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An Investigation of state changes of PSR J2021+4026 and Vela pulsar

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We report on long-term evolution of gamma-ray flux and spin-down rate of the two bright gamma-ray pulsars, PSR J2021+4026 and Vela (PSR B0833-45). PSR J2021+4026 shows repeated state changes in gamma-ray flux and spin-down rate. We report two new state changes, one from a low gamma-ray flux to a high flux that occurred around MJD 58910 and another one from high to low flux that occurred around MJD 59510. We find that the flux changes associated with these two new state changes are smaller than those determined in the previous events, and the waiting time of the new state change from the high gamma-ray flux to low gamma-ray flux is significantly shorter than previous events. The waiting timescale of the quasi-periodic state changes is similar to the waiting timescale of the glitch events of the Vela pulsar, suggesting that the state change of PSR J2021+4026 may be related to a glitch. For the Vela pulsar, the flux of the radio pulses briefly decreased around the 2016 glitch, suggesting that the glitch may have affected the structure of the magnetosphere. Nevertheless, we could not find any significant change of the gamma-ray emission properties using 15 years of Fermi-LAT data. Our results provide additional insights into the relationship between glitches and changes to the gamma-ray emission in pulsars.

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