Solar Eclipse wrapup...

by
Alex Schwarz
(VE7DXW)

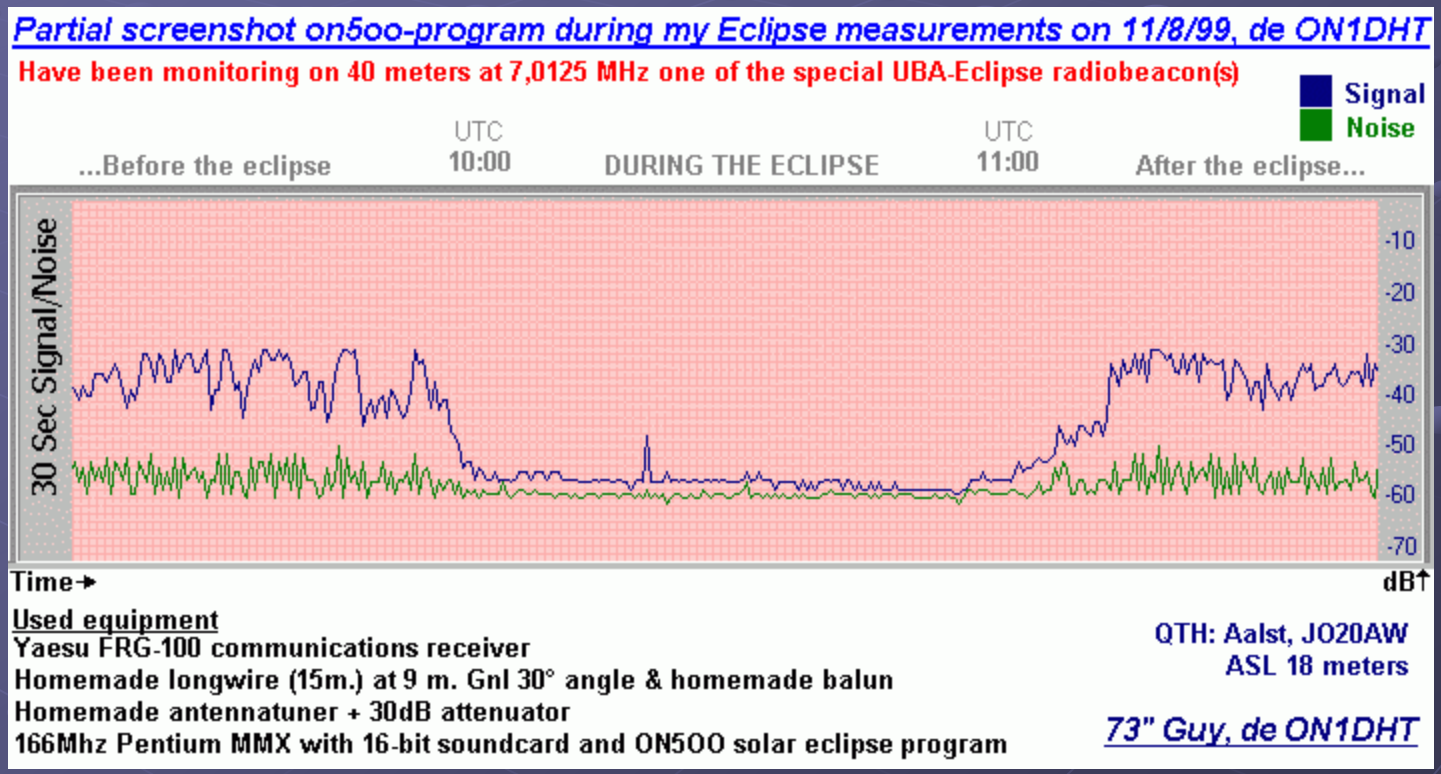
Local Solar Eclipse Conditions

- Clear Sky over Vancouver:

  air pressure was 1023mB, temp 27°C
- Solar Flux: 90 and rising
- Solar Weather:

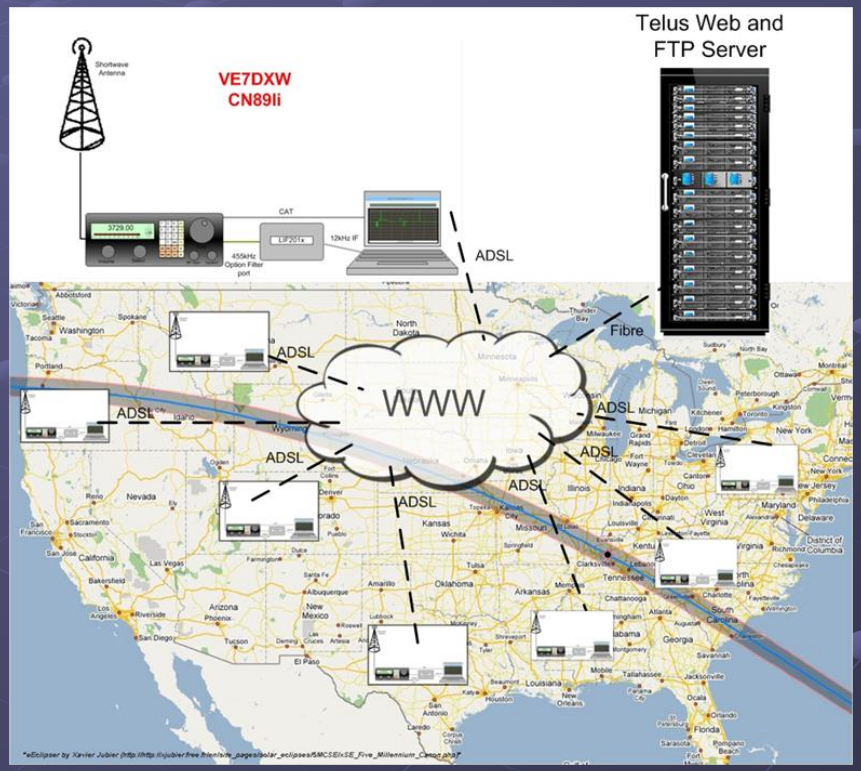
  active and turbulent, a solar flare had released and the D-Layer was excited, NOAA was forecasting a G2 magnetic storm…
- Eclipse Totality: 85% (CN89)

Solar Measurement from ON1DHT during the Solar Eclipse in Europe



The RF-Seismograph Multiple Station measurement topology

- Each monitoring station is independent and does not rely on any other operators.
- Real time graphs are uploaded as graphics
- After measurement the data is uploaded to MDSR server.



