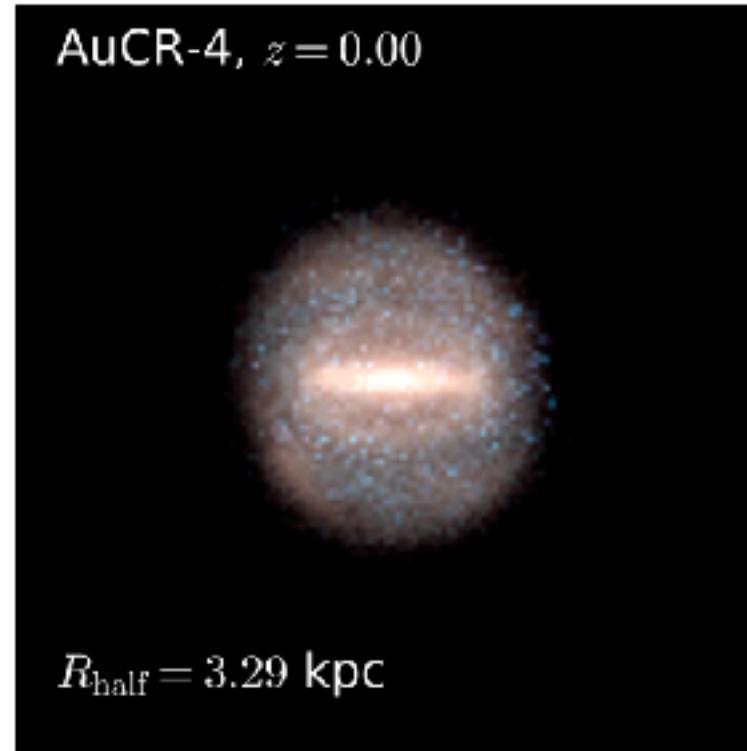


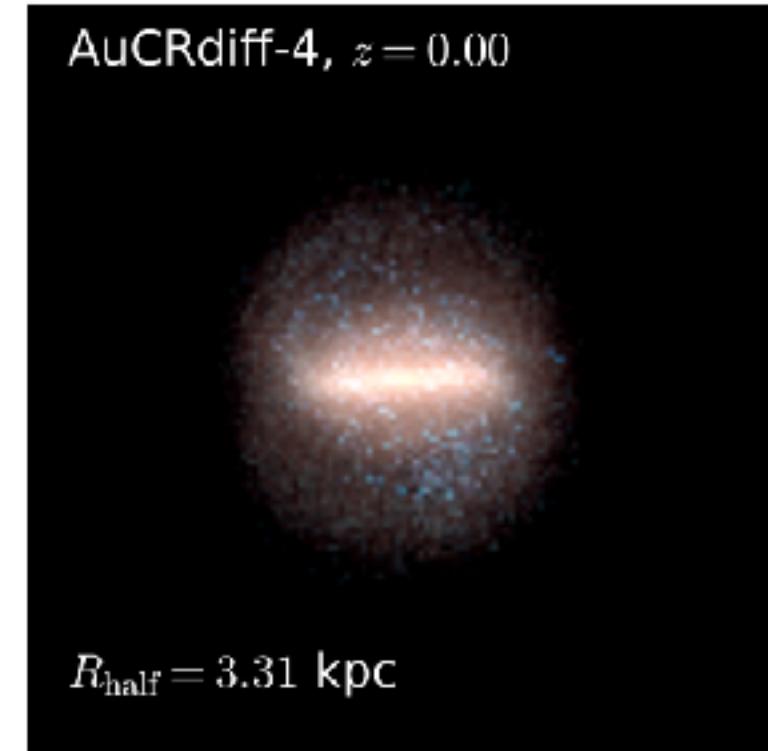
Effects of cosmic rays in cosmological simulations of Milky Way mass galaxies

