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The movement of pulsars in the Galaxy and determination of their kinematic ages

Knowing neutron star (NS) ages is important to better understand the formation and evolution of the Galactic NS population. The characteristic age is only a rough estimate, based on assumptions like pure magnetic dipole braking and a negligible birth period. Since these assumptions are not justified for many pulsars, we use kinematic simulations for 162 non-recycled pulsars and are able to determine unambiguous kinematic ages for 92 of them. The applied method requires knowledge of the pulsar's current position, proper motion and distance to calculate the trajectory and find its intersections with an area of ±100 Parsec around the Galactic plane, which is assumed as the birth place. The distribution of logarithmic kinematic ages roughly follows a Gaussian, with a peak around 10ˆ6 years. We obtain large differences between kinematic and characteristic ages and a smaller median for the kinematic ages. The method is problematic for the youngest and oldest NSs. We compare our results to Tetzlaff (2013), who determined pulsar ages by identifying individual birth associations, like supernova remnants, stellar clusters or runaway stars. Our method is mainly applicable for middle-aged NSs, while for young NSs it is better to search for individual birth associations. For the youngest ones we can still see the supernova remnant (SNR), so we can precisely locate the birth place. We try to find runaway stars inside SNRs (see Dinçel et al. 2015) to determine the exact time and place of the SN and constrain pre-SN binary properties. Considering runaway stars of all spectral types will help to estimate, how often the binary SN ejection scenario (Blaauw 1961) happens.

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