Cosmological simulations of structure and galaxy formation at KICC

Debora Sijacki

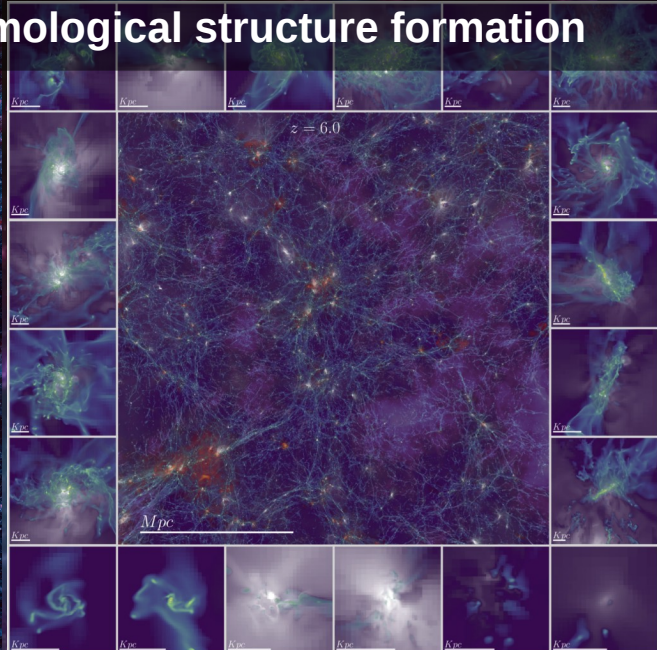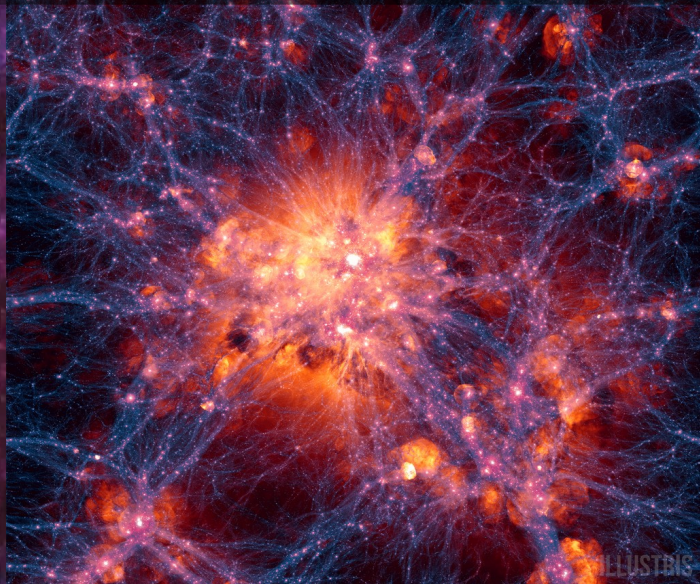# AREPO and RAMSES: massively-parallel astrophysical codes for cosmological structure formation

ENABLING HIGH-IMPACT SCIENTIFIC DISCOVERY AND ENGINEERING RESEARCH & DEVELOPMENT

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$z = 6.0$

Mpc

DiRAC

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## Distributed Research Utilising Advanced Computing

