

PEM036-20

Room: Function Room A

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Long Term Radio Imaging Observation of the Sun by Nobeyama Radioheliograph

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Nobeyama Radioheliograph (NoRH) is a solar dedicated radio interferometer. It has been operating for 18 years since 1992. Observing frequencies are 17 and 34 GHz and the corresponding spatial resolutions are 10 and 5 arc seconds. A set of image are taken every one second for 8 hours per day. Field of view covers the whole solar disk.

Radio emission mechanisms in short centimeter region are mainly gyro-synchrotron, gyro-resonance, and thermal free-free emissions. Gyro-synchrotron emission is used to study particle acceleration in solar flares. Gyro-resonance emission is a lower harmonics emission of the gyro-frequency from thermal electrons. It is localized where magnetic field is very strong such as sunspot umbra. This is the reason why total radio fluxed in microwave range can be used as solar activity index.

Thermal free-free emission is due to collisions of thermal electrons with ions. This emission dominates the total flux from the non-flaring Sun. Upper chromosphere is optically thick in the quiet area. On top of the flat disk, we can see enhanced emission from active regions. Polar regions are also brighter due to enhanced limb brightening. It is well correlated with strong polar magnetic field during solar minimum. Dark filaments can be clearly seen in radio images due to absorption. When they crossed the limb, they become as emission due to dark sky background. Eruptions can be traced clearly because of no Doppler effect in continuum radio emission.

Eighteen years of continuous radio images of the Sun taken by NoRH will be used to study global solar activities (active regions, polar brightening, dark filaments, prominence eruptions) during 1+ 2/3 solar cycles, especially during the minimum of 23/24 cycles.

Keywords: Sun, microwave, image, Nobeyama Radioheliograph