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Crab Flares and Magnetic Reconnection in Pulsar Winds

Alice K. Harding
NASA Goddard Space Flight Center

The striped winds of rotation-powered pulsars are ideal sites for magnetic reconnection. The magnetic fields of the wind near the current sheet outside the light cylinder alternate polarity every pulsar period and eventually encounter a termination shock. Magnetic reconnection in the wind has been proposed as a mechanism for transferring energy from electromagnetic fields to particles upstream of the shock (the “sigma” problem), but it is not clear if, where and how this occurs. Fermi and AGILE have recently observed powerful gamma-ray flares from the Crab nebula, which challenge traditional models of acceleration at the termination shock. New simulations are revealing that magnetic reconnection may be instrumental in understanding the Crab flares and in resolving the “sigma” problem in pulsar wind nebulae.