Tobias Buck¹, Christoph Pfrommer¹, Rüdiger Pakmor², Robert Grand²

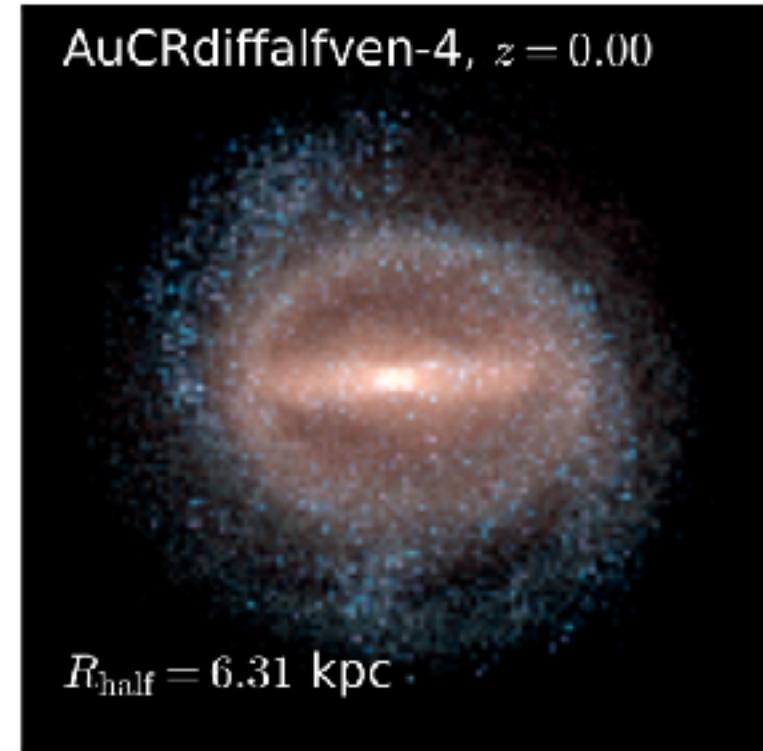
CR advection



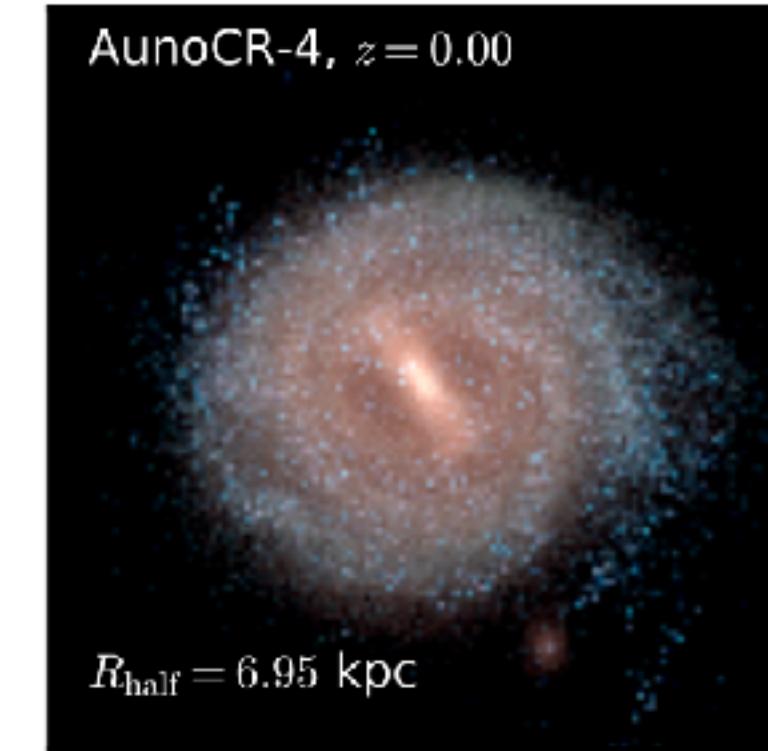
CR diffusion



CR streaming



AURIGA



Effects of cosmic rays in cosmological simulations of Milky Way mass galaxies

Tobias Buck¹, Christoph Pfrommer¹, Rüdiger Pakmor², Robert Grand²
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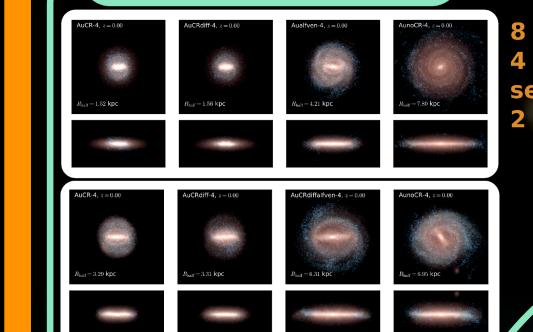


