Observed Luminosity Difference between Isolated and Binary MSPs

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We’re not the first ones to measure this difference. Several authors have suggested that there may be a luminosity difference between the isolated and binary MSPs (Bailes et al. 1997; Kramer et al. 1998; Hobbs et al. 2004). Bailes et al. (1997) find that luminosities of isolated and binary MSPs are different at the 99.5% confidence level, with the isolated MSPs being intrinsically dimmer. We have confirmed their results with an updated catalog.

If isolated MSPs really are less luminous than binary MSPs, you’d expect that the scale height of known binary MSPs is larger than the scale height of known solitary MSPs. This seems to be the case, as shown in Figure 1. For the pulsars listed, one finds that the standard deviation from zero for the binary MSP population is twice that of the isolated MSP population: $570 \pm 90$ pc vs $280 \pm 65$ pc. Figure 1 shows a histogram of $z$ for each population. The isolated MSP population is represented in the upper half of the figure, the binary MSP population in the lower half. Also, a simple examination of the median distance of the isolated population (510 pc) compared to the median distance of the binary population (1155 pc) suggests that the isolated MSPs must be less luminous.

You could, by the way, wonder if this scale-height difference was actually representative of the population. We suggest that it’s not. If there was a real scale-height difference you’d also expect the velocities of the two populations to be different, and they’re not.

Magnetic Field Difference? Maybe.

If there’s a luminosity difference shouldn’t we see a magnetic field difference? Yes, but it’s not clear whether or not we do. We’re limited by sample size. See Figure 2.

Implications for Formation

If there’s a luminosity difference shouldn’t we see a magnetic field difference? Yes, but it’s not clear whether or not we do. We’re limited by sample size. See Figure 2.

References

Some of the work presented on this poster has been published in the following article:


Other sources:


References