USING *ISOLATED* GALAXY CLUSTERS TO DETECT NEW FORMS OF DARK MATTER

Harvey+, 2017, 2018b, MNRAS

1. GALAXY CLUSTERS HAVE FLAT CENTRAL DENSITY PROFILES

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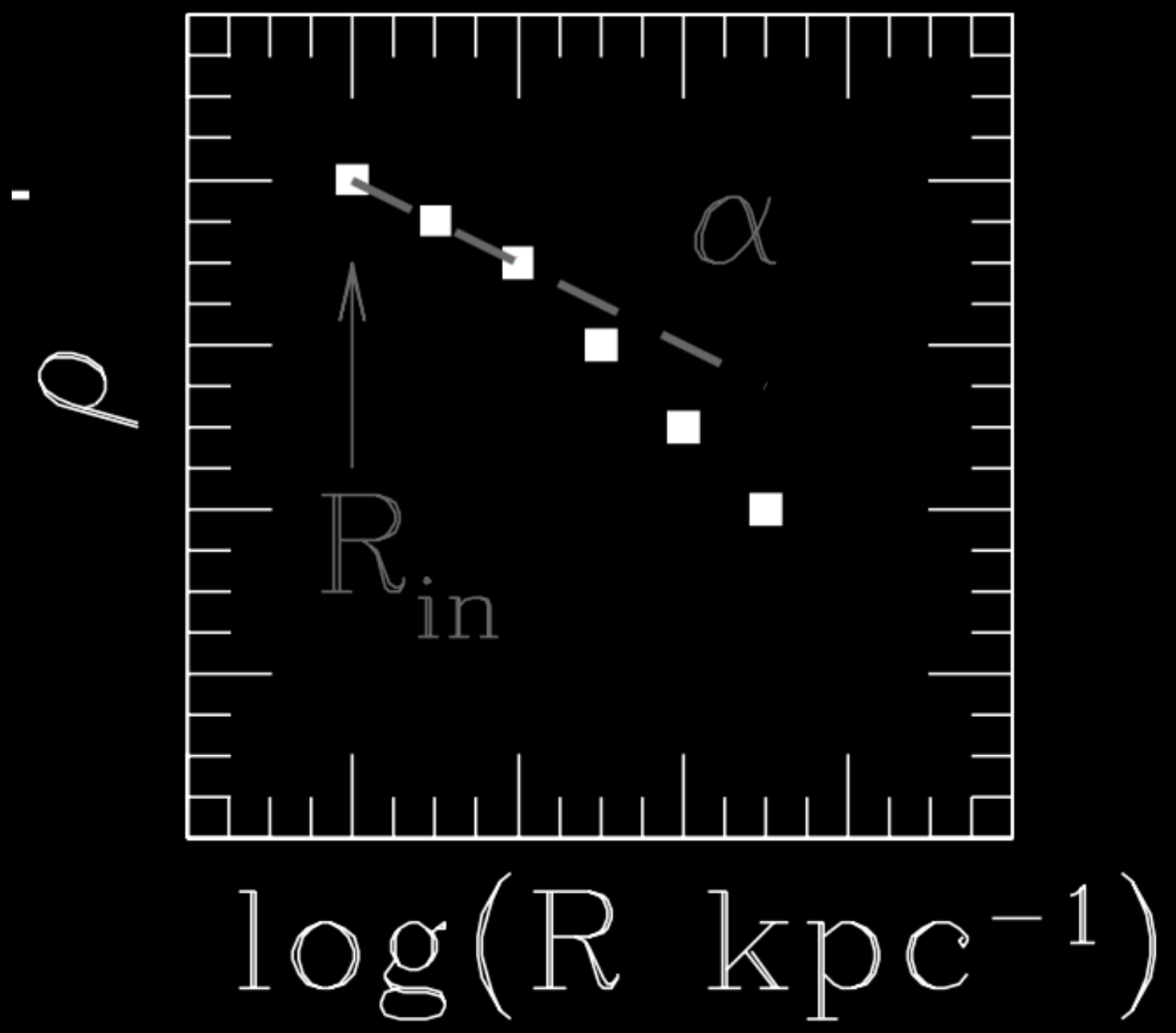
2. DARK MATTER IS UNLIKELY TO HAVE A VELOCITY INDEPENDENT SELF-INTERACTION CROSS-SECTION

