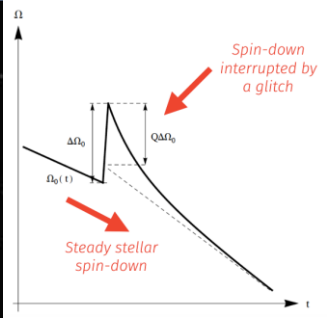


Introduction



- Pulsar glitches are sudden increases in spin frequencies
- Thought to arise from **vortex unpinning**

Methods & Data

Using updated glitch catalogue, Bayesian model comparison analysis of glitch size & time interval distributions and size-time correlations were done.

Interpretation

- Large glitches: nonlinear creep, threshold triggered & time correlated
- Small glitches: linear creep, stochastic unpinning, weak/no correlation

Modified coherent noise condition:

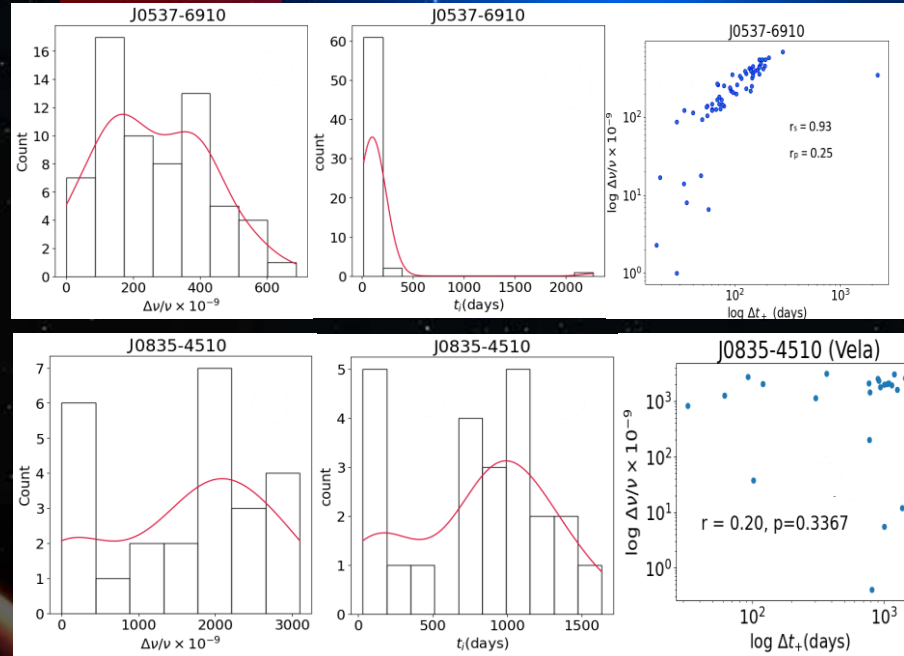
$$F_p \approx \frac{F_M}{C} + \frac{k_B T}{\xi^2}$$

Pinning force $\rightarrow F_p$, Partial stress contr. $\rightarrow \frac{F_M}{C}$, Thermal activation $\rightarrow \frac{k_B T}{\xi^2}$

Standard models:

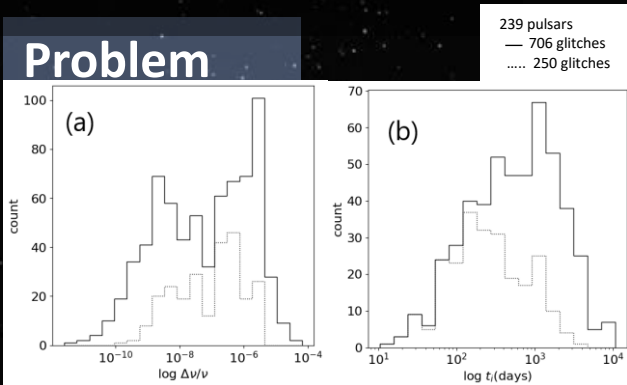
- Threshold triggered avalanche
- Vortex creep

Results



- Allows sub threshold unpinning

Problem



Observed statistics are inconsistent with threshold triggers:

- Bimodal glitch size distributions
- Random and correlated glitches
- Mixed size & time interval distributions

Do pulsar glitches arise from a single mechanism or multiple dynamical regimes?

- Low Bayesian information criterion confirm bimodal cases
- Small glitches worsen correlation

Glitch populations are statistical mixtures of two regimes, not separate mechanisms

Conclusion

Explains observed distributions and correlations; predicts max small glitch size \approx dip location (temperature & pinning dependent).

Pulsar glitches reflect the coexistence of stochastic and threshold-driven vortex dynamics