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On the peculiarities in the spin-down of isolated radio pulsars

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Abstract. We investigate the spin-down behaviour of a sample of 25 radio pulsars on decadal timescales (∼18 years) using a continuous timing data obtained over a period of at Hartebeesthoek Radio Astronomy Observatory (HartRAO). Particular attention is placed on achieving a better time resolution of both the short-term and long-term changes in pulsar spin-down using local phase-coherent measurements of the spin-down rates ($\dot{\nu}$). We demonstrate that the spin-down of radio pulsars is generally complicated by a superposition of processes that may or may not be related. Specifically, our results show that (i) for 7 pulsars, the observed spin-down variation is largely stochastic, characterized by random and sustained jumps in $\dot{\nu}$ of varying amplitudes, (ii) for 9 objects, the spin-down evolution shows dominant monotonic variations in $\dot{\nu}$ superimposed on short-term stochastic jumps in the parameter, and (iii) for the remaining 9 pulsars, the long-term spin-down evolution is non-monotonic, dominated by some systematic excursion in the measured spin-down rates.