Measuring Locations

- The MDSR Test station in Lynn Valley
- The Mobile MDSR Test Station at Cypress Cross Country Area
- Newport, OR: WA7MHB Joe Joncas

The main Station for monitoring

- Antenna: HG 18HT jr
  mounted on the roof of 3287 Mountain Hwy
- Radio: FT-950 with CAT control for MDSR and RF-Seismograph software
- BiLIF unit as interface between computer and transceiver
- ASUS Win8.1, i5 CPU

  running the MDSR and the RF-Seismograph software during the eclipse and automatic upload of the latest image of the graph

Setting Up on Cypress Mtn.

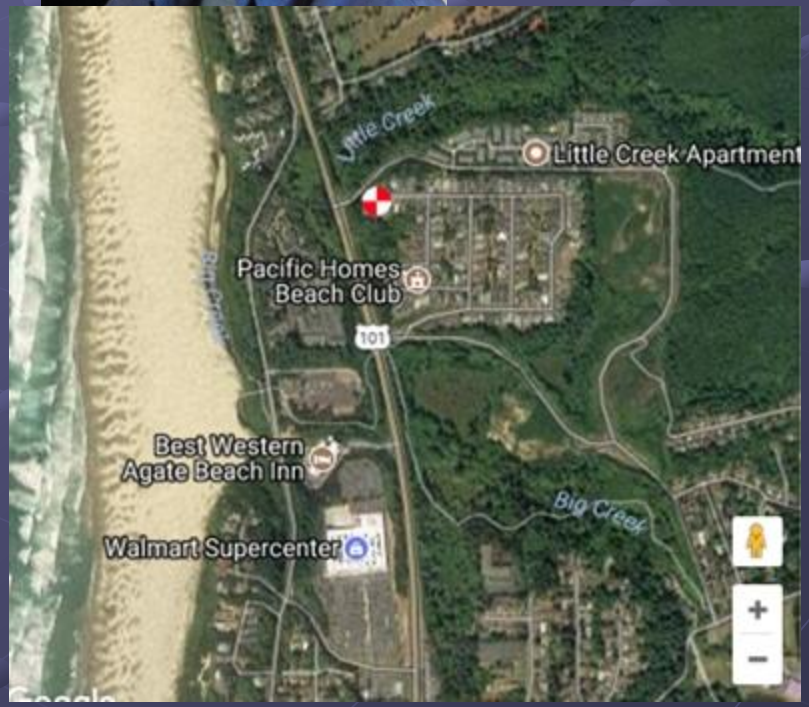
- Antenna: MFJ1979;
  mounted on a rack that is secured to the car
- Radio: FT-817
  CAT control for MDSR and RF-Seismograph software
- Portable BiLIF unit
  as interface between computer and transceiver
- ASUS Laptop W10

  running the MDSR and the RF-Seismograph software during the eclipse

Setting Up in Newport OR

- Antenna: Homebrew dipoles and Yagi for 20m
- Radio: FT-950
  CAT control for MDSR and RF-Seismograph software
- LIF-2016 unit
  as interface between computer and transceiver
- Computer W10

  running the MDSR and the RF-Seismograph software during the eclipse and uploading of images to the Web



Shadow of the moon racing over the planet

- https://player.**vimeo.com/video/236139202**

The total surface of earth is 510.1 x $10^6 km^2$. Half of that gets hit by solar radiation which is: 255.05 x $10^6 km^2$.
The surface of the lunar shadow is $50^2 km^2$ x 3.1415 = $7854 km^2$
So if we take the surface area that receives sun (255.05 * $10^6 km^2$) divide it by the surface of the lunar shadow ($7854 km^2$) we get a ratio of 1 to 32486.

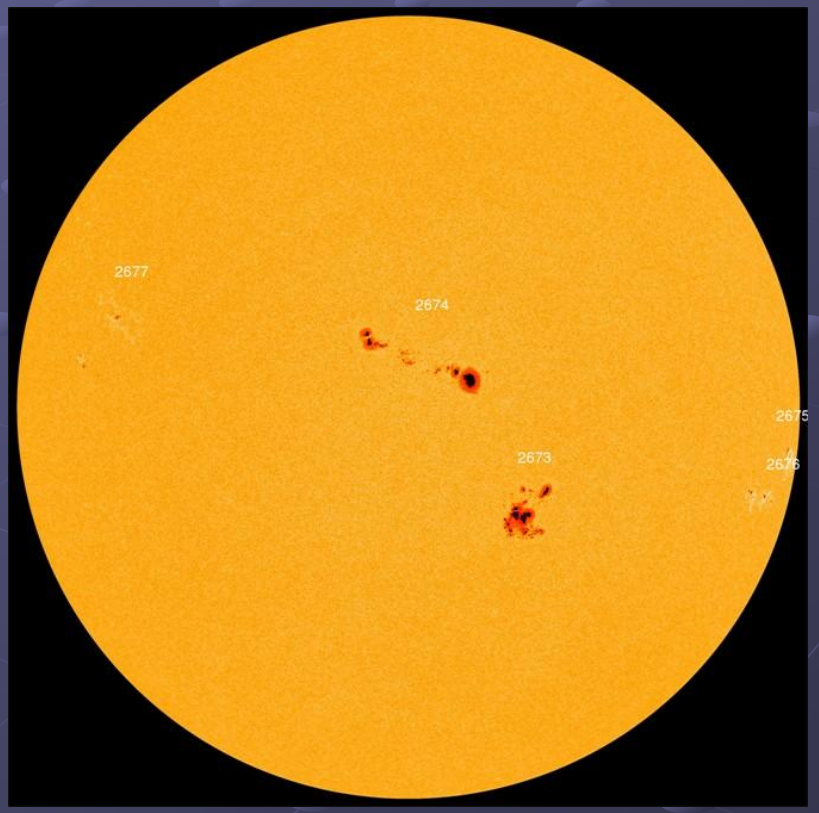
So this means that the global effect of the lunar shadow causes only 3.08 * 10^{-5} of the total received radiation to drop. Because we have the umbrae of the moon to consider as well, the energy drop is slightly more.

