Low frequency solar radio emission

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The appearance of solar radio emission, particularly at low frequencies, is heavily influenced by propagation effects. [43] A propagation effect is anything that impacts the path or state of an electromagnetic wave after it is produced. These effects therefore depend on whatever mediums the wave passed through before being observed.

Solar radio emissions generally are easy to recognize in the narrowband audio output from ordinary high frequency receivers or in the wideband spectral signatures displayed by software defined radio (SDR) receivers

solar surface. Upward particle acceleration gives rise to solar radio bursts with lower frequency emissions generated farther out into the corona. The 15-30 MHz emissions come from regions about 1-2 solar radii above the photosphere. During solar activity, the Sun effectively converts magnetic energy into kinetic energy of

The radio emissions that occur in the solar atmosphere to interplanetary space arise from a broad range of physical phenomena with space weather implications (e.g. flares, solar energetic particles, CMEs and shocks, Fleishman et al., 2020; Nindos, 2020; Vourlidas et al., 2020).

The solar radio flux at 10.7 cm (2800 MHz) is an excellent indicator of solar activity. Often called the F10.7 index, it is one of the longest running records of solar activity. The F10.7 radio emissions originates high in the chromosphere and low in the corona of the solar atmosphere.

Ndacyayisenga, T., Uwamahoro, J., Uwamahoro, J. C., Okoh, D. I., Sasikumar Raja, K., Rabiu, A. B., Kwisanga, C., and Monstein, C.: Low-frequency solar radio type II bursts and their association with space weather events during the ascending phase of solar cycle 25, Ann. Geophys., 42, 313–329, https://doi /10.5194/angeo-42-313-2024, 2024.

The figure above shows the monthly-averaged F10.7 index from Natural Resources Canada (black line) between the years 2000 and 2019 (the year is indicated by the labels on the horizontal axis). The blue line shows the same data smoothed over a period of 13 months. One s.f.u. is defined as 10-22 W m-2 Hz-1.

Bursts of electromagnetic radiation at radio wavelengths are a common phenomenon on the Sun. They can occur during large solar explosions and eruptions, namely flares and coronal mass ejections (CMEs), and also in their absence. These bursts are classified into five main types: type I - V (Wild, 1963). Type I and type III radio bursts usually dominate the observations of solar activity at meter wavelengths in the absence of large eruptive events.

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