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On the correlation between the millimeter brightness temperature and the solar magnetic field

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ALMA millimeter wavelength images of the Sun show significant correspondence with the solar magnetograms. We analyze the observed correspondence by comparing ALMA solar images taken at 1.2 and 3.0 mm with SDO/HMI line-of-sight magnetograms. We find that the active regions and the chromospheric network show a positive correlation where the brightness temperature increases with the line-of-sight magnetic field strength, while sunspots display the opposite behavior with a negative correlation. On the other hand, quiet Sun regions do not show any dependence of brightness temperature with the magnetic field. Several radiation mechanisms are explored to explain the observed (anti)correlations. Thermal free-free emission is given as the most probable explanation and the main contributor to the observed correlations with enhanced heating in the active regions and a decrease of temperature in the sunspots due to the suppression of convection by the magnetic field.

Student poster?

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