What most People missed!

- Very high and unusual sunspot activity during and after the eclipse. During a short period the Solar Flux was higher than the last solar max!

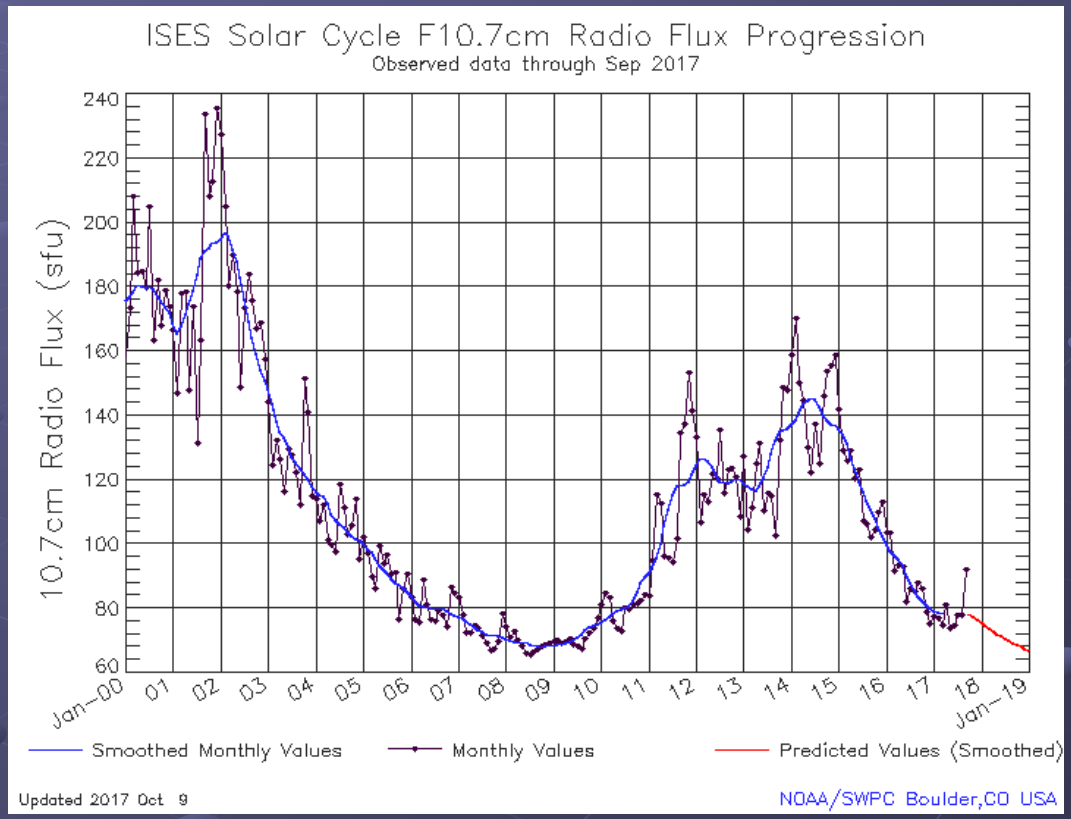
This image was recorded in Sept. 2017.

Sunspots 2673 and 2674 are very active and Sunspot 2675 on the left rim.



