## Response to referee report for manuscript ref. MN-19-2054-MJ

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The paper presented here is very well written and offers important new insights. It studies the
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Major comments:
1) One of the main points of the paper is studying the multiplicity of Pop III stars in a halo
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-Resolution testing

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2) The authors select their haloes by the halo finding algorithm Rockstar. They should add a bi
Further, it is not entirely clear why atomic cooling haloes are excluded in this analysis and i
In addition, the authors should state the fraction of haloes that have Pop III stars forming ou
The baryon fraction varies with redshift. Please give an estimate by how much this influences t
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-address concern about Rockstar details, and Machacek halo definition -exclusion of atomic cooling haloes - we excluded these because of a bug in our code... how to explain this without simply saying that? -fraction of halos that halo Pop III stars forming outside the haloes: I'm not sure I will be able to tell exactly how many are not in halos. I need to look back at the data to see if I will be able to pick out which halos I artificially drew a halo around. -shall I look at the baryon fraction as a function of time to see how much it varies?

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Minor comments:
The authors should state at one point in the paper for which properties they use comoving or ph
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-We use physical units throughout the whole paper, apart from when we discuss the boxsize. I will make this more clear.

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Introduction:
The authors write that Pop III star formation is generally more massive. While a fraction of th
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-I will look at and add these citations and detail to the introduction.

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The authors name a few processes for suppressing Pop III star formation. For completeness, they
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-I will add this detail

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The authors cite the well-known study from Machacek+01. However, a more recent result would be
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-I will check out Visbal+ 14 (I think I have looked at this paper, will double check)

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Methods:
In Wise+12, three different environment regions are picked. Please provide more description on
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-I will look at that simulation again, if John could provide some insight here that would be nice.

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The initialization at z=130 is very late. I am aware that it is impossible to repeat this simul
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-Personal question: why is this initialization late?

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Why do the authors pick a non-zero metalicity threshold for Pop III star formation? How many Po
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-Simulation question

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What is the physical motivation for a density threshold of 1.e6/cc? Is there convergence?
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-Simulation question

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Similarly, why do the authors chose a H2 fraction of 1.e-3? (Is is a mass fraction or a number
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-Simulation question

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Do the authors set fixed mass limits to the IMF and if yes, which are they? If not, which is t
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-We do set fixed mass limits, between 1 and 300 Msol. I will add this detail. -What is the best way to get this information? Shall I look at all the Pop III stars at the end of the simulation and look at their masses? I should be able to get a fraction of these endings from that, correct?

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One effect than can weaken the shielding is shifting out of the Lyman-Werner resonance lines (s
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-Will have to look at Hartwig+15.

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In Figure 1, please mention in the caption or at the top / bottom of the left axis that a shiel
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-This is a good point, that is confusing. I will add this.

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The analytic calculation of the shielding factor is a nice property of the paper. However, assu
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-I will check out a more realistic H2 fraction for a halo and try to get a nice plot out of that.

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Results:
Figure 2 is quite empty, it would be useful to include the halo mass function of the earliest h
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-Figure 2 is empty. I will add a vertical line at $10^5 M sol to show our resolution limit. As far as the HMF of the earliest P$ 27, $what is the HMF at that time and how does it compare with Sheth - Tormen? I will plot this up.$

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Figure 3 looks very nice. It would be helpful if an additional line that only provides the glob
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-Woohoo! Figure 3 does look nice! I will add the global LWBG, hopefully it looks alright. I am fairly certain we did this and for some reason it all didn't seem to add up. I will try this again.

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The authors find no correlation between the host halo mass and the Lyman-Werner background inte
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-Haven't thought about the time integrated LW flux. Would like some advice on this point.

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Figures 7 and 8 show very nice histograms as an additional panel on the right. I suggest to inc
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-I will add a histogram on the spread of the creation time in Figure 9.

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Discussion:
The authors give three reasons for the halo mass spread. Can they estimate which of the three p
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-It's not immediately obvious to me how we would be able to estimate this. I would have to look at these processes in more detail to see if there are some mass ranges correlated with them. Any insight from John?

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One of the most extensive studies on over 1000 minihaloes was performed by Hirano+15, who also
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-I will check out this paper, and see what can be added.

In Figure 10, the result from Yoshida+03 is hard to see, maybe use a different symbol / colour

-I will adjust this symbol.

Since the authors study star formation in minihaloes, it would be appropriate to also mention

-I will check out these papers and add accordingly.

The authors mention a few times that streaming velocities are another pathway of suppressing P

-I will check out these papers as well, and see if I can compare.