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Using the genetic algorithms to study the galactic structure

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Abstract. We investigated the spiral structure of our Galaxy from comparisons of the 2MASS data with the results of the Besançon Galaxy Model for inner Galaxy. The main goal of this work is to join the abilities of the BGM with a powerful method of global optimization, the Genetic Algorithms (GAs) which consists in a robust optimization technique to fit several parameters. Our main procedure consists in to adjust the parameters of spiral arms (initial radius, pitch angle, phase, amplitude) in order to reproduce the color-histogram (J-K) observed by 2MASS. In the total we adjusted 22 parameters of the spiral arms for the tangential directions to the spiral arms in the inner Galaxy, with latitudes varying from -0.50^o to +0.50^o. A good relationship was obtained between the observed histogram (J-K) and the one obtained after the adjustments. Our results point out a Galaxy with four main spiral arms with pitch angle equal to 11.5 ± 1.0. We also compared our results with other models which describe the spiral structure as well as the HII regions distribution in the Galaxy. The tangential directions obtained with our method are also in agreement with the other values found in the literature.

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References

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