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## Distributed electric current systems in solar active regions

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Using data from the Helioseismic and Magnetic Imager on board the Solar Dynamics Observatory (HMI/SDO) on the magnetic field vector in the solar photosphere, we analyzed the structure of magnetic fields and vertical electric currents in six active regions (ARs) with different levels of flare activity. Decomposition of the transverse magnetic field vector into two components allowed us to reveal the existence of vortex structures of the azimuthal magnetic field component covering a large area around the main sunspots of an AR, which indicates to a presence of the distributed over large area electric current system. The low value of the vertical electric current imbalance over the entire AR (below 0.1%) suggests that the distributed electric current is closed within an AR. We calculated the distributed electric currents in all analyzed ARs and studied their temporal variations and the relationship with the flare productivity of an AR. It was found that low-flaring ARs exhibit small variations of the distributed current in the range of  $\pm 20 \times 10^{12}$  A, whereas the highly flaring ARs exhibited significant smooth variations of the distributed current in the range of  $(30-95) \times 10^{12}$  A. Intervals of the enhanced flaring appear to be co-temporal with smooth enhancements of the distributed electric current.

### Student poster?

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