Natural Radio

News, Comments and Letters About Natural Radio

April 2000

After 75 degree weather here in northern Illinois week ago, it was about 20 degrees when I went out this morning for the first weekend of coordinated listening. The gates of the park where I do some of my listening were locked, so I was not in a very good location. There was mild sferic activity with a few tweeks but not much else. Friday night was much more interesting with loud static crashes and more tweeks than I have heard in quite a while.

We are heading out to Maryland next weekend for a family visit during spring break, so I will be doing some monitoring from the East Coast for the second weekend. Maybe there are more whistlers out there than here.

I have not done a lot on my receiver due to several other major volunteer commitments this month. I did get rid of the RF and intermod problem by putting a low pass filter of about 8kHz right after the input preamp.

Web Resources For Space Weather Although we know something about the mechanism of whistlers, we don't know exactly what geomagnetic and ionospheric conditions are favorable for their propagation. Fortunately, NASA and NOAA have placed many satellites in orbit to study the fields and radiation that affect the space weather around the earth. These resources, from basic to very technical, are available on the internet with many of them being updated on a near real-time basis. Thus, all levels of experimenters can monitor the space weather and draw some correlation between what they are hearing and what's happening in the earth-sun environment. Here's some of the more useful ones. Please note that just about all of these sites have links to many other resources so please investigate them as well.

SpaceWeather.com http://spaceweather.com This is a NASA site that has the latest space weather and articles about space weather. It is not too technical and is designed to be used in the classroom.. You can subscribe to Space-Science News here, and that NASA will E-mail you daily with current space science news. This is very useful, because you will get E-mail warnings about aurora, magnetic storms and other interesting items.

Today's Space Weather is at www.sec.noaa.gov/today.html. This is my favorite site because it provides a real-time picture of factors that affect the earth's geomagnetic environment. The data is provided by the GOES-8 and GOES-10 weather satellites. These satellites are in geosynchronous orbit above the equator. (They orbit at the same speed the earth is rotating, so they appear to be stationary.) GOES-8 is parked approximately over Ecuador and GOES 10 is parked in the middle of the Pacific southeast of Hawaii. These are primarily weather satellites that provide the satellite photos you see on the evening weather report (http://www.goes.noaa.gov/), but they also have sensors to monitor the space weather.

This page provides a space weather forecast each day at about 2200 UT. Continuously updating plots of Solar X-Ray flux, and satellite environment plots of proton flux, electron flux, magnetic flux and an estimated Kp index are also featured on the page. Click on each of the plots for a more detailed explanation. There are also links to other pertinent sites.

The Advanced Composition Explorer (ACE)
http://www.sec.noaa.gov/ace/ACErtsw_home.html This satellite provides near real time measurements of the solar wind and the interplanetary magnetic field. To be away from the earth's magnetic field, ACE orbits the L1 libration point which is a point of Earth-Sun gravitational equilibrium about 1.5 million km from Earth and 148.5 million km from the Sun, approximately 1/100 of the distance between earth and sun. By orbiting the L1 point, ACE will stay in a relatively constant position with respect to the Earth as the Earth revolves around the sun. The location of ACE at the L1 libration point between the earth and the sun will enable ACE to give about a one hour advance warning of impending geomagnetic activity. Three instruments of interest on board the satellite are described below.

The Electron, Proton, and Alpha Monitor (EPAM) is composed of five telescope apertures of three different types. Two Low Energy Foil Spectrometers (LEFS) measure the flux and direction of electrons above 30 keV, two LowEnergy Magnetic Spectrometers (LEFS) measure the flux and direction of ions greater than 50 keV and the Composition Aperture (CA) measures the elemental composition of the ions.

The ACE/MAG instrument is measuring the local interplanetary magnetic field (IMF) direction and magnitude. It measures the amplitude and direction of the interplanetary magnetic field thirty times per second and can do Fast Fourier Analysis on these measurements to get the frequency spectrum of fluctuations in the magnetic field.

The purpose of the Solar Wind Electron, Proton, and Alpha Monitor (SWEPAM) is to provide detailed knowledge of solar wind conditions to aid in the interpretation of data measured by the ion and the electron composition monitors of the ACE mission payload.

The Solar And Heliospheric Observatory (SOHO) http://sohowww.nascom.nasa.gov/ SOHO is a joint project of ESA & NASA and is designed to study the internal structure of the Sun, its extensive outer atmosphere and the origin of the solar wind, the stream of highly ionized gas that blows continuously outward through the Solar System. You can view current imagery of sunspots, flares, and other solar activity.

NOAA Auroral Activity Site This site provides a picture of the estimated current position of the auroral ring. Instruments on board the NOAA Polar-orbiting Operational Environmental Satellite (POES) continually monitor the power flux carried by the protons and electrons that produce aurora in the atmosphere. SEC has developed a technique to estimate the total power deposited in an entire polar region by these auroral particles. The power input estimate is converted to an auroral activity index that ranges from 1 to 10. http://www.sec.noaa.gov/pmap/index.html

Current UVI Image Page This page provides a view of the ultraviolet light in the aurora taken by the NASA POLAR spacecraft and is another way to view auroral activity.
http://uvisun.msfc.nasa.gov/UVI/current_image.html

Lightning Here's a couple sites to help correlate your listening with lightning activity. I haven't found any real-time data for lightning strikes at the conjugate points, but Intellicast will give a weather forecast for South America. Look under world weather.