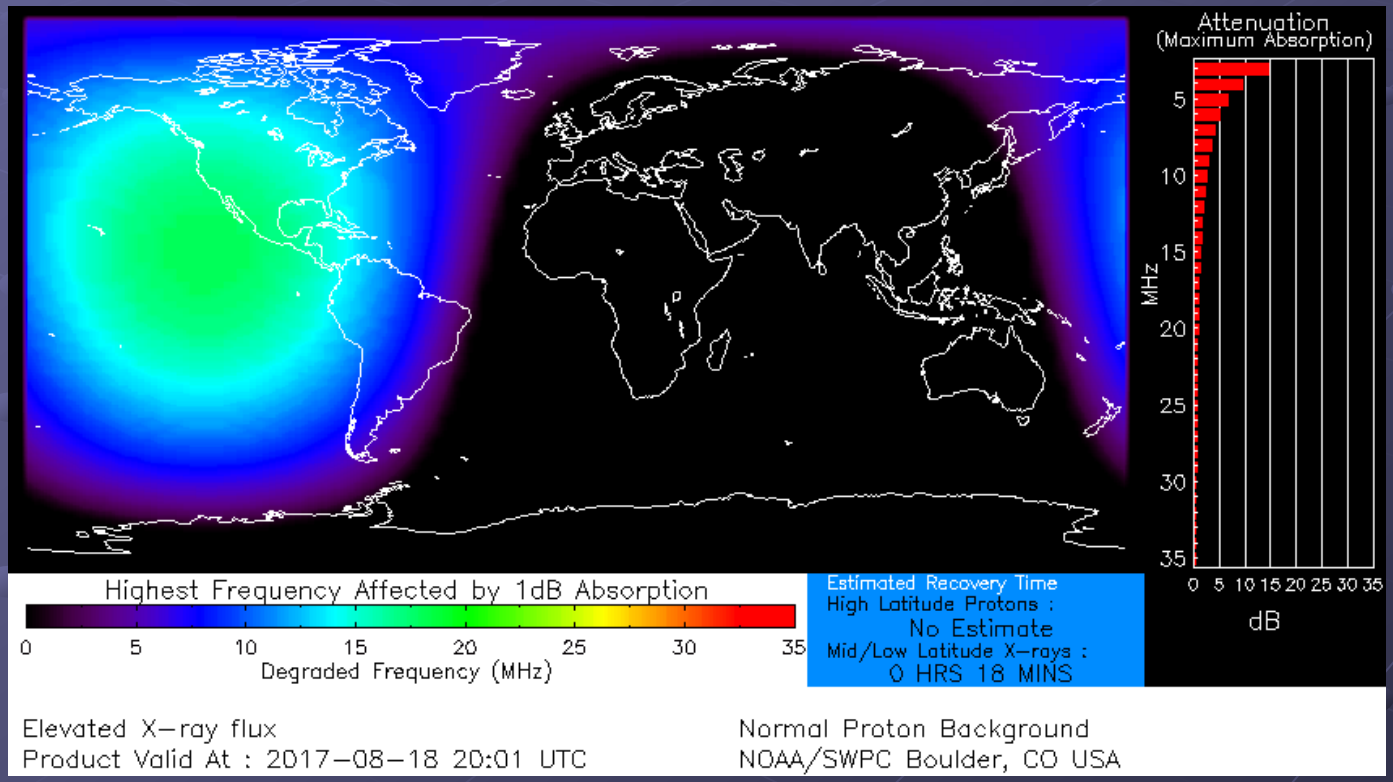
Solar Flux Measurement from NOAA

NOAA keeps an updated Solar Flux progression graph on their website, and the solar activity that started in mid August had an impact on the solar output. The graph represents a running average. It requires a persistent and big increase in solar activity similar to an “Indian Summer” to show in the graph.

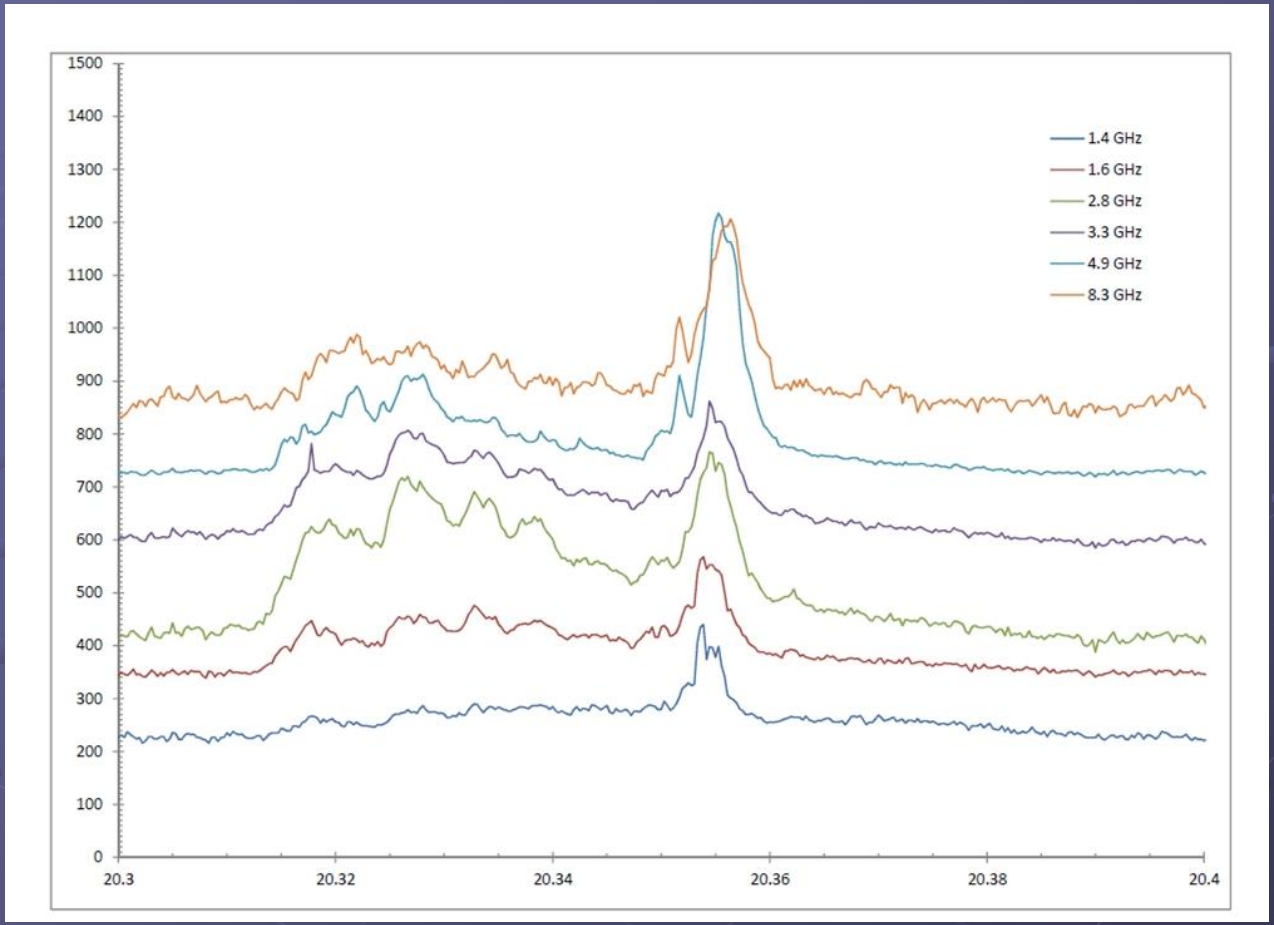


Effects of Solar Flux on D-Layer

- M-Class Flare on Aug 18 is just one of the many little explosions coming from the sun… this one hits NA dead on.



