A first estimate of the Milky Way dark matter halo spin
(Corrigendum)

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Because we wrongly interpreted the width of the log-normal spin distribution of Jiang et al. (2019) to be given in natural logarithm, as is typically used in this context, the distribution in Fig. 6 of the paper (solid gray curve) is too narrow by a factor of \( \ln(10) \). With this correction, the distribution of Jiang et al. (2019) with \( \lambda = 0.037 \) and \( \sigma = 0.215 \ln(10) = 0.495 \) is very close to the one of Bullock et al. (2001) for example, with \( \lambda = 0.035 \) and \( \sigma = 0.500 \) (the latter now added for comparison in the revised Fig. 1). In the Introduction, we were wrongly interpreting the smaller \( \sigma \) of Jiang et al. in comparison with older published values to be explained by an increase in resolution.

With this correction, in Sects. 5.2 and 6, the spin for the contracted NFW model is \( 1.0\sigma \) away from the peak of the log normal distribution, while the uncontracted NFW is \( 1.7\sigma \) away, both with respect to the distribution of Jiang et al. (2019). The revised probabilities for a galaxy to have the same dark matter halo spin as our estimate for the MW become 30.9% for the contracted NFW model and 9.7% for the uncontracted NFW one (the old incorrect values were 21% and 0.2%, respectively). This means that the contracted NFW mass model is still favored over the uncontracted one, but the latter is not an extreme outlier, as stated in the original abstract. Thus, in the discussion of Sect. 5.2, the probability of finding a galaxy with the MW’s stellar mass and the MW’s spin (in the contracted dark matter halo case) is 0.31%, and not 0.22%. The error we made only affects the comparison with the work of Jiang et al. (2019), as given above, and the subsequent interpretation that a MW with an uncontracted NFW mass profile is an extreme outlier, instead of just less likely (by a factor of \( \sim 3 \)) than a MW with a contracted mass profile.

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References

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Fig. 1. Corrected DM halo spin distribution for the NIHAO sample (solid gray curve, Jiang et al. 2019) and from the dark-matter-only simulations of Bullock et al. (2001; dashed gray curve), together with the MW predictions for the NFW and contracted NFW mass models (faint and solid red points), and the spins of the MW-type galaxies in NIHAO (green stars).