoring system which consists of a three-axis vector magnetometer, an Energetic Particle Sensor (EPS) and associated High-Energy Proton and Alpha Detector (HEPAD), and an X-Ray Sensor (XRS). This set of instruments is designed to provide real-time measurement of solar activity, the charged particle environment, and the Earth's magnetic field at synchronous orbit. This data, on the above-mentioned website, will alert you to solar flares, proton events, and geomagnetic activity. Clicking on the charts will provide an explanation of the data.

The Space Weather Today site at http://www.sec.noaa.gov/SWN/index.html, provides graphical data from the ACE satellite (Advanced Composition Explorer). ACE sits at a LaGrangian Point (a point where the earth's and sun's gravity cancel each other), approximately 1/100 of the distance from the Earth to the Sun. ACE provides near-real-time solar wind information over short time periods. When reporting space weather, ACE can provide an advance warning (about one hour) of geomagnetic storms that can overload power grids, disrupt communications on Earth, and present a hazard to astronauts. Data on this site let's you know what's happening with the solar

wind and may be useful in predicting when chorus will be audible. Space weather alerts are also listed on this site.

If you are interested in monitoring solar activity visually, go to the SOHO site at http://sohowww.nascom.nasa.gov/data/realtime-images.html. SOHO is the (Solar & Heliospheric Observatory) project is being carried out by the European Space Agency (ESA) and the US National Aeronautics and Space Administration (NASA). This site provides a variety of near real-time solar images as well as movies of recent flares and CME's.

The NASA Space Weather site at http://spaceweather.com/, is an educational site that provides information about Space Weather in conversational language. It provides information about geomagnetic storms, auroral alerts and other information about events in the sky.

Finally, for earthbound monitoring of ionospheric and geomagnetic activity, check out the data page at the HAARP site at http://www.haarp.alaska.edu/haarp/data.fcgi. This page provides data from the instrumentation near the HAARP facility in Alaska. For those of you who monitor propagation there is a lot of useful data here.

Like the weather, prediction of geomagnetic storms and Natural Radio signals is not an exact science, but herewith are the data sources to let you formulate your own predictions or at least educated guesses.

SOHO Screensaver A new screensaver has been produced courtesy of the ESA that will put real time solar images on your screen. Download it at:
http://sohowww.nascom.nasa.gov/whatsnew/screensaver.html

RADIO WAVES below 22 kHz. Renato Romero has updated his excellent website at www.vlf.it/ Some new articles include *FFT for Dummies* by Renato Romero and *Receiving Loop Theory* by Bill Payne.