Strong Flare during Solar Eclipse

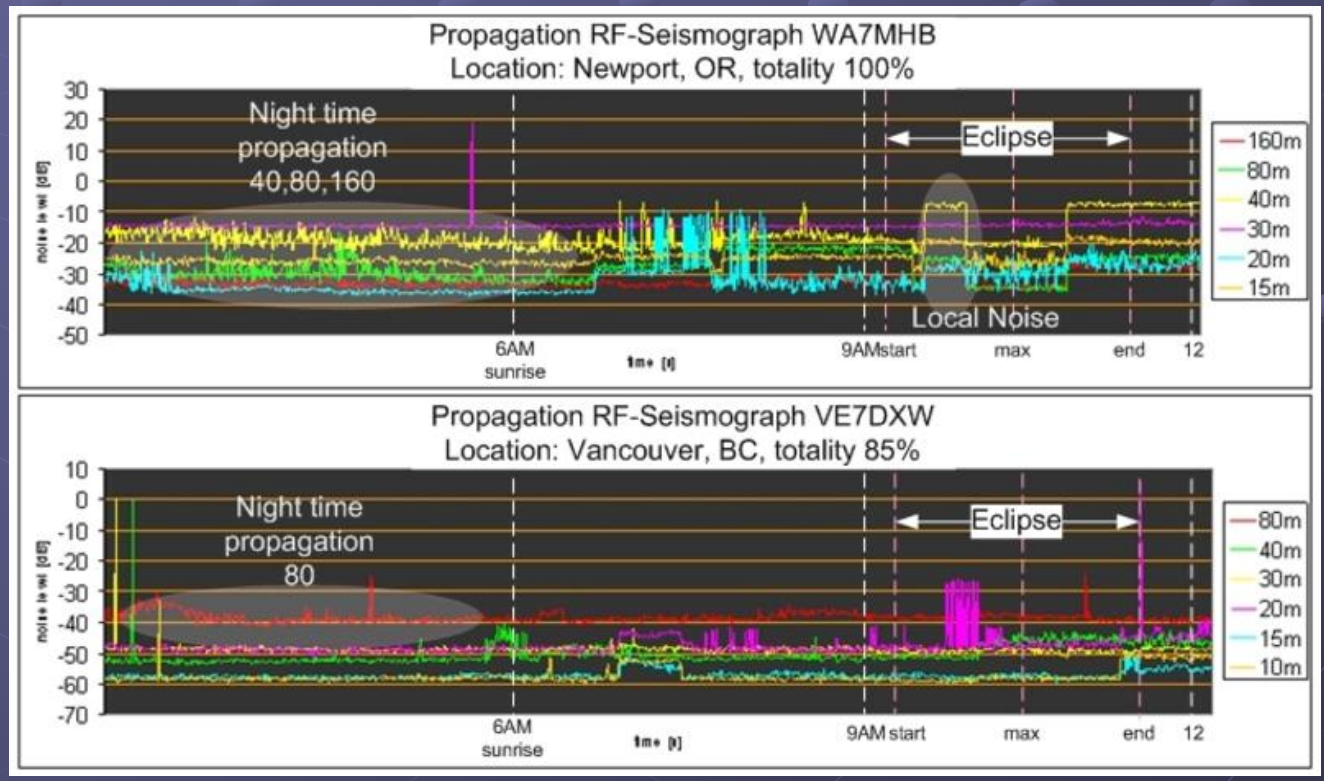


Measurement from new Solar Flux instrument at DRAO in Penticton BC.

The big spike is a M-Class solar flare. The increase in noise before the flare is also caused by the sun. At no point do we see the moon shadow effect we expected to see.

Comparison of the two main Monitoring Stations

Even the WA7HMB station in the pass of the totality does not show any pickup of propagation in the lower bands or shift to lower bands.