DR DAVID HARVEY, EPFL

AN INNOVATIVE METHOD TO PROBE NEW MODELS OF DARK MATTER IN CLUSTERS OF GALAXIES

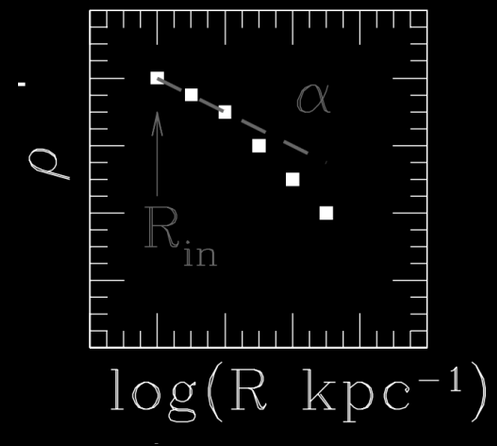
COLD & COLLISIONLESS DARK MATTER “FAILS“ TO PREDICT SMALL SCALE OBSERVATIONS

THE INNER SLOPE OF DWARF GALAXIES ARE EXPECTED TO HAVE A SLOPE OF -1

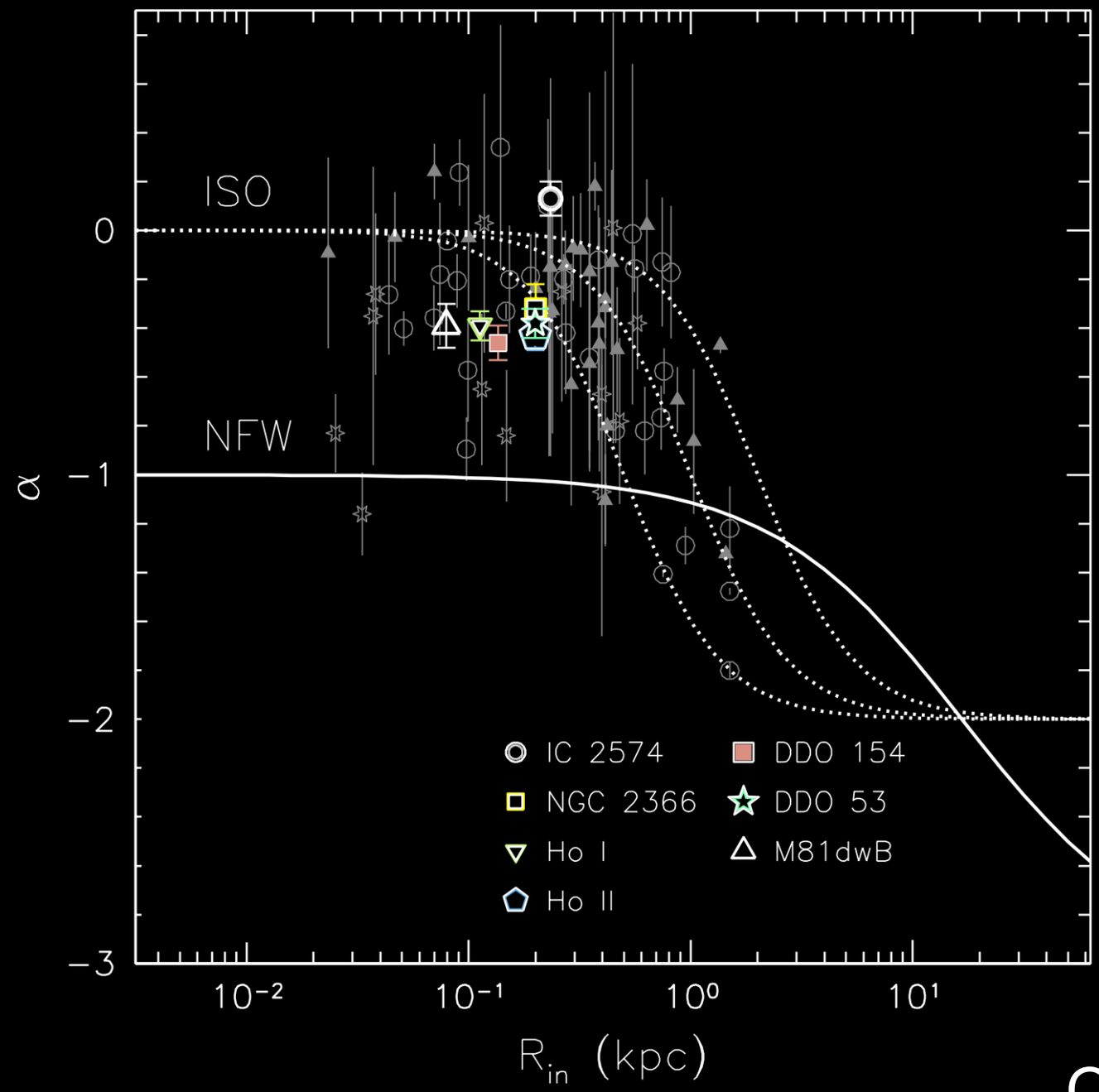


Oh + 2008

DWARF GALAXIES APPEAR TO HAVE NON-STANDARD DENSITY PROFILES



Standard dark matter →



Oh, S.-H + (2011)

SIMULATIONS OF DWARF GALAXIES INFER THAT IS IMPOSSIBLE TO TELL

Harvey + 2018a (*submitted*)

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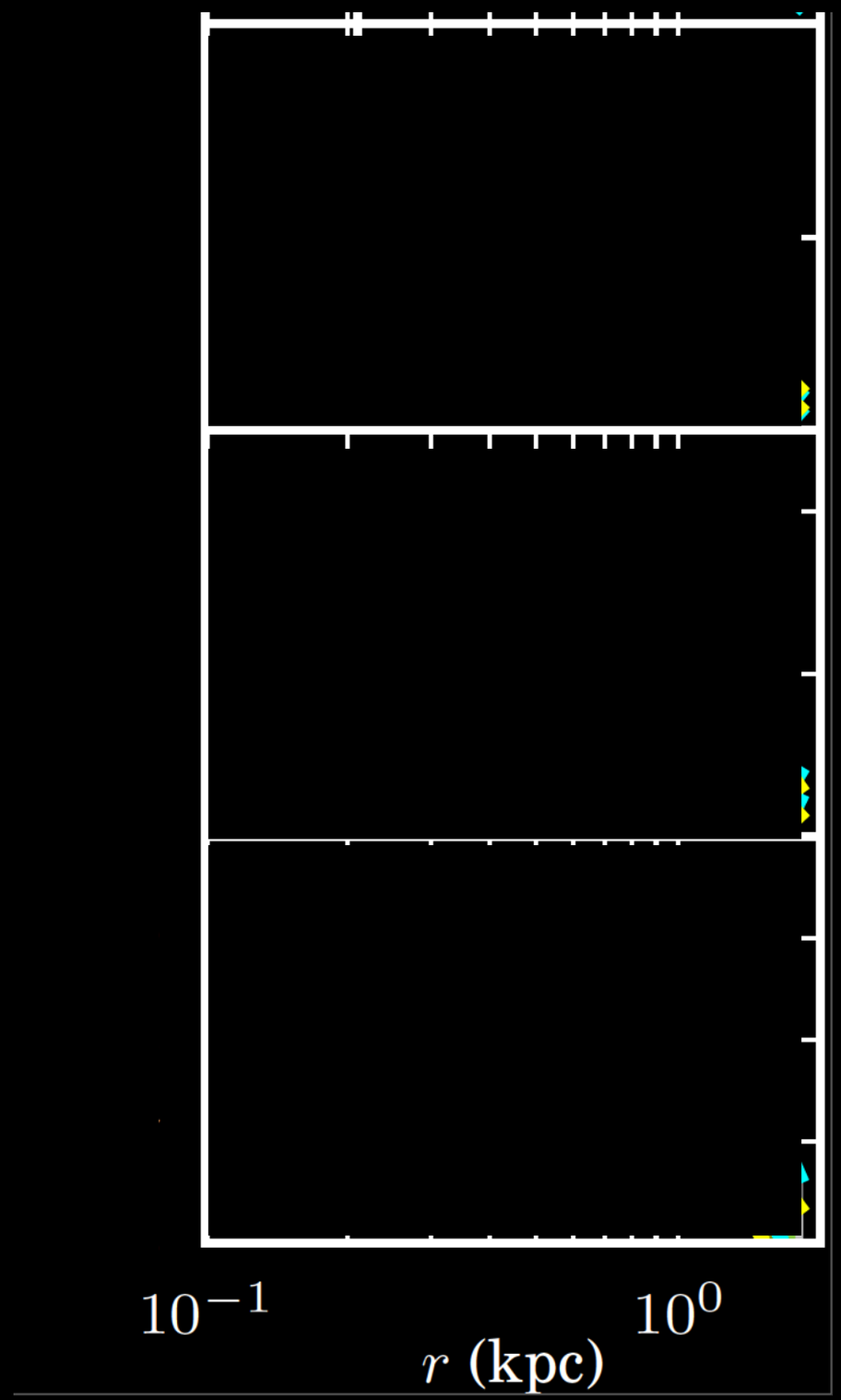

