Recap

The author divides the introduction in three paragraphs. In the first paragraph he introduces the standard model used for analzying the evolution of cosmic structure,ΛCDM, and the Navarro-Frenk-White profile for the dark matter. In the second paragraph he describes two methods for estimating the mass of a galaxy, explaining how the the presence of dark metter can alterate this measure, and, to same extent, he starts to motivate the importance of modeling the dark metter. In the third paragraph the author wants to explicity state his contribution in this research project and give an idea on how this could impact the ongoing scientific debate.

Paragraph I and II

I made some comments on the paper. All of them are only suggestions based on my understanding, so it could honestly make no sense for the author.

- Capital letter for Lambda Cold Dark Matter. I think it helps to remember the abbreviation (my thought).
- "A second method infers the mass of a galaxy using the observed speed and positions of the stars, and solving the gravitational equation." (I think that the fact that you are explaing two methods for inferring the mass has been already stated, so you can start with that. - Writing paper -)
- I cut some of the adverbes. This is very personal, I think sometimes it makes the reading smoother.

Paragraph III

For the third paragraph it was hard to write on the paper, so I'm going to rewrite in here how I would structure it. Take in mind that I followed the scheme:

- The idea is rule out parameters
- Why that is something you want to be doing
- Which approach you use (ABC)
- Why ABC

In this context the Sculptor dSph (dwarf Spheroidal) and other dwarf galaxies are particularly interesting. In fact they contain a higher ratio of dark matter to normal matter than larger galaxies. Sculptor, for instance, has sufficient mass that baryonic effects should not alter the shape of its dark matter profile. Moreover the ΛCDM model would predict that the dark matter density profile would follow a dark matter cusp [4].

It turns out that some of the parameter values present in the NFW profile are consistent with either a dark matter cusp or a dark matter core and could indeed be ruled out. Rulling out parameter values consistent with either a dark matter cusp or a dark matter core, would help to validate the ΛCDM method and indicate areas where the theory can be refined. Unfortunately previous analaysis were unable to succesfully determine appropriate parameter values for the NFW profile function. We hope to contribute the ongoing debate using Approximate Bayesian Computing (ABC) to estimate credible intervals for the relevant parameters. ABC is a set of computational methods that bypass the evaluation of the likelihood function and it is in fact defined a "free-likelihood" approach. A free-likelihood approach to estimate credible intervals is particularly attractive in such a situation where relationship between the dark matter profile and the observational data, positions and velocities of stars, are very complex. A further complication is provided by the two distinct populations of stars that make up the Sculptor dSph. The first population is a metal rich population concentrated near the core of the galaxy and the second is a metal poor population found primarily farther from the center. Modelling these two populations simultaneously while also incorporating the random processes by which stars are observed would further complicate the estimation of a likelihood function.