

Readme: Solar Radio

Solar Radio

Scientists monitor the structure of the solar corona, the outer most regions of the Sun's atmosphere, using radio waves (100's of MHz to 10's of GHz). Variations in the radiowave spectrum reveal characteristics of the corona and upper chromosphere in terms of altitude profile for the local plasma temperature, density and magnetic field. Typically, the lower the frequency then the higher the height of origin. The frequency, like the solar electron density, decreases uniformly outwards with 245 MHz originating high in the corona whereas 15,400 MHz originates in the low corona.

Radio bursts are associated with solar flares. The delay at Earth of the different radio frequencies during burst events is due to the outward movement of the source. Bursts can have temperatures of 10^{12} degrees Kelvin. Large bursts last 10 to 20 minutes on average. Longer radio noise storms of persistent and variable high levels of radiation originate in sunspot groups, areas of large, intense magnetic fields. These storms are strongly circularly polarized due to the intense magnetic fields.

The microwave wavelength 2800 MHz daily radio flux correlates highly with the daily sunspot number and the two databases are used interchangeably. The 2800 MHz, or 10.7 cm, responds to the same conditions that produce changes in the visible and X-ray wavelengths. Schmahl and Kundu (1995) find that the solar radio fluxes in the spectral range 1000-9400 MHz correlate well with the total solar irradiance. The intermediate frequencies (at 2800 and 3750 MHz) are produced mainly by free-free gyroresonance emission from sunspot structures, while 1000 and 9400 MHz flux are produced mainly by free-free processes from structures associated with plages. They can distinguish plage-associated emission from spot-associated emission in the time series of microwave flux, both contributing opposing effects on the total solar irradiance.

For great movies of solar radio events and more information about Solar and Stellar Radio Astronomy, please visit the website of [Dr. Stephen White](#). His PowerPoint talk [The Radio Sun](#) is also available.

AVAILABLE DATASETS

Dataset: Solar Radio Burst (1960 – Present)

Description: This dataset consists of solar radio burst tables and reports from various solar observatories located worldwide.

Reports:

- Compiled listing of fixed frequency reports – [Data](#) (1960-2010)
- Compiled listings of spectral reports – [Data](#) (1960-2011)
- RSTN WINDS (Sagamore Hill, MA) – [Data](#) (2012-Present)

Tables:

- [Nancay Radio Astronomy Facility](#) - [Data](#) (2007-Present)

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- [Solar Geophysical Reports](#) – Fixed Frequency – [Data](#) (2000-2011)
- [Solar Geophysical Reports](#) – Spectral – [Data](#) (2000-2011)

Dataset Status: Active

Dataset: International Astronomical Union’s Quarterly Bulletin of Solar Activity (1948 – 2011)

Description: Original datasets provided by XX stations collected for the time interval 19xx to xxxx. See the [IAU QBSA](#) Contributing observatories are:

- QBSA – [International Astronomical Union](#)

Dataset Status: TBD

Dataset: Noontime Flux

Description: Descriptive Test. Contributing observatories are:

- [Cracow Astronomical Observatory \(Jagellonian University\)](#) - [Data](#) (1994-1996)
- Penticton ([National Research Council Canada](#)) – [Data](#) (1947-Present)
- Learmonth ([USAF Radio Solar Telescope Network](#))- [Data](#) (1988-2011)
- Palehua ([USAF Radio Solar Telescope Network](#)) – [Data](#) (1988-2011)
- Sagamore Hill ([USAF Radio Solar Telescope Network](#)) – [Data](#) (1966-2011)
- San Vito ([USAF Radio Solar Telescope Network](#)) – [Data](#) (1988-2011)
- NOAA ([Space Weather Prediction Center](#) – Lists) – [Data](#) (2011-Present)

Dataset Status: TBD

Dataset: USAF Radio Solar Telescope Network - RIMS (1980 – Present)

Description: Fixed frequency receiver

- Learmonth ([USAF Radio Solar Telescope Network](#)) – [Data](#) (1980-Present)
- Palehua ([USAF Radio Solar Telescope Network](#)) – [Data](#) (1980-2010)
- Sagamore Hill ([USAF Radio Solar Telescope Network](#)) – [Data](#) (1981-Present)
- San Vito ([USAF Radio Solar Telescope Network](#)) – [Data](#) (1986-Present)

Dataset Status: Active.

Dataset: USAF Radio Solar Telescope Network - SRS (2000 – Present)

Description: Swept frequency receiver

- Holloman AFB ([USAF Radio Solar Telescope Network](#)) – [Data](#) (2000-2004)
- Learmonth ([USAF Radio Solar Telescope Network](#)) – [Data](#) (2000-Present))
- Palehua ([USAF Radio Solar Telescope Network](#)) – [Data](#) (2001-2010)
- Sagamore Hill ([USAF Radio Solar Telescope Network](#)) – [Data](#) (2004-Present)

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- San Vito ([USAF Radio Solar Telescope Network](#)) – [Data](#) (2000-Present)

Dataset Status: Active.

Dataset: Solar Radio Maps

Description: Daily maps of solar radio emissions. Contributing observatories are:

- [Nobeyama Solar Radio Observatory](#) - [Data](#) (2002-2011)
- [Wilcox Solar Observatory \(Stanford\)](#) – [Data](#) (1962-1973)

Dataset Status: Inactive

References:

Mclean, D.J. and N. R. Labrum (1885), *Solar Radiophysics - Studies of Emission from the Sun at Metre Wavelengths*, Cambridge University Press, 1985.

Schmahl, E. J. and M. R. Kundu (1995), Microwave proxies for sunspot blocking and total irradiance, *J. Geophys. Res.*, 100(A10), 19,851–19,864, doi:10.1029/95JA00677.

Schmahl and Kundu (1998), *Synoptic Radio Observations*, ASP Conference Series, Vol 140, 387-399.

White, S.M. (2007), *Solar Radio Bursts and Space Weather*, *Asian Journal of Physics*, 16, 189-207.