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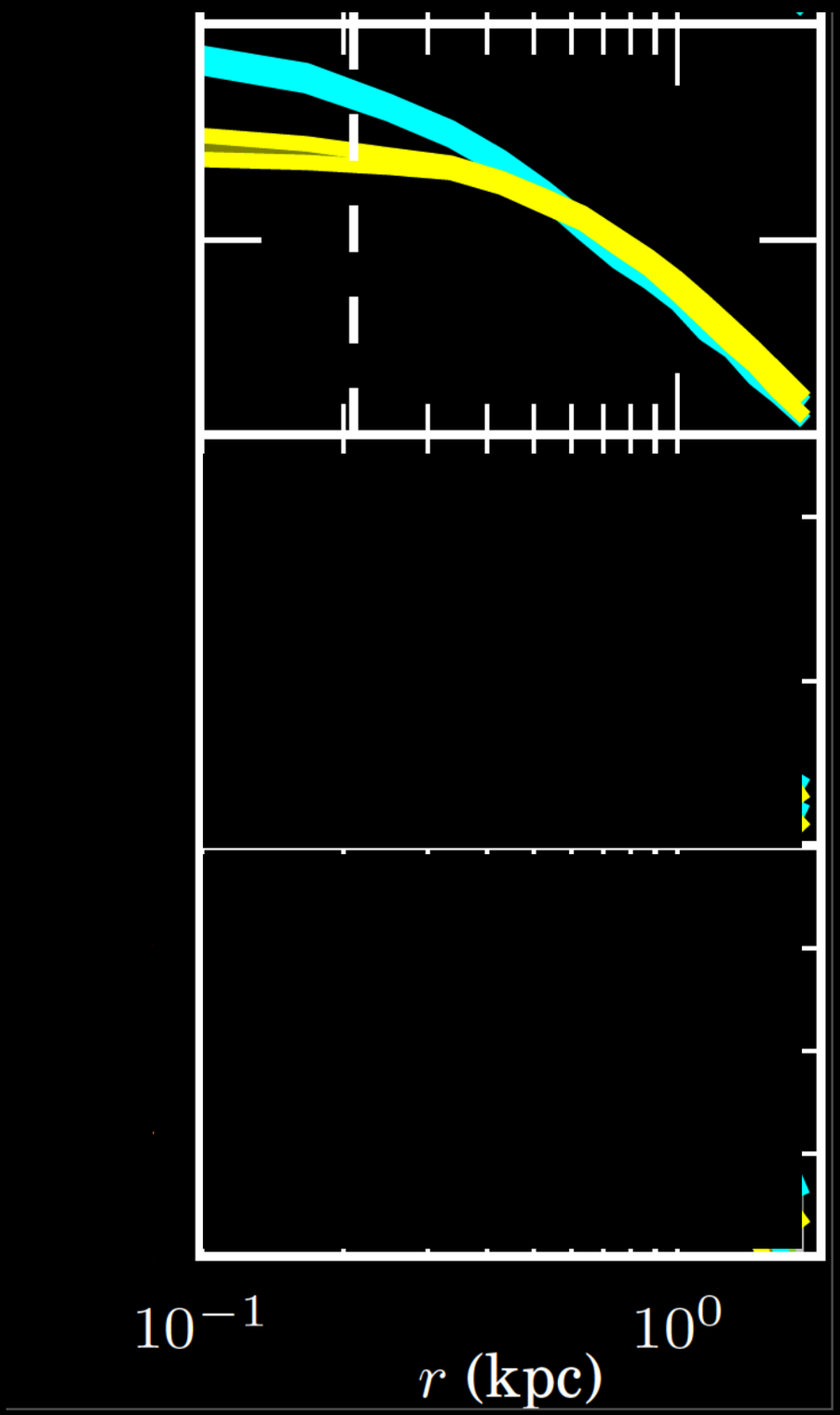
SIMULATIONS OF DWARF GALAXIES INFER THAT IS IMPOSSIBLE TO TELL

dark matter density



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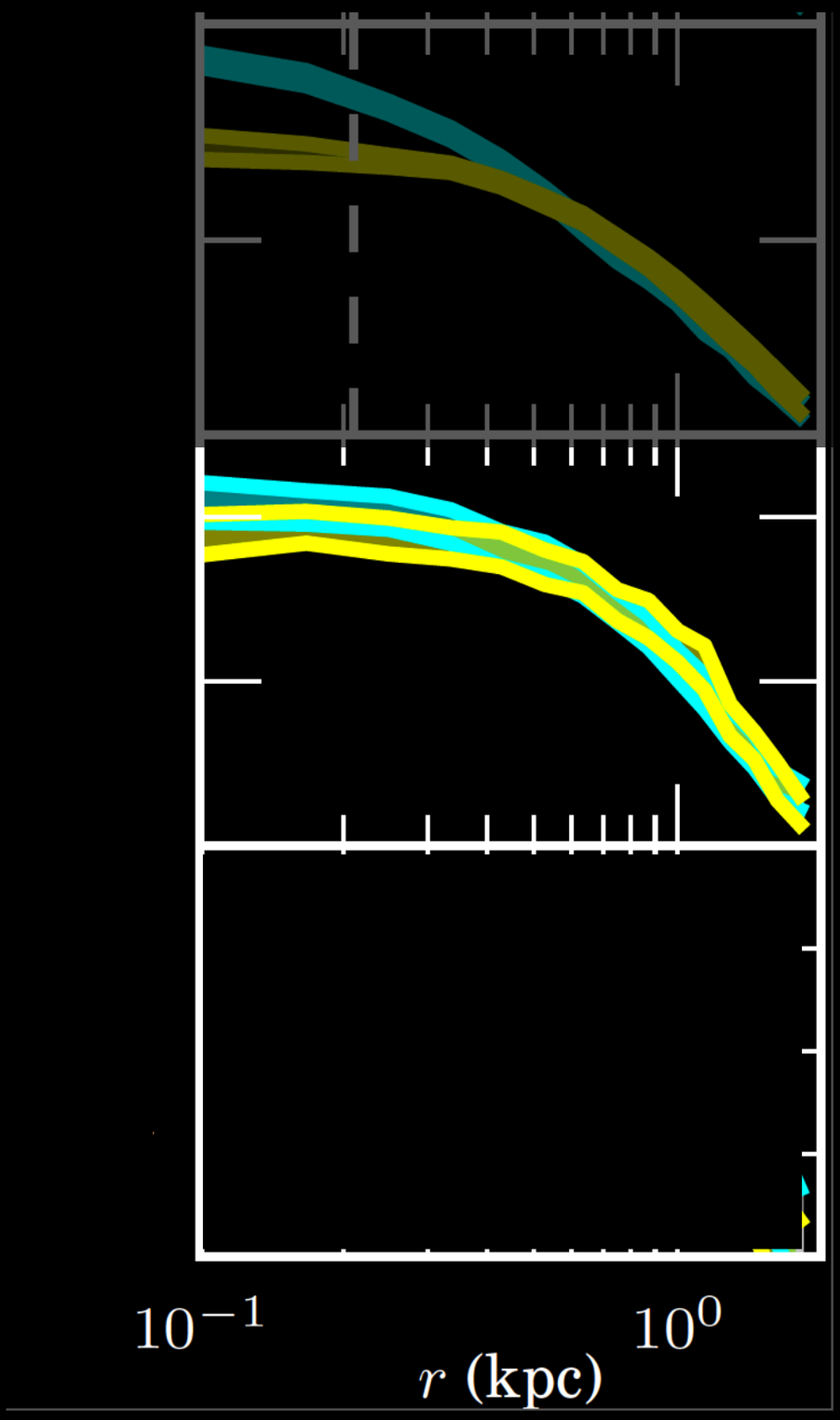
SIMULATIONS OF DWARF GALAXIES INFER THAT IS IMPOSSIBLE TO TELL

