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Aggravating matters: accounting for baryons in cosmological analyses

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Stellingen

behorende bij het proefschrift

Aggravating matters: Accounting for baryons in cosmological analyses

1. X-ray observations of the matter contained within groups and clusters of galaxies can strongly constrain the matter power spectrum, independently of cosmological hydrodynamical simulations.
Chapter 2
2. Accurate cluster mass calibrations do not ensure unbiased cosmological analyses if we do not adjust our theoretical cluster abundance predictions for the effects of galaxy formation.
Chapter 3
3. Projected cluster masses within fixed apertures can be measured directly with high precision and low systematic uncertainty from both weak lensing observations and simulations, providing pragmatic theoretical mass calibrations for cluster cosmology.
Chapter 4
4. Since projected cluster masses can be measured without additional assumptions about the mass distribution within clusters, they are less sensitive to our limited understanding of galaxy formation processes.
Chapters 4 & 5
5. The power of simple but physical models should not be underestimated in the era of big data and machine learning: they are of vital importance to gain actual understanding of complex observations.
6. The proliferation of sophisticated computational methods in astronomy should go hand in hand with the development of open and reproducible research tools if we are to prevent a replication crisis.
7. Future galaxy surveys might teach us more about galaxy formation than about cosmology due to their systematic uncertainties.
8. The societal reach of breakthroughs in astronomy is sufficient justification for its research budget.
9. The zeroth step of any (research) project should be setting up a version control system.
10. It is important to have the humility to acknowledge the limits of your expertise.
11. It is irresponsible to be defeatist about climate change and negligent to reject any emission-reducing solution, sociological or technological, outright.
12. Relativity provides a solid foundation in physics as well as in life.