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Improving Galactic Disk simulations with Gaia

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The *Gaia* mission has produced an extraordinary amount of high quality photometric data for the whole sky and has contributed dramatically to advancing our understanding of the Milky Way. In particular, its data can be used to calibrate population synthesis models of our galaxy, aiming to reduce the gap between simulations and observations.

We present here a study of the star formation rate (SFR) of the Galactic disc based on data from the third data release of the *Gaia* mission. We select a sample of stars within a cylinder of the extended Solar Neighborhood with radius 200 pc and spanning 1.3 kpc above and below the midplane of the Galaxy. We split the sample in 28 slices located at different heights from the Plane and we build synthetic color-magnitude diagrams in 16 age bins for each slice with the TRILEGAL population synthesis model, which includes state-of-the-art stellar models and a detailed treatment of interacting binaries. Using the Bayesian color-magnitude diagram fitting tool we developed, we determine simultaneously the SFR in all age bins and all slices, and we compute the scale heights of the Galactic disc in each age bin. We find that our results are compatible with previous ones, although we achieve a better age resolution. Most importantly, we obtain a clear picture of the increase with age of the scale heights, from about 50 pc in the youngest age bins to about 500 pc in the oldest ones.

These results will be included in the geometric model of the Galaxy implemented in TRILEGAL, leading to a significant improvement in the simulated Galactic disc structure.

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