dark matter density

luminosity density



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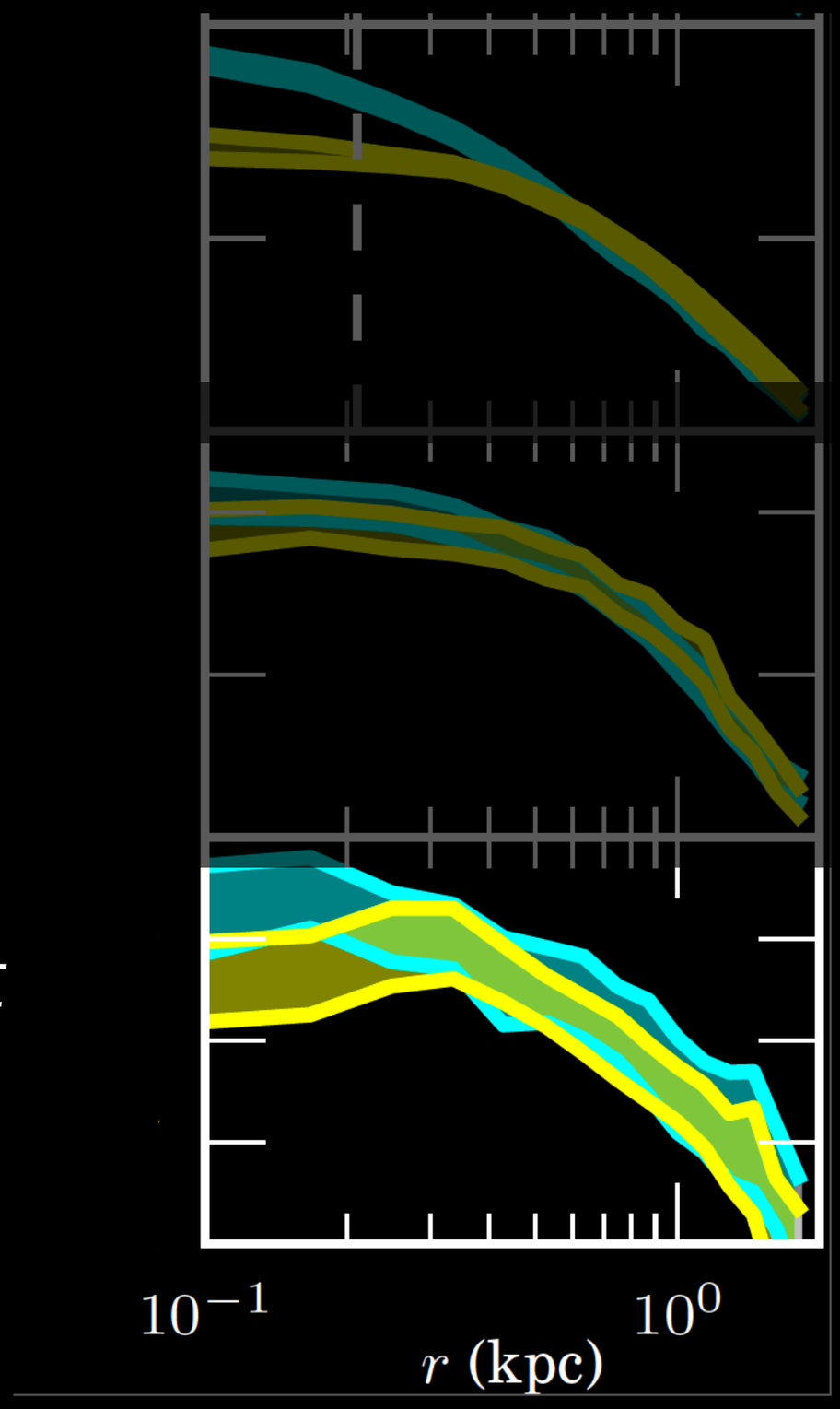
SIMULATIONS OF DWARF GALAXIES INFER THAT IS IMPOSSIBLE TO TELL