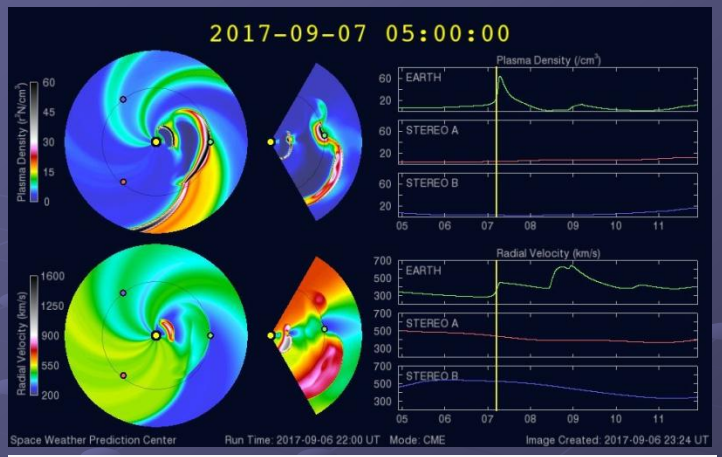


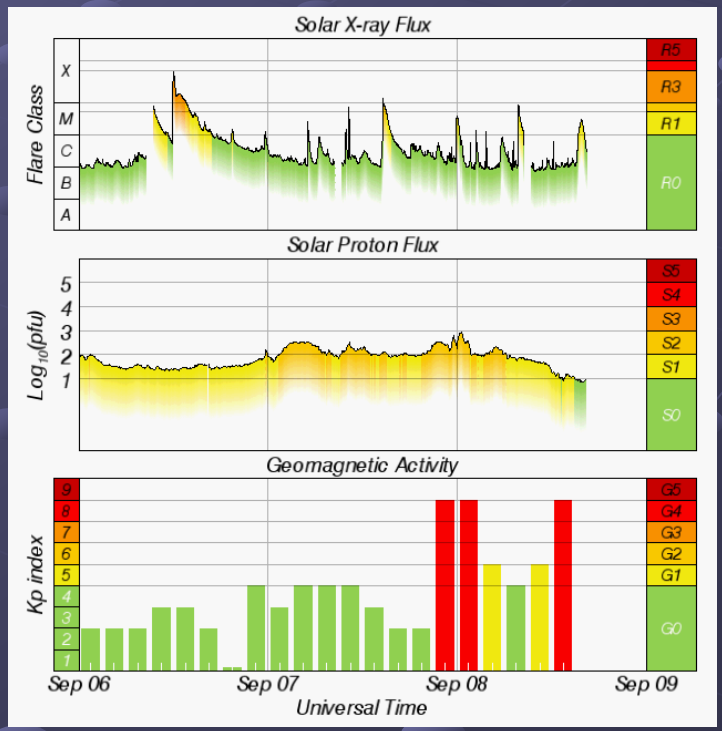
Apex of the Solar unrest

- On September 6 the high solar activity came to a peak with two X-Ray flares at 1200 Zulu time. But the unrest was not done yet . On the next day there were another 3 M flares. On the 9th there were even more flares.

- The Solar Proton Flux (mass from the sun) increased from an already bad S1 to a borderline S3 storm. Solar particles take a few days to travel the distance between the sun and earth.

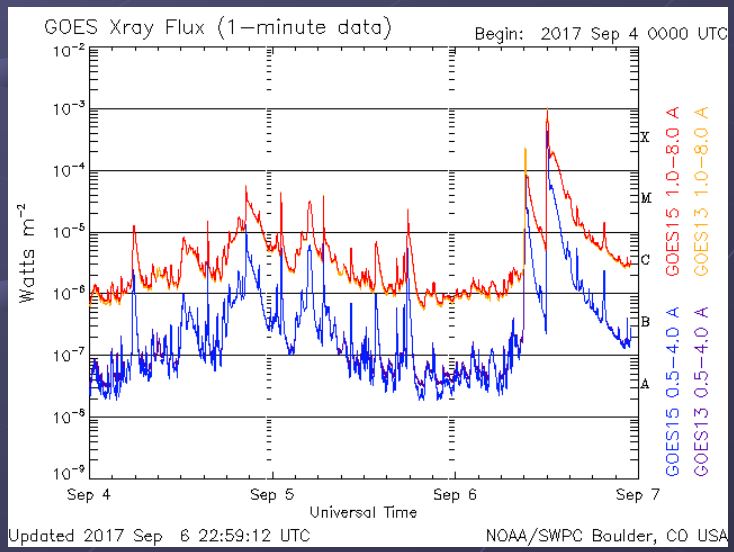
- Geomagnetic activity peaked late in the evening of Sept. 8 at G4 level then dropped off during the day, only to increase again to G4 for another 8h.





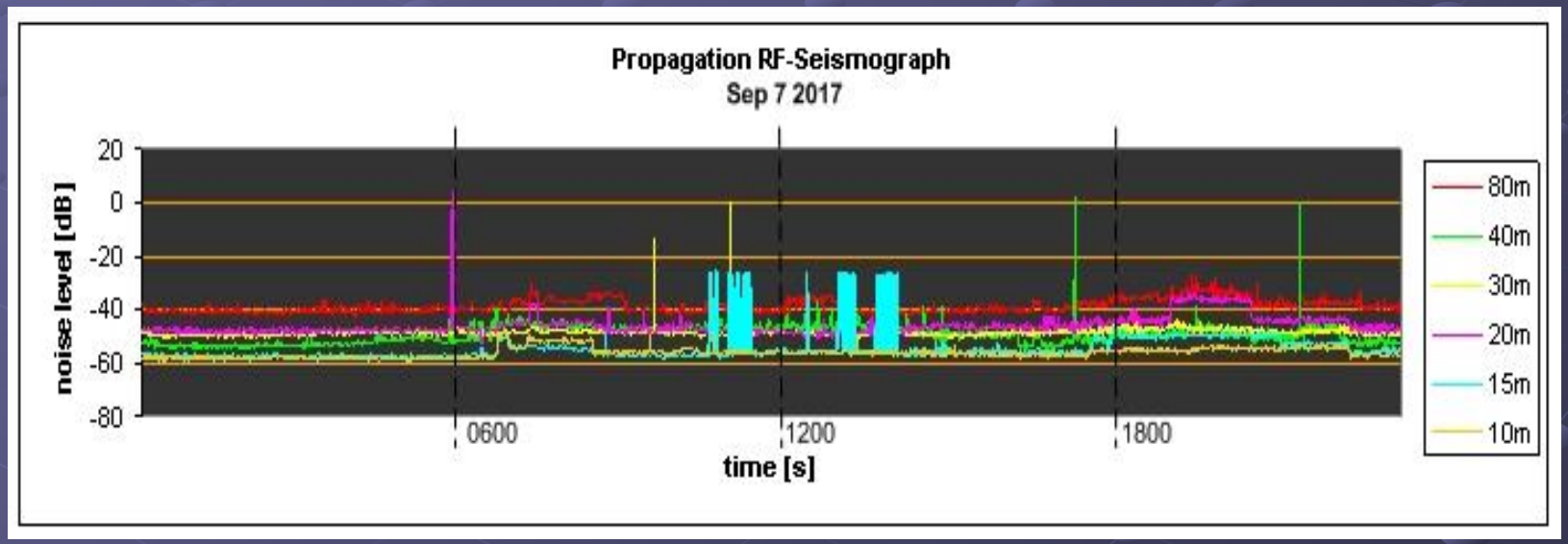
X-Flare…or even stronger?

- This was a double peaking flare with the second burst reaching into an energy level that is currently not classified. Luckily for us the spot creating it was pointed 45° away from our planet.
- With all my years of monitoring the sun I can not recall a stronger flare. Is it possibly comparable in strength to the infamous “Hyder” flare? With the difference that this one came from a sunspot, not a dark filament and was not pointed directly to earth?

