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STUDY ON THE ROLE OF THE GYRORESONANCE EMISSION MECHANISM IN THE BRIGHTNESS INTENSIFICATION AT 17 GHZ OF SOLAR ACTIVE REGIONS

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Associated with magnetic fields between the chromosphere and the corona, specifically in active regions, gyroresonance emission plays an important role in revealing the magnetic dynamics in such layers. This category of radio emission originates in the acceleration of thermally distributed electrons that spiral magnetic field lines. Then, given the magnetic association of this radiation, this work hypothesized the possible relationship of the gyroresonance mechanism with brightness bumps at radio frequencies. Such hypothesis was based on the control played by the magnetic field on the radio emission when such field reaches conditions conducive to gyroresonant radiation at given frequency and harmonic. To test such a hypothesis, we selected and observed 8 active regions from the ascending phase of the 24th solar cycle. In this analysis, the data for these regions were HMI magnetograms from the Solar Dynamics Observatory (SDO) and images at 17 GHz from the Nobeyama Radioheliograph (NoRH). Although these magnetograms map only photospheric magnetic fields, they are useful for indicating where the intensity of these fields approaches values associated with the gyroresonant mechanism for a given frequency and harmonic of the radio emission. For each active region, then, we compiled both the SDO and NoRH maps of the same time and analyzed its magnetic field and brightness temperature. We then observed that the magnetic field conducive to the gyroresonance mechanism was partially or completely enveloped by the brightness bumps at 17 GHz. Furthermore, we also observed that most of these bumps had circular polarization modulus ($|r_C|$) above 30% and that the brightness temperature of the selected active regions was strongly correlated with $|r_C| \geq 30\%$ while it was weakly or moderately correlated with $|r_C| < 30\%$. The results of this work therefore support the proposed hypothesis, which makes brightness bumps at 17 GHz useful means of identifying gyroresonance sources.