dark matter density

luminosity density

line-of-sight velocity



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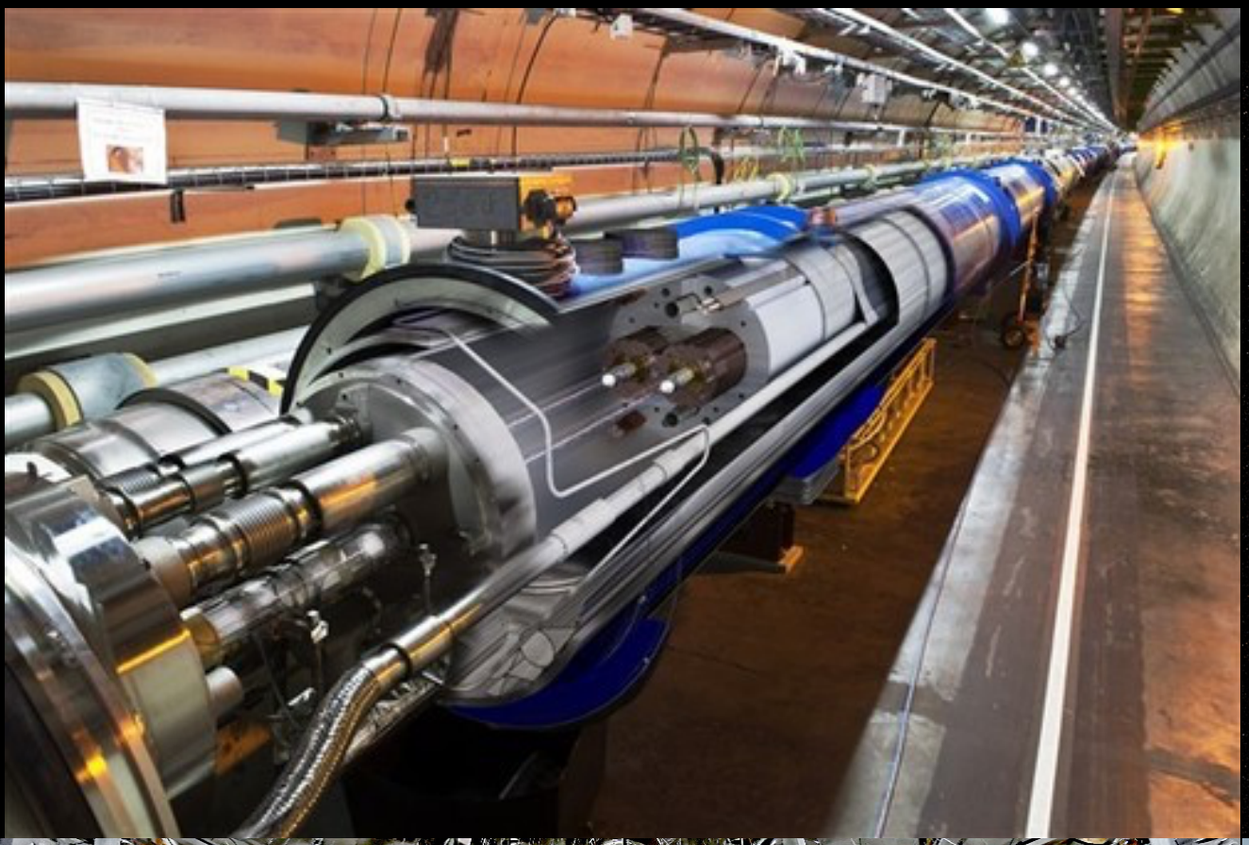
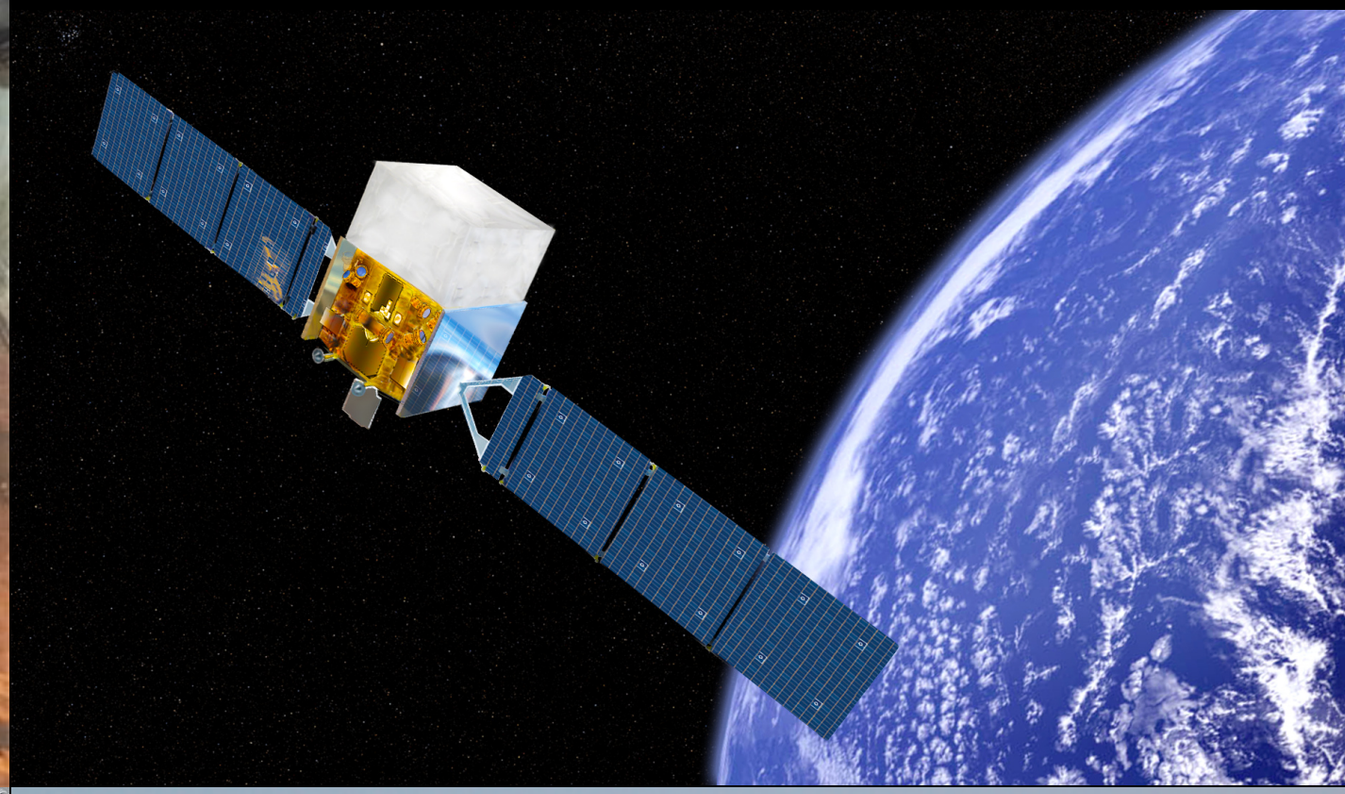
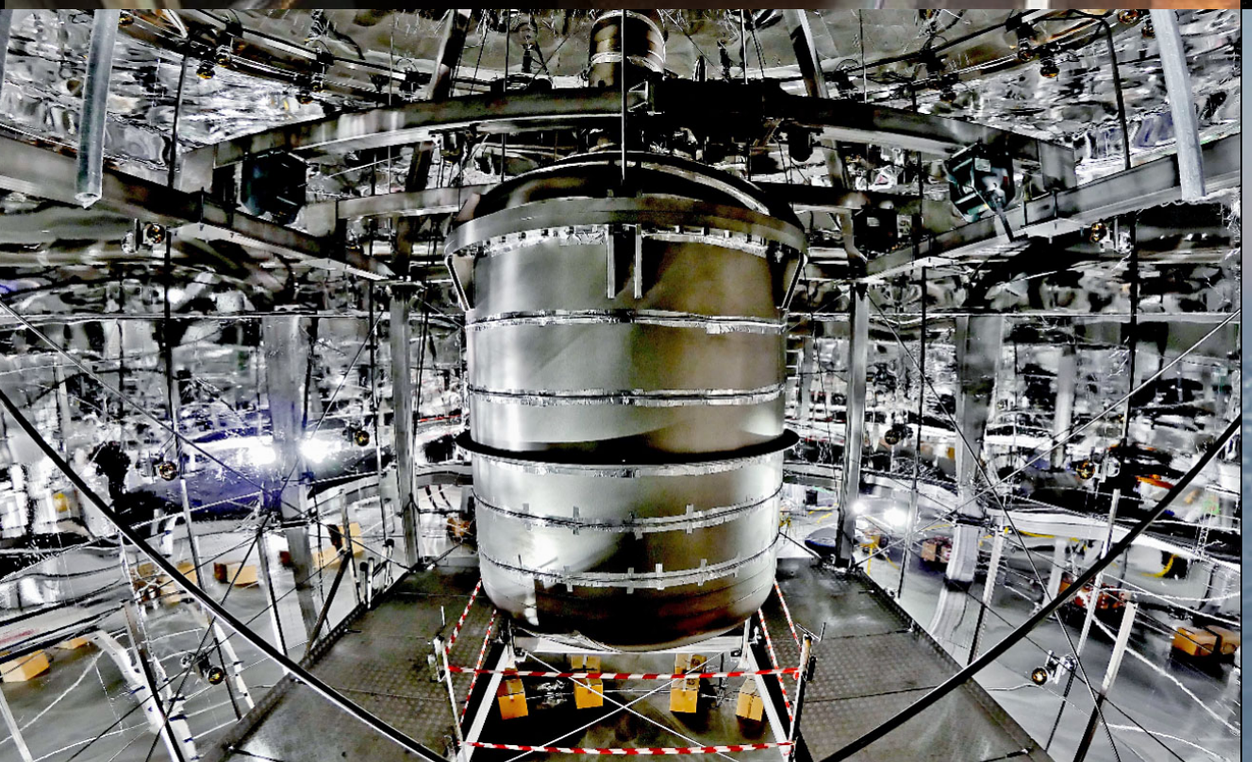
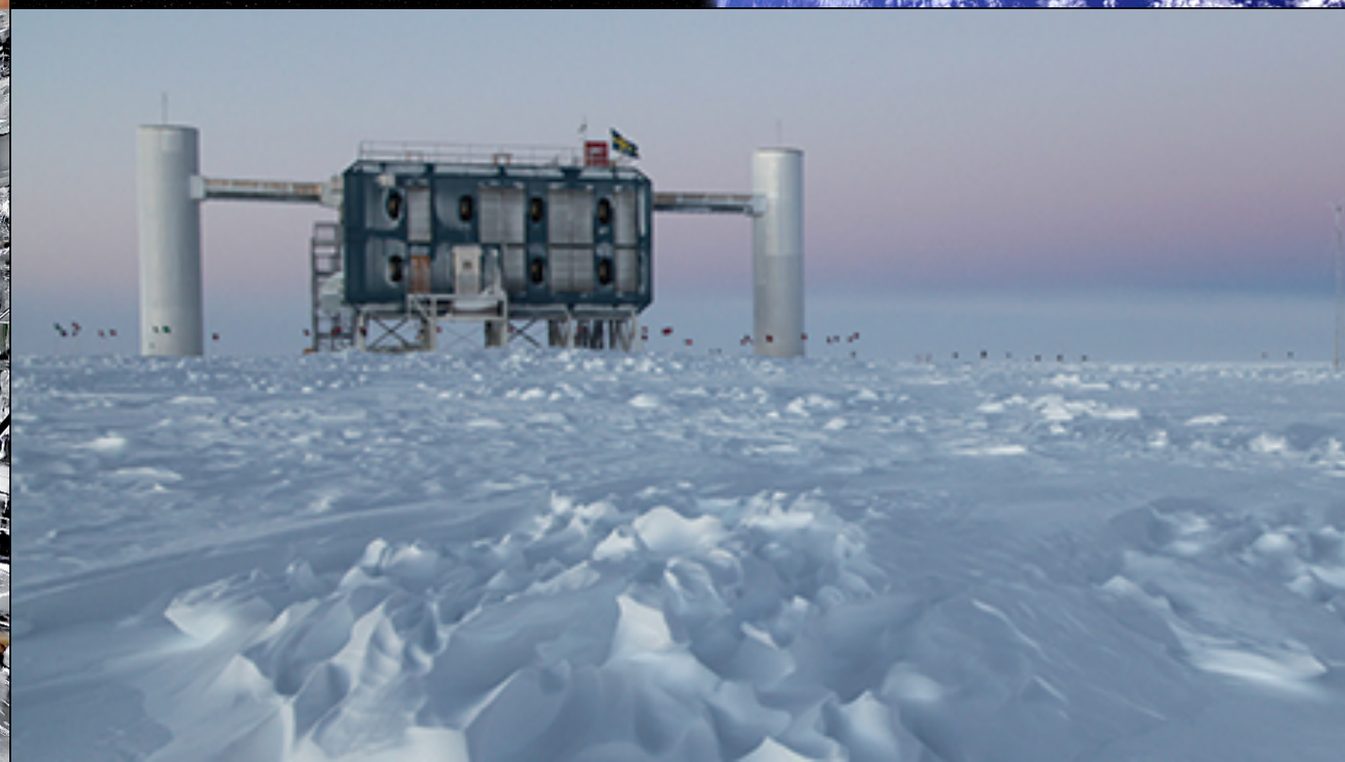
WHAT HAPPENS IF DARK MATTER KNOWS NOTHING ABOUT OUR UNIVERSE?