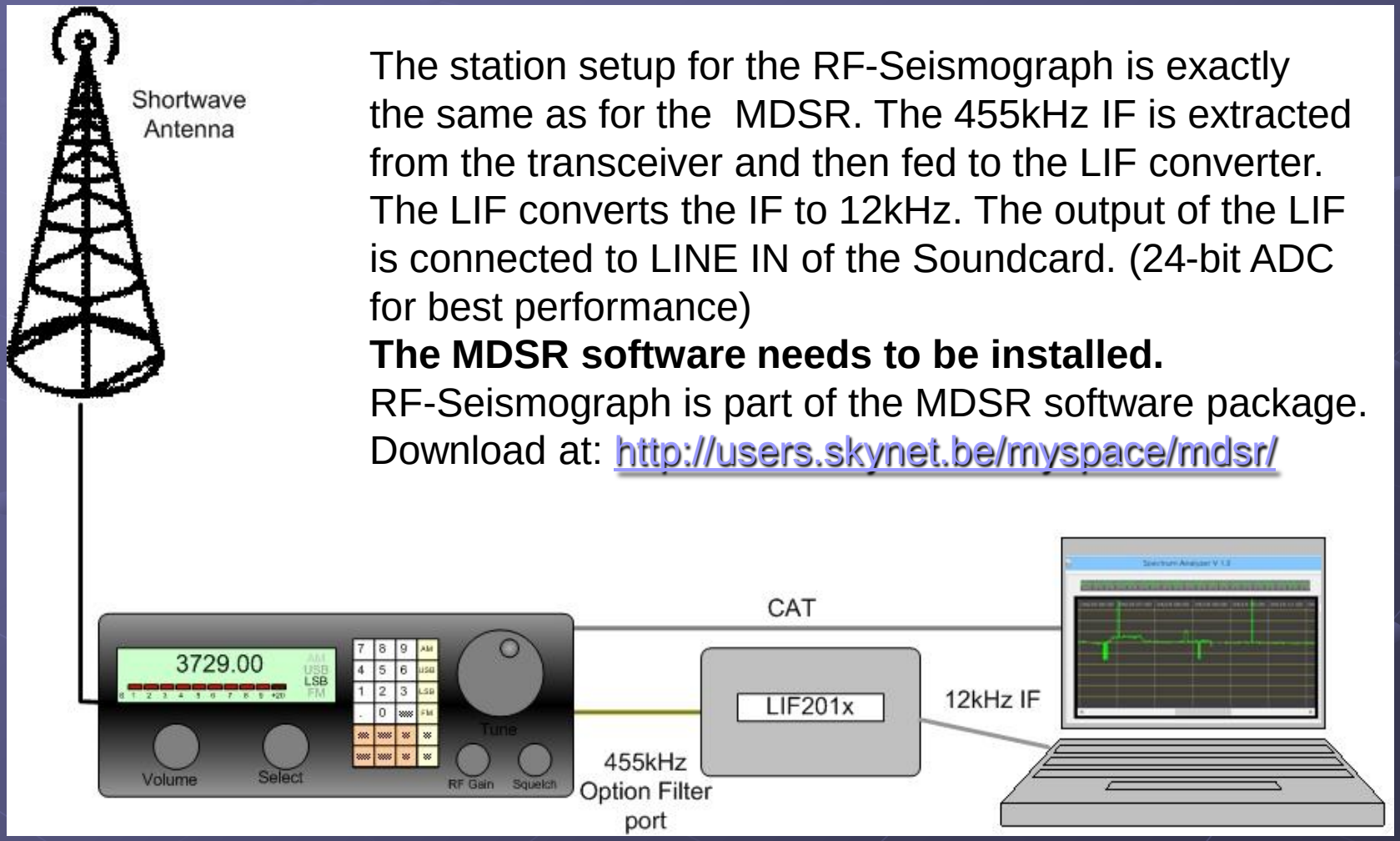


Propagation after the X-Ray Flare

- After the X-ray flare the extra radiation from the sun opens up the 15m band! Unfortunately this is short lived because of the solar proton storm that follows. (time shown is local DST)



How is “RF Seismograph” connected to the Transceiver



The station setup for the RF-Seismograph is exactly the same as for the MDSR. The 455kHz IF is extracted from the transceiver and then fed to the LIF converter. The LIF converts the IF to 12kHz. The output of the LIF is connected to LINE IN of the Soundcard. (24-bit ADC for best performance)

The MDSR software needs to be installed.

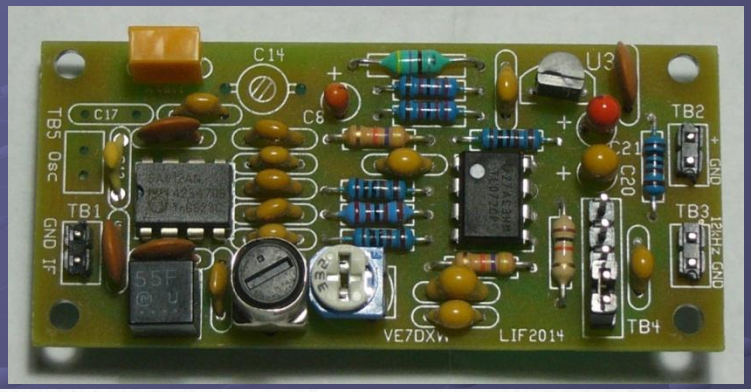
RF-Seismograph is part of the MDSR software package.