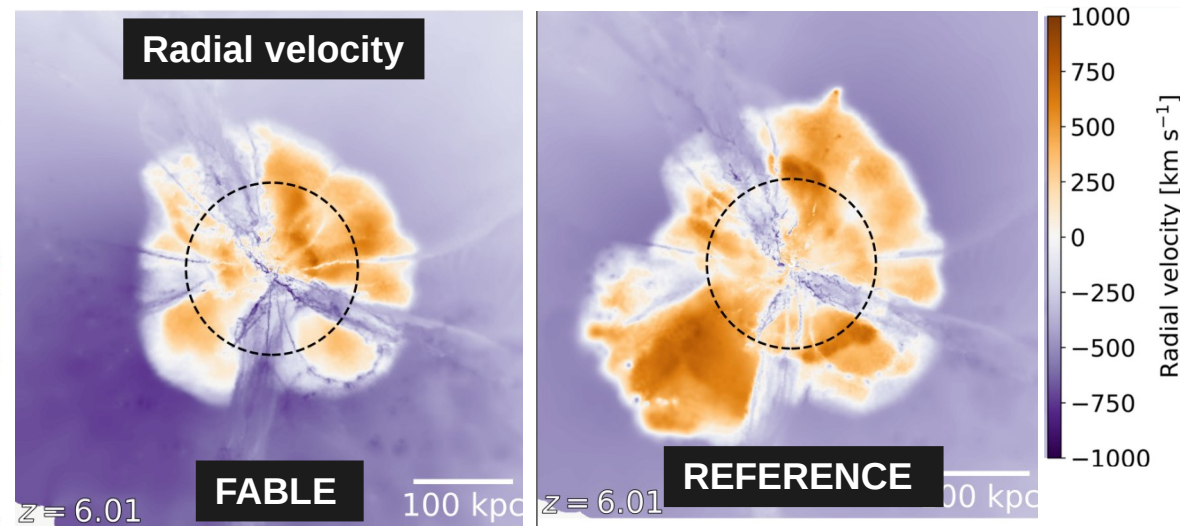# Cosma HPC, Durham and Cambridge Service for Data-Driven Discovery
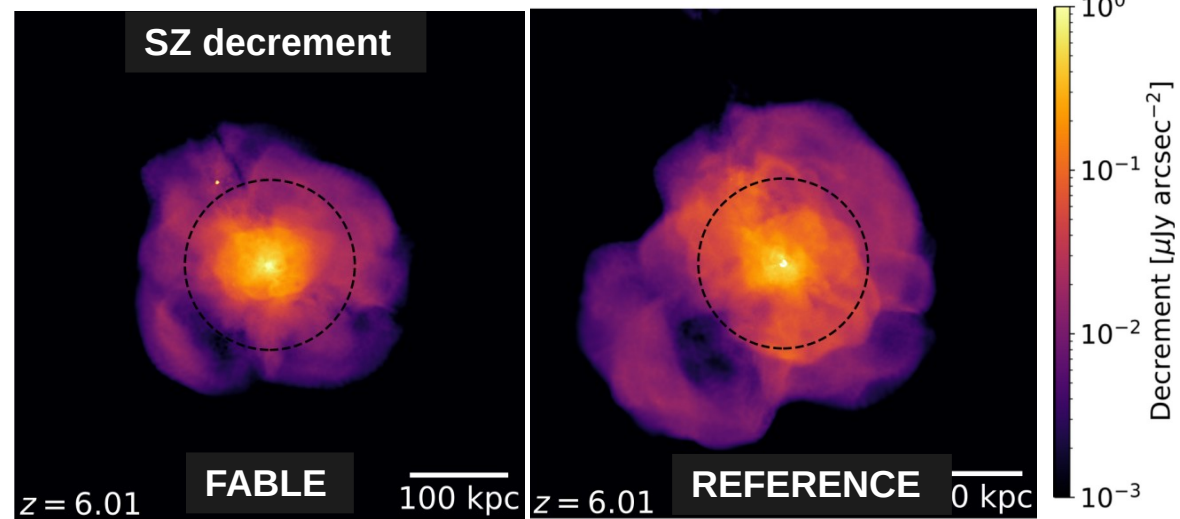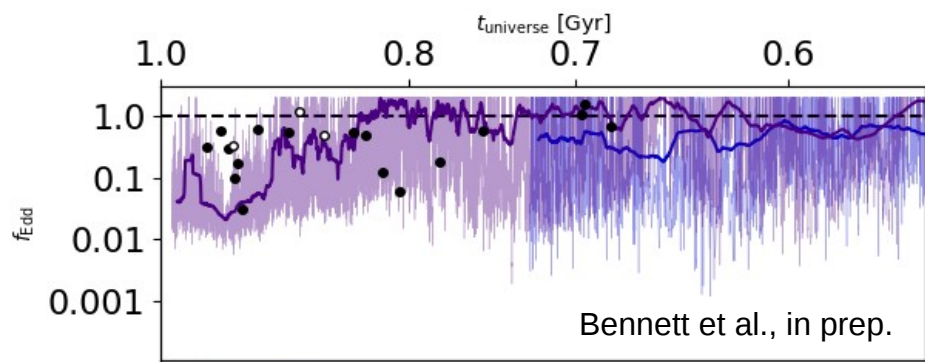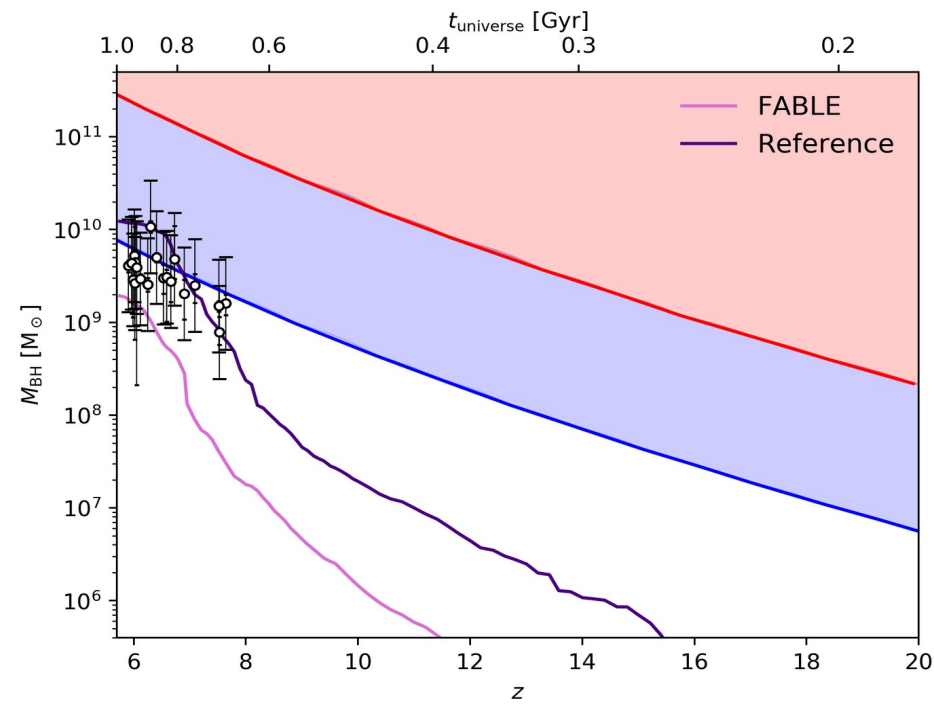
Current research topics:

→ **High redshift galaxies in the reionization epoch: from dwarfs to proto-clusters [Sergio Martin-Alvarez, Harley Katz, Jake Bennett, Callum Witten, Nicolas Laporte, Martin Haehnelt]**

→ **Assembly of high z QSOs, Lyα haloes, CGM [Yuxuan Yuan, Sergio Martin-Alvarez, Jake Bennett, Tiago Costa, Martin Haehnelt]**

→ **IMBHs and SMBHs in dwarf galaxies [Sophie Koudmani, Ricarda Beckmann]**

→ **Black hole seeding mechanisms [Ricarda Beckmann, Sophie Koudmani, Colin DeGraf]**

→ **Merging SMBHs on small-scales: multi-messenger science [Martin Bourne, Sophie Koudmani, Joanna Piotrowska, Michalis Agathos]**

→ **Astrophysics of galaxy clusters, AGN (MHD) jets [Ricarda Beckmann, Martin Bourne, Rosie Talbot]**

→ **Resolved ISM modelling [Yuxuan Yuan, Matthew Smith, Martin Bourne, Sergio Martin-Alvarez]**

→ **Baryonic feedback & cluster cosmology [Martin Bourne, Ewald Puchwein]**

→ **Baryonic feedback & S8 tension [Leah Bigwood, Alex Amon, Ewan Chamberlain, Vid Irsic, Martin Bourne]**

