Aggravating matters: accounting for baryons in cosmological analyses

Debackere, S.N.B.

List of publications

Refereed publications

1. *Galaxy cluster aperture masses are more robust to baryonic effects than 3D halo masses*
   Debackere, S. N. B., Hoekstra, H., Schaye, J.
   Monthly Notices of the Royal Astronomical Society, 515, 6023 (2022)

2. *Why are we still using 3D masses for cluster cosmology?*
   Debackere, S. N. B., Hoekstra, H., Schaye, J., et al.
   Monthly Notices of the Royal Astronomical Society, 515, 3383 (2022)

3. *How baryons can significantly bias cluster count cosmology*
   Debackere, S. N. B., Schaye, J., Hoekstra, H.
   Monthly Notices of the Royal Astronomical Society, 505, 593 (2021)

4. *The impact of the observed baryon distribution in haloes on the total matter power spectrum*
   Debackere, S. N. B., Schaye, J., Hoekstra, H.
   Monthly Notices of the Royal Astronomical Society, 492, 2285 (2020)

Non-astronomy publications

1. *An evaluation of behaviours considered indicative of skill in handaxe manufacture*
   Hutchence, L., Debackere, S.
   Lithics–The Journal of the Lithic Studies Society, 36 (2019)

Curriculum vitae

I was born on April 27th 1993 in Gent, Belgium, but moved to Leuven at four years of age. There, I attended the Sint-Albertuscollege studying Classical Languages and taking the Greek-Mathematics 8 specialization in the final two years. In my fifth year of secondary school, I took part in the astronomy summer school organized by the Flemish Astronomy Society. I had been fascinated by astronomy ever since my brother Tom received a small refractor telescope for his birthday. In my final year of secondary school, I won the Flemish Astronomy Olympiad with a proposal to determine whether the anomalous X-ray Pulsar 4U 0142+61 is a magnetar by observing polarized luminosity variations due to the lensing effect caused by its strong magnetic field.

Intending to study aerospace engineering in Delft, I encountered the astronomy programme in Leiden and was immediately sold. Eleven years later, I have completed my double Bachelor's degrees in Astronomy and Physics, culminating with a research project on the instrumental polarization of the Extremely Large Telescope with Dr. Frans Snik (*cum laude*, 2014) and obtained a Master's degree in Physics, specializing in cosmology, with a thesis supervised by professor Joop Schaye on modelling baryonic effects in hydrodynamical simulations with a phenomenological halo model (*summa cum laude*, 2016), all at Leiden University. After a year at the University of Cambridge, where I completed the Master of Advanced Studies in Applied Mathematics (2017), I returned to Leiden as a de Sitter PhD fellow to work with professors Joop Schaye and Henk Hoekstra on studying the impact of baryonic effects on the cosmological analysis of future surveys like Euclid.

During my studies, I was able to present my research at Euclid meetings in Milan (2018), Barcelona (2019), and Paris (February 2020), the last physical meeting before the pandemic. Additionally, I have tutored first year Bachelor's students (2013-2016), taught examples classes for courses on Electromagntic Fields (2016), Quantum Mechanics (2016), and Large-Scale Structure and Galaxy Formation (2018-2020), and supervised Joshiwa van Marrewijk's Master's project. Finally, I was consulted by secondary school students on their graduation project and I presented an introduction to dark matter to a group of Dutch and German fifteen-year-olds. From 2019 to 2022, I also served as an editor for the Dutch Journal of Physics.

In September 2022, I will be moving to México to start a new career outside of academia.

Acknowledgments

Completing a PhD is not a solo effort, even though a lot of time is spent reading, thinking, coding and debugging on your own. Many people have helped to make my time in Leiden a memorable one. First of all, I would like to thank my supervisors, Joop and Henk, for their continuous guidance and in-depth discussions about my work, which could get lively at times. Joop, you care deeply for all of your students and wish for them to succeed. This clearly shows in the thorough comments you provide on our drafts, the dissection of papers during the preprint meetings, and your shared insights into the sociological aspects of the academic world. I have learned a lot from you. Henk, thank you for always being able to drop by your office to discuss strange results or to talk about the clearest and most concise way to get my points accross. I sincerely enjoyed our discussions about education and research, and our shared appreciation for Demeyere pans. Collaborating with you has been a real pleasure.

Being part of two research groups provides twice the learning opportunities. To all the people in the cosmological simulations and weak lensing groups: thank you for the interesting meetings and for keeping me informed about a broad range of topics during times when my own projects were very singularly focussed.

The observatory is full of lively students whom I want to thank for creating a homely atmosphere. Alex, Kirsty, David, Dilovan, Steven, Leon, Leindert: thank you for the fun times both inside and outside of the observatory and the wide-ranging topics up for discussion (when we veered away from instrumentation).

Bavo, David, Kasper, Leindert, Leon en Steven: we begonnen samen aan deze reis, zo'n slordige 11 jaren geleden en nu mag ik dit hoofdstuk afsluiten. Bedankt voor alle goede tijden: de filmavonden, terrasjes, diners en de reizen. Dat er nog vele mogen volgen! David, jou wil ik in het bijzonder bedanken voor je bezorgdheid en om te verzekeren dat ik ook af en toe het daglicht zag tijdens het afronden van de thesis. Kasper, bedankt voor het aangename gezelschap, de fijne avonden met interessante discussies en af en toe een decadent diner. Leindert, bedankt voor jouw nuchtere kijk op de dingen: naast jouw inzichten in de astronomie heb ik ook genoten van onze filosofische overpeinzingen. I also sincerely want to thank Laurie: our video chats during the pandemic were remarkably effective at keeping my spirits up. Stay candid and sincere and keep those recommendations of comedians and shows coming.

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