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On the Structure of Magnetic Field and Radioemission of Sunspot-related Source in Solar Active Region

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In this work we present the method of the physical conditions diagnostic in the transition region and the lower corona in the active region.
Calculation of the radioemission (both cyclotron and free-free) is based on the magnetic field structure and various parameterized models of temperature and density distributions in the chromosphere and the solar corona. Magnetic field structure reconstructed from photosphere magnetic field, observed on Hinode/SOT instrument, in the non-linear force-free field model; dipole approximation is also used for a comparison. Calculated radioemission then compares with multiwave observations on RATAN-600 radiotelescope in the wavelength range 6-16 GHz in intensity and polarization.
We show the method, which allow singling out the radioemission of the sunspot-related source and estimating the contribution of thermal free-free and cyclotron emission mechanisms. The comparison of sunspot-related source with the sizes of gyroresonance levels allows to estimate the role of different harmonics of cyclotron emission in different parts of source.
As the result, we can obtain the parameters of solar atmosphere (temperature and density in chromosphere and lower corona, height of transition region) in different parts of active region. It is shown that for an explanation of observing source sizes, intensity and polarization it is necessary to use different models of solar atmosphere above the sunspot and above the rest of active region; non-linear force-free field approximation can be used for interpretation of the observed radioemission.