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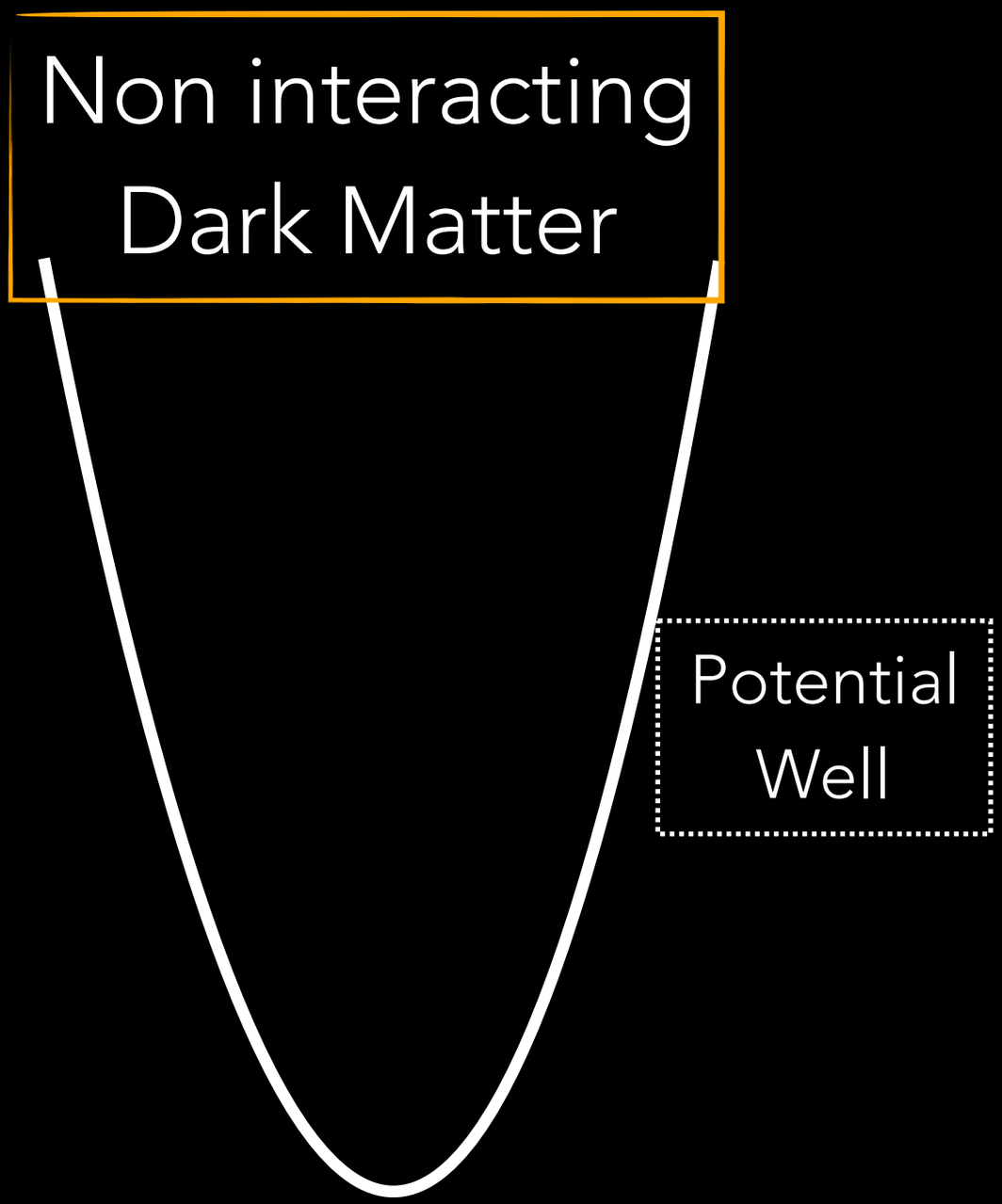

