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Structure and evolution of metallicity and age radial profiles in Milky-Way-like galaxies

E. Athanassoula

Aix Marseille Univ, CNRS, CNES, LAM, Marseille, France

Abstract. I will give here a very short summary of some of the work I have been doing lately on the chemical evolution in Milky-Way-like spiral galaxies.

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In this talk, I discussed the structure and evolution in time of the radial metallicity and age profiles, using high resolution chemo-dynamical N-body simulations of Milky-Way-like galaxies. The simulations and the code used are described in Athanassoula *et al.* (2016, 2017). This sample of simulations includes both barred and non-barred disc galaxies, formed and evolved either in isolation or following a major merger.

I presented in some detail two examples: one non-barred formed from the evolution of a merger remnant, and one strongly barred formed and evolving in isolation. For the first I chose a case having a type II surface density radial profile, since observations show that this is the most common type (for a review of the dynamical aspects see Athanassoula (2017) and references therein). For the non-barred example, I obtained the radial profiles by an azimuthal averaging. This, however, was not a good solution for the strongly barred example, so I used two narrow slits, along the direction of the bar major and minor axes, respectively. For both examples I found a clear link between the metallicity or age profiles and the surface density ones.

Extending this analysis to a large number of such examples I reached the conclusion that the properties and evolution of the metallicity and age radial profiles display a considerable variety, depending on several parameters such as e.g. those determining the disc angular momentum and its morphology. In particular, the existence and strength of a bar and of spirals will strongly influence both the radial migration and the star formation and thus the radial metallicity and age profiles and their evolution.

I also argued that for radial profiles it is preferable to avoid units such as arcsec, or kpc and, instead, to normalise by a length with some physical significance. In non-barred galaxies one can use e.g. the (inner) disc scale length, or, even better, the break radius. In barred galaxies the best is to use the barlength, which, although not trivial to calculate accurately, has a physical meaning, separating regions with clearly different orbital structure. Such a normalisation will allow better comparisons between different galaxies, or galaxies and simulations.

References

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