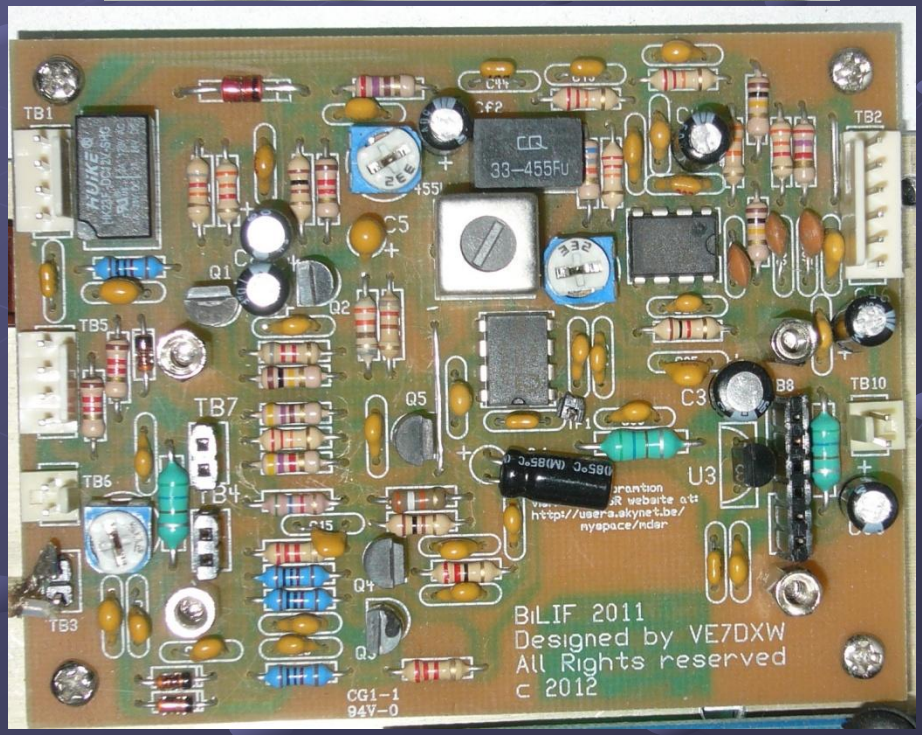
Download at: http://users.skynet.be/myspace/mdsr/

LIF and BiLIF Hardware

- LIF2014 PCB
  - Down-converter for 450/455kHz & 9MHz to 12kHz LIF
  - **available as kit**
- Up-converter LIF2011
  - Up-converter, both kits make up the BiLIF unit for full RX/TX MDSR operation
  - **available as partial kit**

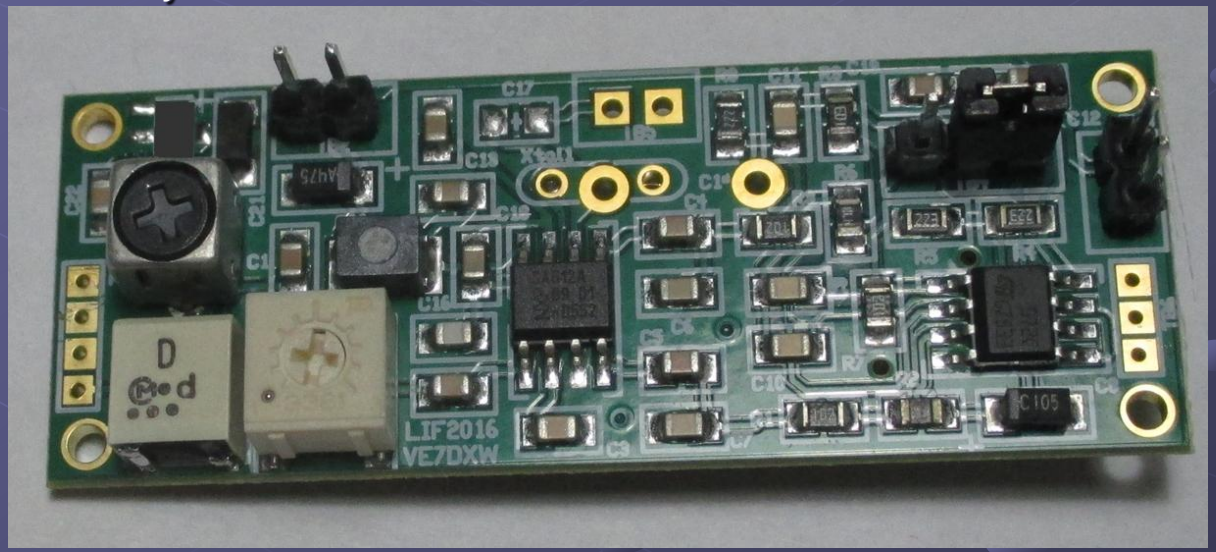
- easy to build
- easy to follow manuals
- no fancy tools are required
- only for 450 or 455 kHz IF
- online tech support





LIF 2016

- Fits into the option filter slot of many Yaesu and other radios
  - PCB size: 56 x 22mm (2.2 x 0.850”) same pin-out as option filter
- Only requires +12V to be wired from inside the radio
- 12kHz output ready for the Sound Card on TB3
  - RX only



References

Eleven Years of Sporadic E (must read!)
http://www.qsl.net/w/wa5iyx/Mar1992QST.htm

NASA Solar Eclipse Experiment 1999
http://science.nasa.gov/science-news/science-at-nasa/1999/ast04aug99_1/

Guy Roels (ON6MU) Experiment together with ON5OO Software (1999)
http://users.belgacom.net/hamradio/experiment.htm

National Research Council Canada (DRAO)
http://www.nrc-cnrc.gc.ca/eng/

NOAA Radio Communication Dashboard
http://www.swpc.noaa.gov/communities/radio-communications

Spaceweather.com
http://www.spaceweather.com/

Download MDSR software from:
http://users.skynet.be/myspace/mdsr/

Questions?

Contact information:

Alex Schwarz: alexschwarz@telus.net
Website: http://users.skynet.be/myspace/mdsr/

Yahoo user group:
http://groups.yahoo.com/group/mdsradio/

Thank you for your interest and participation in this presentation

Kits are available from VE7DXW