Intellicast provides data on lightning strikes in the US at:
http://www.intellicast.com/LocalWeather/World/UnitedStates/NationalLightning/

Lightningstorm.com provides both a paid subscription and a free service to view lightning strikes in the US at http://www.lightningstorm.com/

New Space Weather Satellite Here's an edited version of NASA's description of a new satellite that will hopefully be in orbit by the time you read this. This could really provide some breakthrough information on ULF & VLF phenomenon.

A new NASA mission to explore Earth's magnetic space environment may change that. Scheduled for launch on March 25, 2000, the "Imager for Magnetopause-to-Aurora Global Exploration" (IMAGE for short) is a spacecraft designed to study the global response of the Earth's magnetosphere to changes in the solar wind.

To get the best view of this new frontier, IMAGE will be launched into an orbit that loops from a low point of 1,000 km (600 mi) to a high point of almost 45,000 km (almost 27,000 mi). From that vantage point, IMAGE's instruments will look back and be able to see the inner structure of the magnetosphere, including the magnetopause, the boundary where the magnetosphere meets interplanetary space. Instruments on IMAGE include:

The Radio Plasma Imager. The RPI will use radar echoes in the frequency range 3 kHz to 3 MHz to detect and monitor ionized gas (plasma) inside the magnetosphere. *(I wonder if we'll be able to hear this one? MK)*

Far Ultraviolet Imager. The FUI will take pictures and spectra of the entire Earth along with the auroral oval at ultraviolet wavelengths. The 3 instruments that combine to form the FUI instrument package (GEO, SI and WIC) will provide almost constant monitoring of auroral activity from above our planet. The Earth is surrounded by a cloud of neutral atoms and molecules that is largely invisible from the ground. The so-called 'geocorona' is an extension of Earth's atmosphere into space. It is mostly made up of hydrogen, because it's the lightest element. GEO will also be used to detect these neutral atoms, measure their energy and map their distribution.

Neutral Atom Imagers. The neutral atom cameras will detect neutral atoms created by ring current ions and escaping auroral ions that collide and exchange charge with the cold, geocoronal hydrogen gas. This will allow scientists to indirectly monitor and explore the ring current and auroral ion fountains.

Extreme Ultraviolet Imager. The EUVI will detect ultraviolet photons from the Sun that are scattered by helium ions in the plasmasphere, a torus of cold dense plasma surrounding the Earth in the inner magnetosphere. A sophisticated deconvolution technique will be used to translate the photon counts into images of the plasmasphere.

With these instruments in orbit, scientists will have a whole new view of the space around Earth. And they're not the only ones. The data from IMAGE will be posted to the web in near real-time for viewing by the public as well as by scientists. Unlike some other missions, IMAGE data will not be considered proprietary to the mission scientists for any length of time.

Your Much Appreciated Correspondence

•**John Lauerman, WB7TQT, Issaquah, WA.** John sent in some great SLF logging information as well as a copy of his tape *The Strange Sounds Of SLF* which I will be reviewing in the next issue.

•**Renato Romero 1K1QFK (**renato.romero@telecomitalia.it**)**
I'm a new LWCA member, and in a Feb. issue of LOWDOWN I have appreciated your note about the comparison of natural radio electric and magnetic reception. I have developed similar results using a loop of 75cm and a RS4 receiver. In effects the difference depends by radiated and induced energy by power lines. I have better results with a loop near my house (in the garden). But at 150m the RS4 works better -- the loop receives hum noise at the same level as in the garden.

To reduce the effects of 50 Hz harmonics, I use a big antenna (not active) "T": 11m high with 45m top. In comparison with the RS4 with 1m whip, the big antenna in the same place, works better. I use also a big horizontal square loop of 30m to listen the frequencies below 86 Hz.

You can find the details of this at my home page: RADIO WAVES below 22 kHz
http://web.tiscalinet.it/vlfradio *(I mentioned Renato's site in the January issue. Please note this is a new web address and the server is much faster than the old one. There's a wealth of information here. Check it out. MK)*

Natural Radio Log

Month Day	Time UTC	What Heard (whistlers/hour where applicable)	ID Grid Sq.
02/12	0846-0855	Strong SLF Pi1 waves. Occ. VLF sferics & tweeks	JL-CN87
02/14	1100-1200 1300 1320	SLF Pi1 waves. Low-level VLF sferics & tweeks. VLF Whistler	JL-CN87
02/20	1015-1400 1153 1204	Fair VLF sferics & tweeks. VLF whistler. VLF whistler, SLF quiet.	JL-CN87
02/24	0800-1100 0957 1053	Few VLF sferics & tweeks. Strong VLF whistler. Weak VLF whistler, SLF Pi1 waves.	JL-CN87
02/25	0800-1000 1150-1245	High VLF sferic & tweek level. Fair SLF Pi1 waves.	JL-CN87
03/07	0630-0640	Strong sferics, few tweeks, brilliant fireball with greenish cast at 0637. No audible effects from object.	MK-EN52

JL - John Lauerman, Issaquah, WA. Equipment - Homebrew VLF Receiver, 300 Hz - 20 kHz. Homebrew ELF/ULF/SLF Receiver 0.03 to 300 Hz., 47,000 turn loop.

MK - Mark Karney, N9JWF, Barrington, IL. Equipment - WR-3, LF Engineering loop, homebrew receiver with 60" whip and -24db/octave hi-pass active filter, 350 Hz. cutoff.