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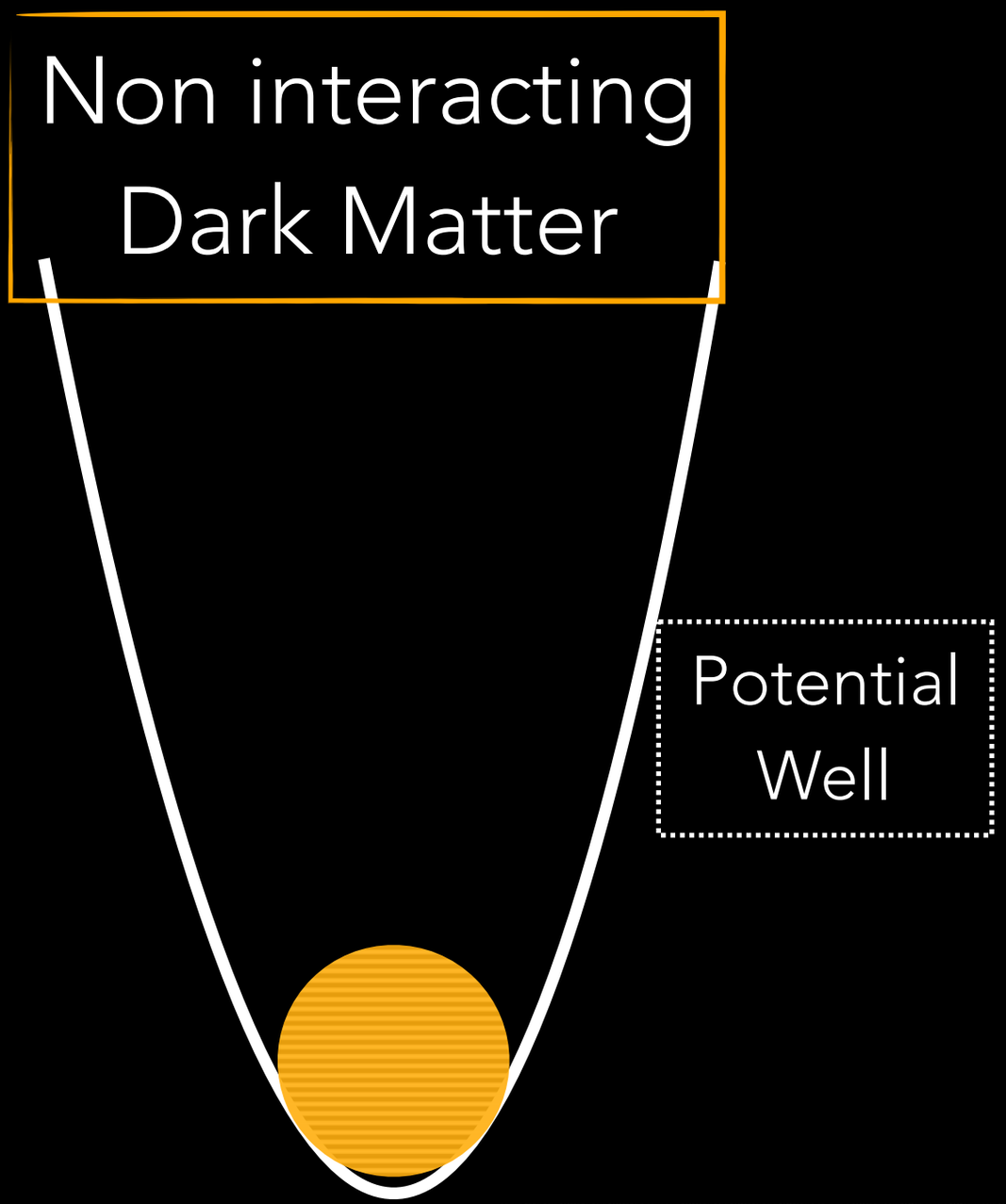

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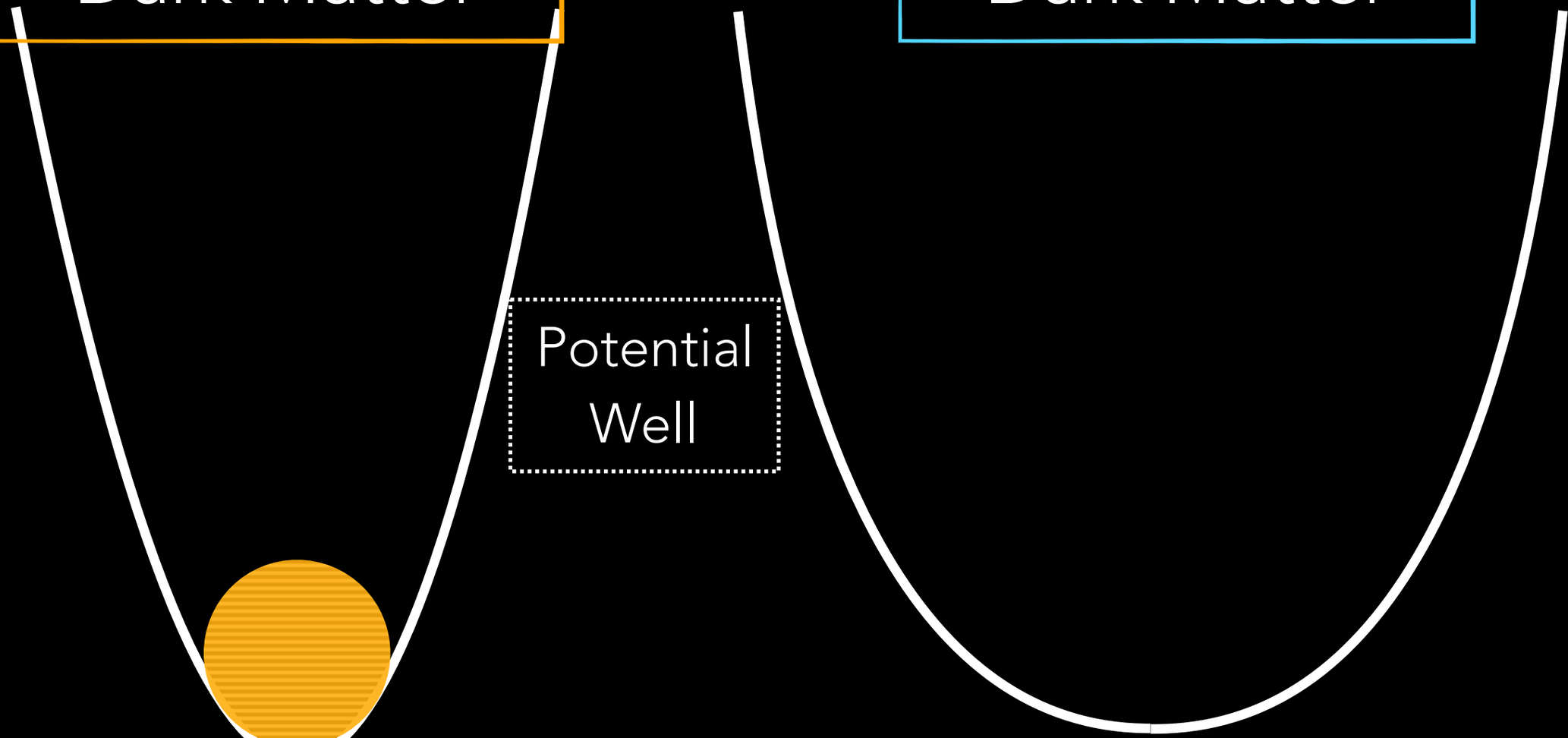
Non interacting Dark Matter

