Title: "Particle Acceleration in Dissipative Pulsar Magnetospheres"

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Abstract: Pulsar magnetospheres represent unipolar inductor-type electrical circuits at which an EM potential across the polar cap (due to the rotation of their magnetic field) drives currents that run in and out of the polar cap and close at infinity. An estimate of the magnitude of this current can be obtained by dividing the potential induced across the polar cap $V_{pc} simeq B_0 R_0 (Omega R_0/c)^2$ by the impedance of free space $Z simeq 4 pi/c$; the resulting polar cap current density is close to $n_{GJ} c$ where n_{GJ} is the Goldreich-Julian (GJ) charge density. This argument suggests that even at current densities close to the GJ one, pulsar magnetospheres have a significant component of electric field $E_{parallel}$, parallel to the magnetic field, a condition necessary for particle acceleration and the production of radiation. We present the magnetic and electric field structures as well as the currents, charge densities, spin down rates and potential drops along the magnetic field lines of pulsar magnetospheres which do not obey the ideal MHD condition $E cdot B = 0$. By relating the current density along the poloidal field lines to the parallel electric field via a kind of Ohm's law $J = sigma E_{parallel}$ we study thestructure of these magnetospheres as a function of the conductivity $sigma$. We find that for $sigma gg Omega$ the solution tends to the (ideal) Force-Free one and to the Vacuum one for $sigma ll Omega$. Finally, we present dissipative magnetospheric solutions with spatially variable $sigma$ that supports various microphysical properties and are compatible with the observations.