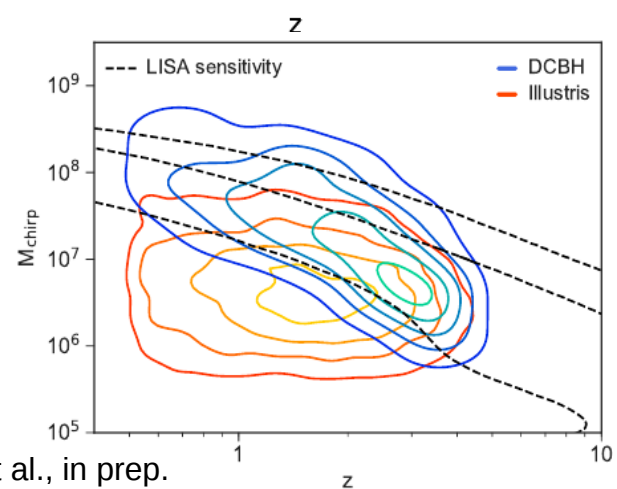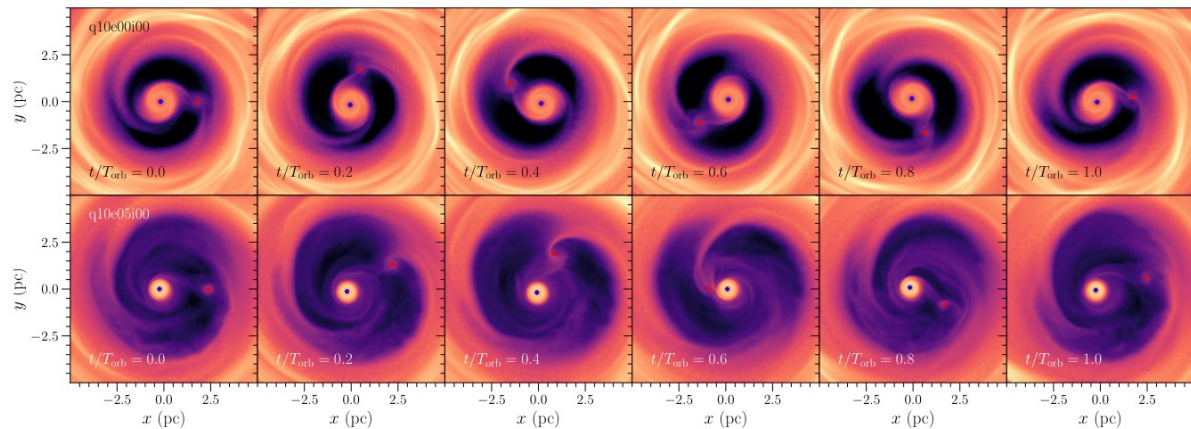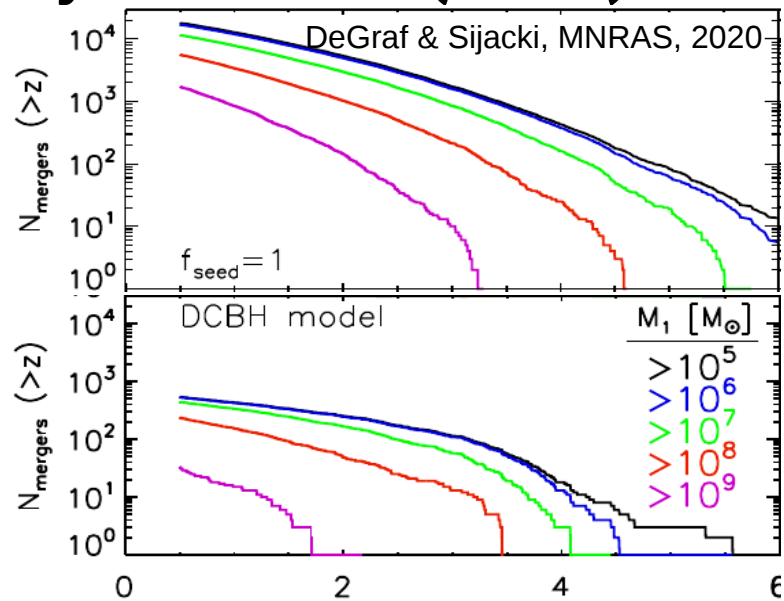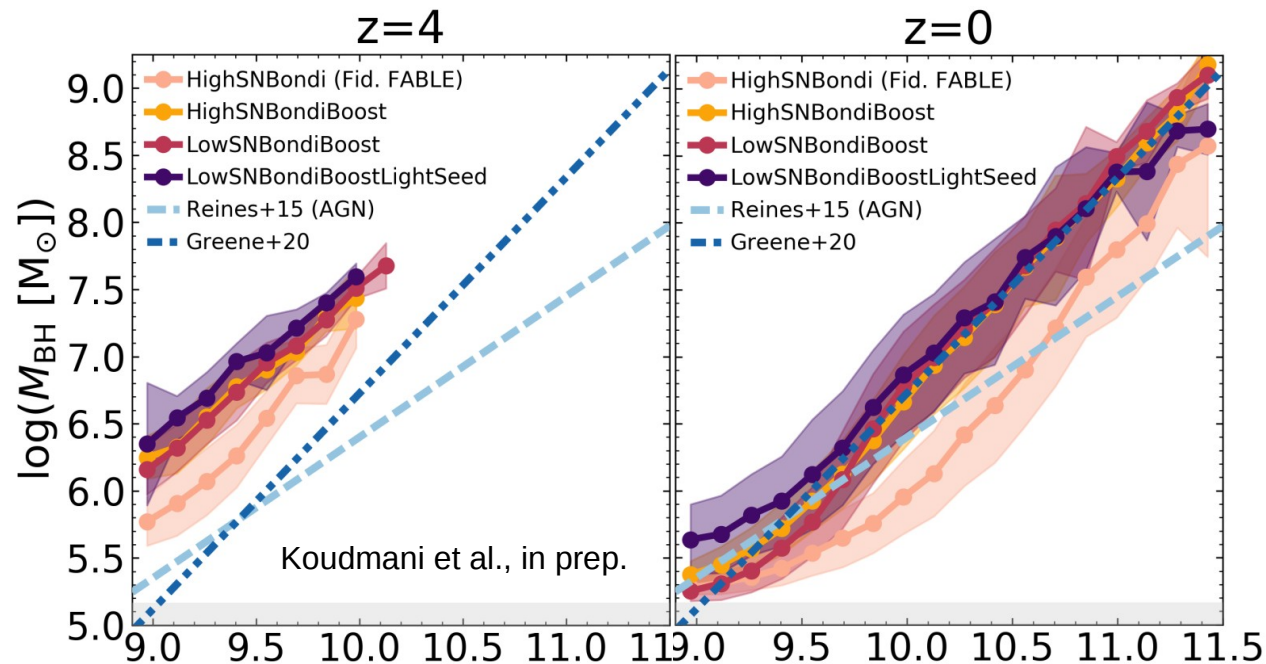# Dwarf galaxies in the reionization epoch: the Pandora suite
