

I think that some effects of the dark matter on the spiral galaxies could be explained using the gravitoelectromagnetism: some differences of the velocity curve in the galaxies could be due to relativistic effects; the magnetic field is an effect of the movement of the electric charges, and a gravitomagnetic field is obtained from the movement of the masses.

The motion of the stars in the galaxies could be approximate from the motion of a disk with uniform density (in the lowest approximation), and the gravitomagnetic field change the force applied on the galaxies with the gravitomagnetism forces:

$$\mathbf{F} = m(\mathbf{E}_g + \mathbf{v} \times 4\mathbf{B}_g)$$

in a better approximation, the effects of few thousand stars with a non relativistic velocity curve could be changed using the gravitomagnetic field of each mass:

$$\mathbf{B}_g = -kM \frac{\mathbf{v} \times \hat{\mathbf{r}}}{r^2}$$

these gravitomagnetic fields change the movement of each mass near the galaxies, curving the trajectories of massive particles.

The effect of the gravitomagnetic field is to move the stars trajectories on the edge of the galaxy, changing the trajectories of classic mechanics with an effect that reduces the observed mass of the galaxy.