

Peer Review

Review of: "The Milky Way Radial Metallicity Gradient as an Equilibrium Phenomenon: Why Old Stars are Metal-Rich"

Claudia Maraston¹¹. University of Portsmouth, United Kingdom

This is very interesting work, well-written and mostly well-referenced, with beautiful plots and an ample discussion of uncertainties. A few comments: the work focuses on measurements for the Milky Way, and then generalises the conclusions to “Milky-Way-like galaxies”. Given that one of the hypotheses to support age/Z structures at large radii is accretion/merger, these conclusions cannot easily be generalised to other spirals given the intrinsic randomness of mergers. On the other hand, the authors could compare their radial gradients to those measured in late-type galaxies, e.g., by MANGA-based efforts (e.g., Goddard et al. 2017), and see how they compare. Also, when discussing APOGEE ages and the case for a merger event in the past of the MW, the authors should quote Lian et al. 2020a,b, who made similar conclusions. Interestingly, those papers are listed in the bibliography, but they are not quoted in the manuscript. I would also recommend shortening the chemical evolution model part, or breaking it down and placing generalities in the Appendix.

A couple of points:

- in sec. 2.1: I'm a bit puzzled by the criteria cutting away the coldest giants, which are going to be the most metal-rich, and I'm not sure about contamination with the main sequence for $\log g < 3$...

- there is a tau that should be a t
- In Fig. 2, left-hand panel, I'd overlay stellar tracks, as RGBs are strongly affected by the assumed mixing-length

Congratulations on the interesting work!

Declarations

Potential competing interests: No potential competing interests to declare.