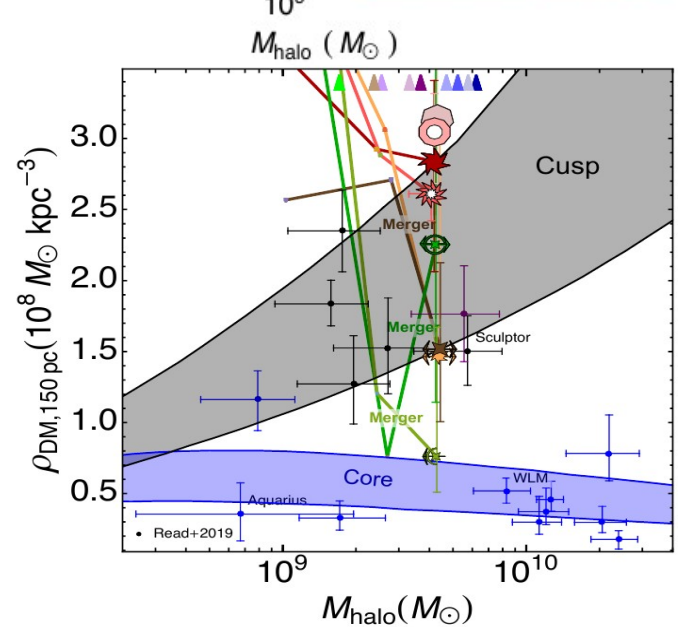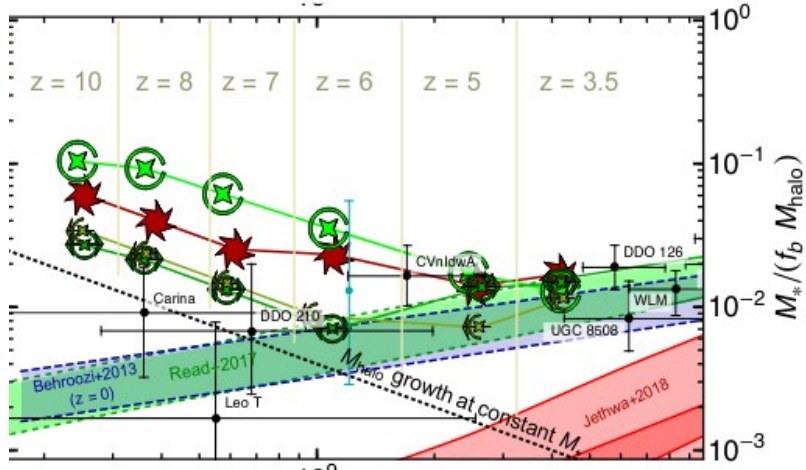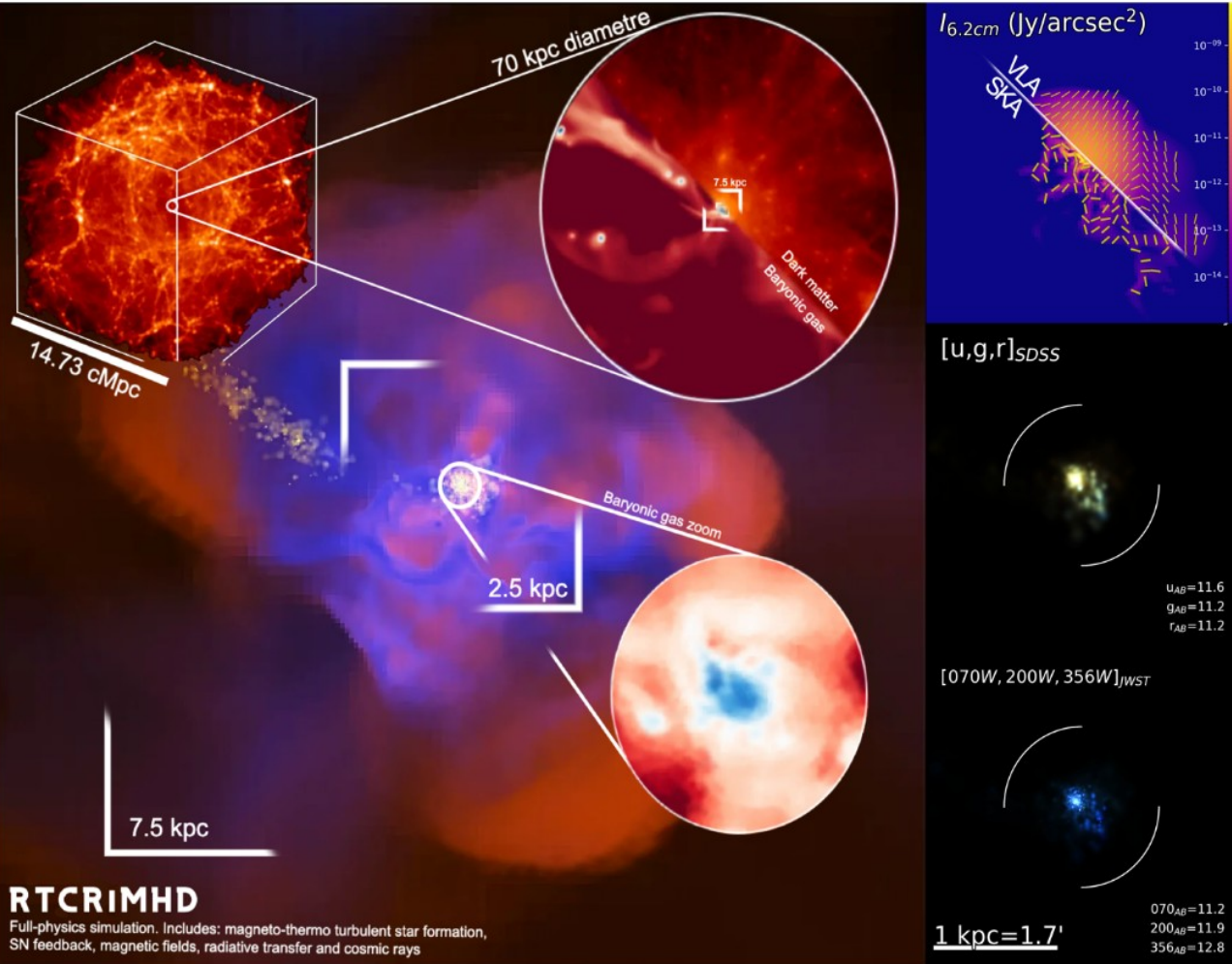
Martin-Alvarez, Sijacki et al., 2022, MNRAS, submitted

The rise of 'gargantuan' black holes: heating of the halo & IGM

Bennett et al., in prep.

BH feedback and mergers in the early Universe (LISA)

z=4   z=0

Koudmani et al., in prep.

DeGraf & Sijacki, MNRAS, 2020

Bourne et al., in prep.