Pulsar interactions with planets

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Résumé

The pulsars PSR B1257+12 and PSR B1620-26 are expected to hold planets, and other pulsars have suspected asteroids or comets. We investigate the electromagnetic interaction of a relativistic and magnetized pulsar wind with a planet or a smaller body in orbit. Many models predict that, albeit highly relativistic, pulsar winds are slower than Alfven waves. In that case, a pair of stationary Alfven waves, called Alfven wings (AW), is expected to form on the sides of the body. They are a magnetic wake into the plasma flow, and they carry a strong electric current. The theory of Alfven wings was initially developed in the context of the Io-Jupiter interaction. We have extended it to relativistic winds, and we have studied the possible consequences that could be relevant for observations : possible radio emissions from planets of pulsars, and a magnetic force configuration with a strong influence on the orbit of asteroids, comets, planetesimals. Electromagnetic effects effects of planets around pulsar may have been already observed. The extremly intermittent behaviour of pulsars PSR B1931+24 and PSR J1841-0500 may result from asteroids at close distance to the star. The Lorimer pulse and fast radio burst may be extremely colimated radio signals emited in the magnetic wake of pulsar planets from remote galaxies.

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