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Understanding pulsar glitches with stress-relax models

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The physical mechanism underlying pulsar glitches, abrupt spin-up events that interrupt the secular spin-down of some pulsars, is unknown. Plausible models include superfluid vortex avalanches, starquakes, or hydrodynamic instabilities. Almost all such models are reducible to a system in which stress accumulates between glitches and is partially (or fully) released at a glitch. The phenomenological prescription of stress accumulation and release allows one to generate sequences of waiting times and sizes of arbitrary length, and compare the long-term statistical predictions of the ‘meta-model’ to what is seen in real glitching pulsars. Of particular importance are the shapes of both the waiting time and size distributions, as well as the cross-correlation between waiting times and sizes. Despite the paucity of pulsar glitches recorded in individual pulsars, one can use data from the pulsars that have glitched the most to falsify meta-models, which in turn falsifies the physical models they represent.

Primary author: CARLIN, Julian (The University of Melbourne)

Presenter: CARLIN, Julian (The University of Melbourne)

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