Natural Radio

News, Comments and Letters About Natural Radio

May 2003

My Natural Radio activity over the winter has been limited to keeping tabs on the VLF_group e-mail list and writing my occasional *Lowdown* articles, so it was nice to get out this fine spring morning and do a little listening. I drove out to my quiet site at the nature center and waited for the gates to open at 8 am. Spring thunderstorm activity created almost continuous sferics, but due to a favorably positioned coronal hole, swishy sounding chorus was rising and falling in the background.. The chorus sounded something like the whistling gusty winds one hears in a blizzard and I wondered what caused these windstorm-like fluctuations.

Solar Wind and Chorus - Doing a little Internet research, I came across a paper, *Solar Wind Control of Polar Chorus* by M. A. Salvati and U. S. Inan of the Space, Telecommunications and Radioscience Laboratory of Stanford University and A. T. Weatherwax and T. J. Rosenberg of the Institute for Physical Science and Technology at the University of Maryland. As indicated by the title, the paper described their study of the correlation between the solar wind dynamic pressure and chorus as observed in Antartica. (http://www-star.stanford.edu/~vlf/Antarctica/AGO/gemposter99/gemposter99.html)

Chorus is an intense plasma wave that permeates magnetospheric regions between the plasmapause and the magnetopause that typically consists of repeating, usually rising and often overlapping coherent tones. It is observable on the ground, most often between sunrise and noon, and occurs regularly in association with disturbed magnetospheric conditions. If the Kp is 5 or above, I know there is a high likelihood that I will hear chorus.

Chorus that is generated within 1-2 R_E (R_E = Earth Radius) of the magnetopause may originate in local regions of minimum magnetic field strength that occur off the magnetic equator as a result of solar wind compression of the dayside magnetosphere and subsequently propagate to the ground in the polar regions. It then propagates to lower latitudes in the earth-ionosphere waveguide.

In this paper, the researchers used solar wind dynamic pressure data from the WIND satellite and correlated it with their on-the-ground measurements of chorus intensity. They needed to delay the WIND data by about an hour to adjust for the time difference of when the solar wind variation is detected by the satellite (positioned out at 213 RE) and when it encounters the region of the magnetosphere where chorus is generated. With this adjustment, they developed a strong correlation between solar wind dynamic pressure and intensity of chorus.

For those of you inclined to experiment, it might be interesting to see if the same correlation exists at the lower latitudes that most of us do our listening from. The source for solar wind data is now the ACE Satellite and is available at http://www.sel.noaa.gov/ace/index.html. Your challenge is to figure the amount of delay time between what the satellite is observing and the events happening on earth.

The delay will be related to the speed of the solar wind and the distance of the satellite from earth.

This measurement seems feasible without any more equipment than most of us already have and would probably be a great science fair project or maybe a new activity for one of the INSPIRE groups.

Using Video Recorders for Natural Radio Audio - I answered a post on the VLF_list this morning on using video recorders for recording natural radio signals, and got to thinking that this was another form of recording that might have some potential use. So here is another addendum to my January article on recording equipment.

In general, consumer recorders that use linear tracks (conventional audio tracks that are on the edge of the tape and used on a typical VHS tape.) will probably deliver marginal performance on audio recording because the specs on these tracks are rather poor and usually of less quality than an audio cassette. Signal-to-noise ratio is typically less than 40 db at SP speed and considerably worse at the slower speeds.

However, VHS HiFi recorders have a 90 db signal-to-noise performance at SP speed and probably adequate response at the slower speeds. Hifi recording uses FM modulation and records deep within the oxide coating along with the video, rather than along the edge of the tape. This should produce excellent Natural Radio Recordings with a little bit of care.

One possible problem is that most lower priced VCR's have Automatic Volume Controls. The sferics in Natural Radio signals drive these crazy with large volume reductions with each burst. For effective recording, manual volume controls are a must.

Many recorders require a video input to record, especially those equipped with Hifi audio. One neat solution to this is to hook a camera to the video input and point the camera at a WWV controlled digital clock. Then you would have an exact time record of each event.

Inspire VLF3 Receiver - The new INSPIRE VLF3 receiver is now available from INSPIRE for $80 in kit form. The order forms are on the INSPIRE website (http://image.gsfc.nasa.gov/poetry/inspire/), but details of the new receiver haven't been posted yet.

According to early reports in the *INSPIRE Journal,* the new version of this classic receiver has increased sensitivity to work better with short whip antennas and a switchable front-end attenuator/filter to get rid of overloading and intermodulation from LORAN and other strong interfering signals. A BNC connector for the antenna as well as an external battery connector have been added.

I hope to order one of these receivers soon, and will write a review after I have evaluated it.