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Introduction and Goals

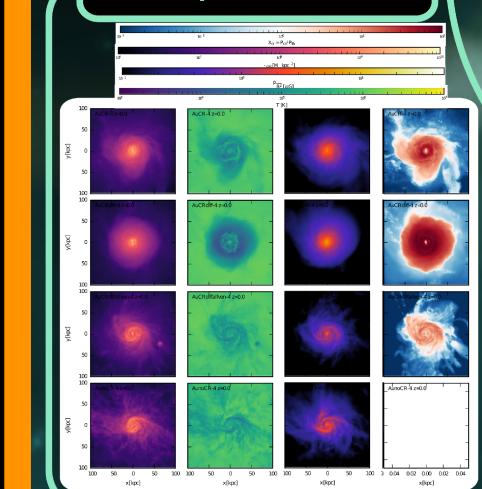
The Simulations:
We study the impact of cosmic rays (CR) in fully cosmological magnetohydrodynamical simulations of Milky Way (MW) mass galaxies taken from the AURIGA project [1]. We focus on the differences between different implementations of the cosmic ray physics, cosmic ray advection, diffusion and a streaming approximation [2,3].

The Simulation Suite...



The most realistic implementation of CR physics, the Alfvén run, agrees well with the fiducial AURIGA model

CGM Properties

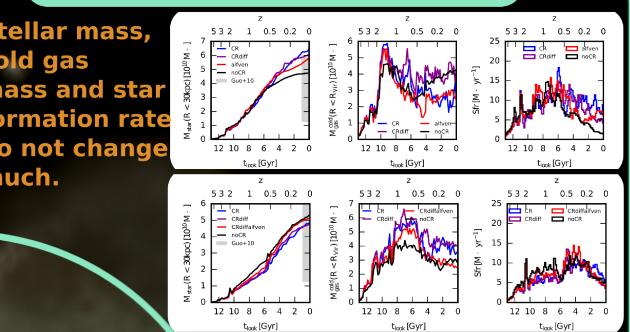


Conclusion and follow-up research

The current implementation of supernova feedback and cosmic ray feedback in the AREPO code does not have a huge impact on global galaxy properties like stellar mass or SFR of Milky Way mass galaxies.

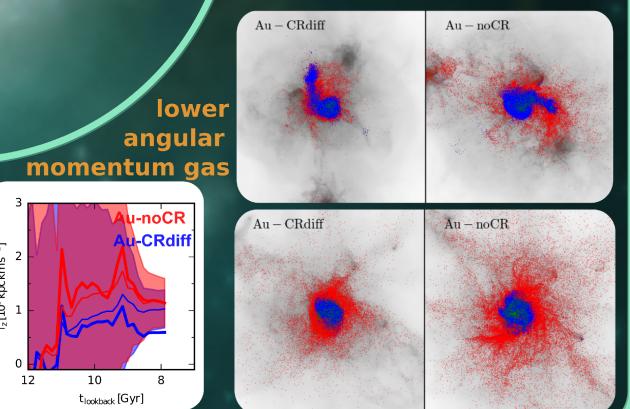
Results: CR feedback does not strongly effect the global properties of MW like galaxies like e.g. stellar mass or SFR. However, the additional non-thermal pressure of the CRs changes the structure of the CGM making it smoother and slightly hotter. CRs alter the gas accretion onto the central galaxy. The lagrangian region of accreted gas is smaller and the specific gas angular momentum is lower. Thus galaxy sizes are slightly smaller in the CR runs compared to the standard AURIGA runs.

Global Galaxy Properties...



Differences are within halo to halo variance.

Origin of Differences
Accretion from a smaller
lagrangian region and of



The additional non-thermal pressure of the CRs effects the structure and properties of the CGM. The lagrangian accretion region of galactic baryons is much smaller in the cosmic ray runs and the specific angular momentum of baryons is lower.

References

- [1] Grand, R. J. J., Gomez, F. A., Marinacci, F. et al. 2017, MNRAS, 467, 179
[2] Pfrommer, C., Pakmor, R., Schaal, K., Simpson, C. M., & Springel, V. 2017, MNRAS, 465, 4500
[3] Pakmor, R., Pfrommer, C., Simpson, C. M., Kannan, R., & Springel, V. 2016, MNRAS, 462, 2603

This research is supported by the European Research Council under ERC-CoG grant CRAGSMAN-646955.