

A Study of Microglitches in Hartebeesthoek Radio Pulsars

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Abstract : We carried out a statistical analyse of microglitches events on a sample of radio pulsars. The distribution of microglitch events in frequency (ν) and first frequency derivatives ν' indicates that the size of a microglitch and sign combinations of events in ν and ν' are purely randomized. Assuming that the probability of a given size of a microglitch event occurring scales inversely as the absolute size of the event in both ν and ν' , we constructed a cumulative distribution function (CDF) for the absolute sizes of microglitches. In most of the pulsars, the theoretical CDF matched the observed values. This is an indication that microglitches in pulsar may be interpreted as an avalanche process in which angular momentum is transferred erratically from the flywheel-like superfluid interior to the slowly decelerating solid crust. Analysis of the waiting time indicates that it is purely Poisson distributed with mean microglitch rate $\langle \gamma \rangle \sim 0.98 \text{ year}^{-1}$ for all the pulsars in our sample and $\langle \gamma \rangle / \langle \Delta T \rangle \sim 1$. Correlation analysis, showed that the relative absolute size of microglitch event strongly with the rotation period of the pulsar with correlation coefficient $r \sim 0.7$ and $r \sim 0.5$ respectively for events in ν and ν' . The mean glitch rate and number of microglitches (N_g) showed some dependence on spin down rate ($r \sim -0.6$) and the characteristic age of the pulsar (τ) with ($r \sim -0.4/-0.5$).

Keywords : method-data analysis, star, neutron-pulsar, general

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