Self Interacting Dark Matter



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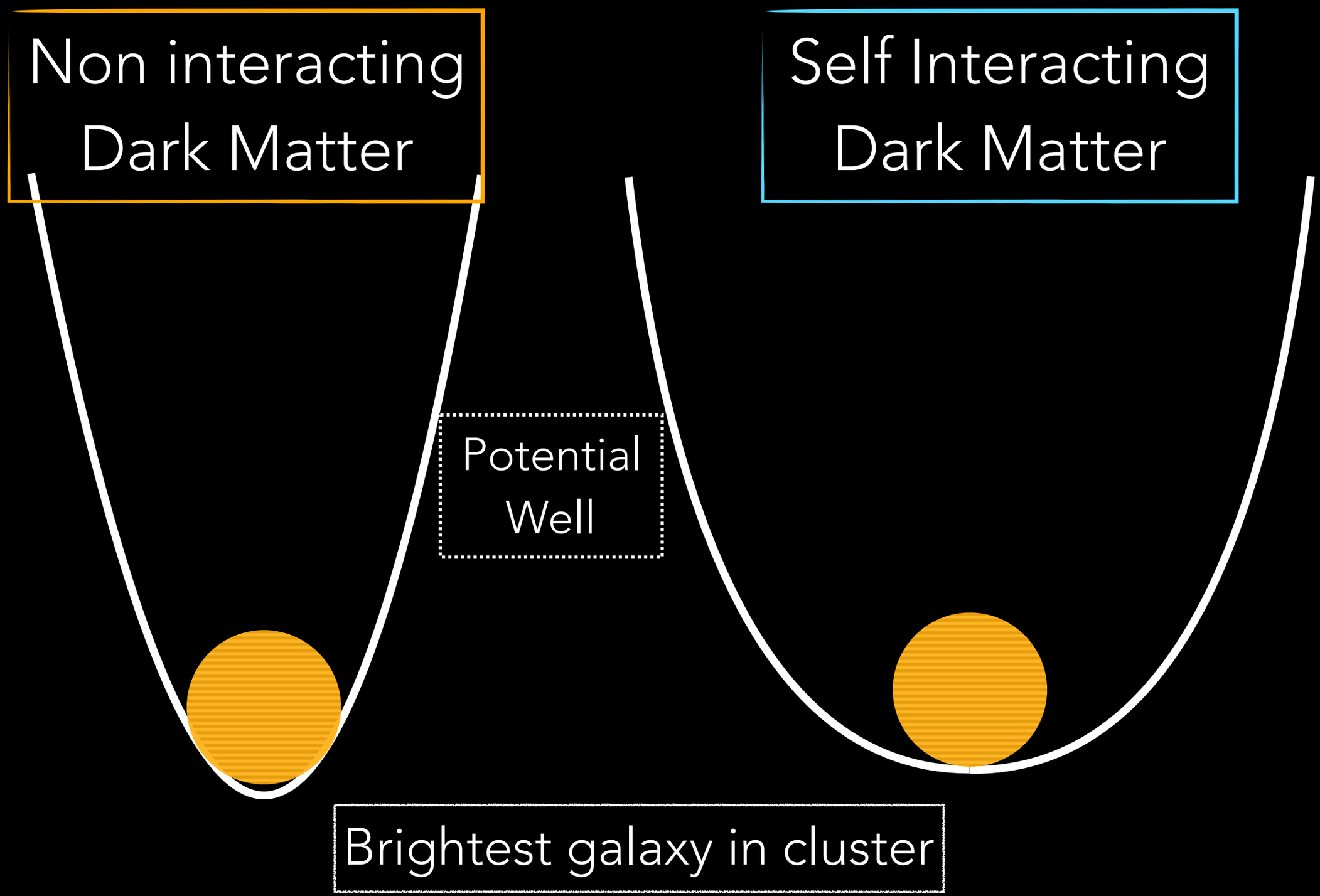

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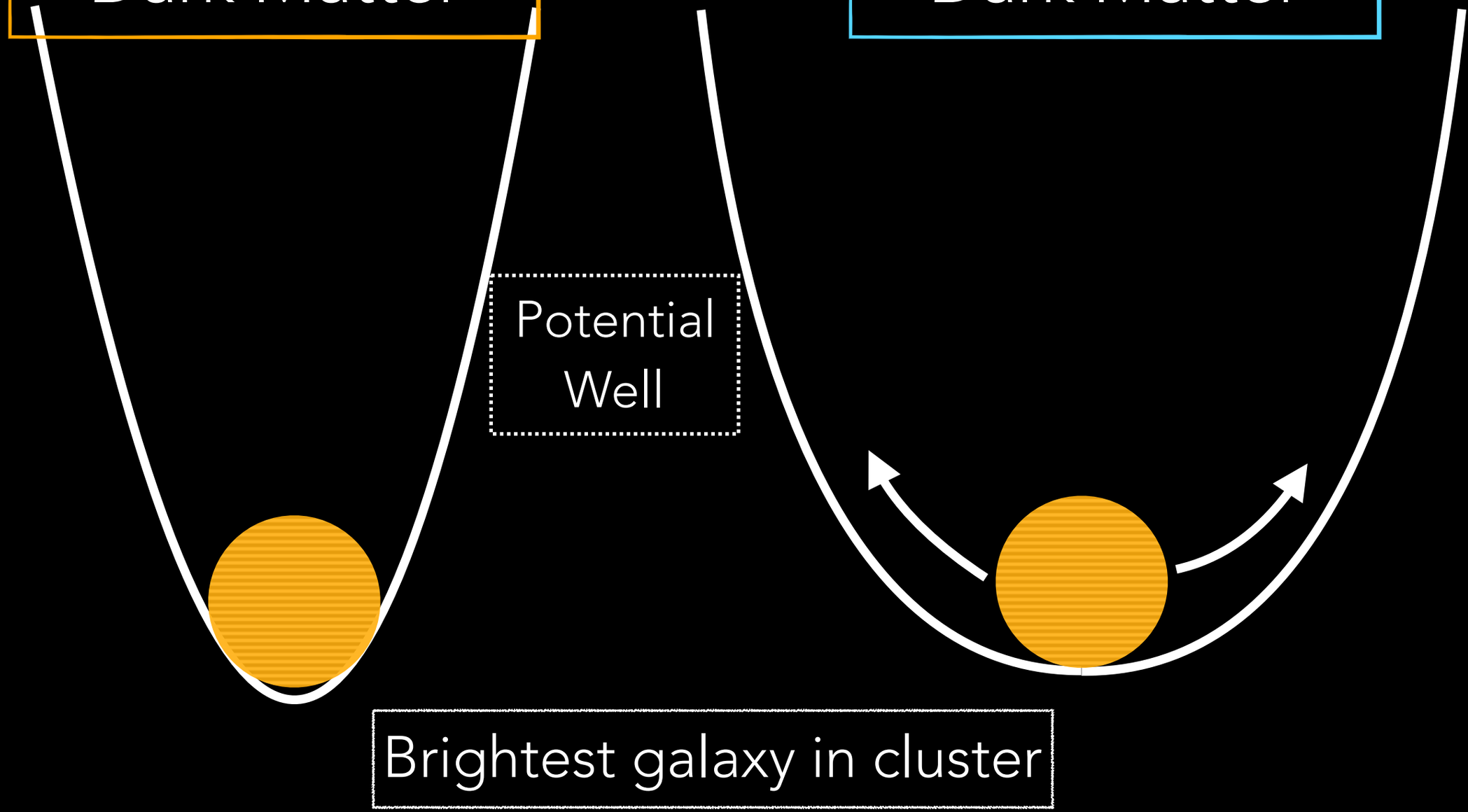
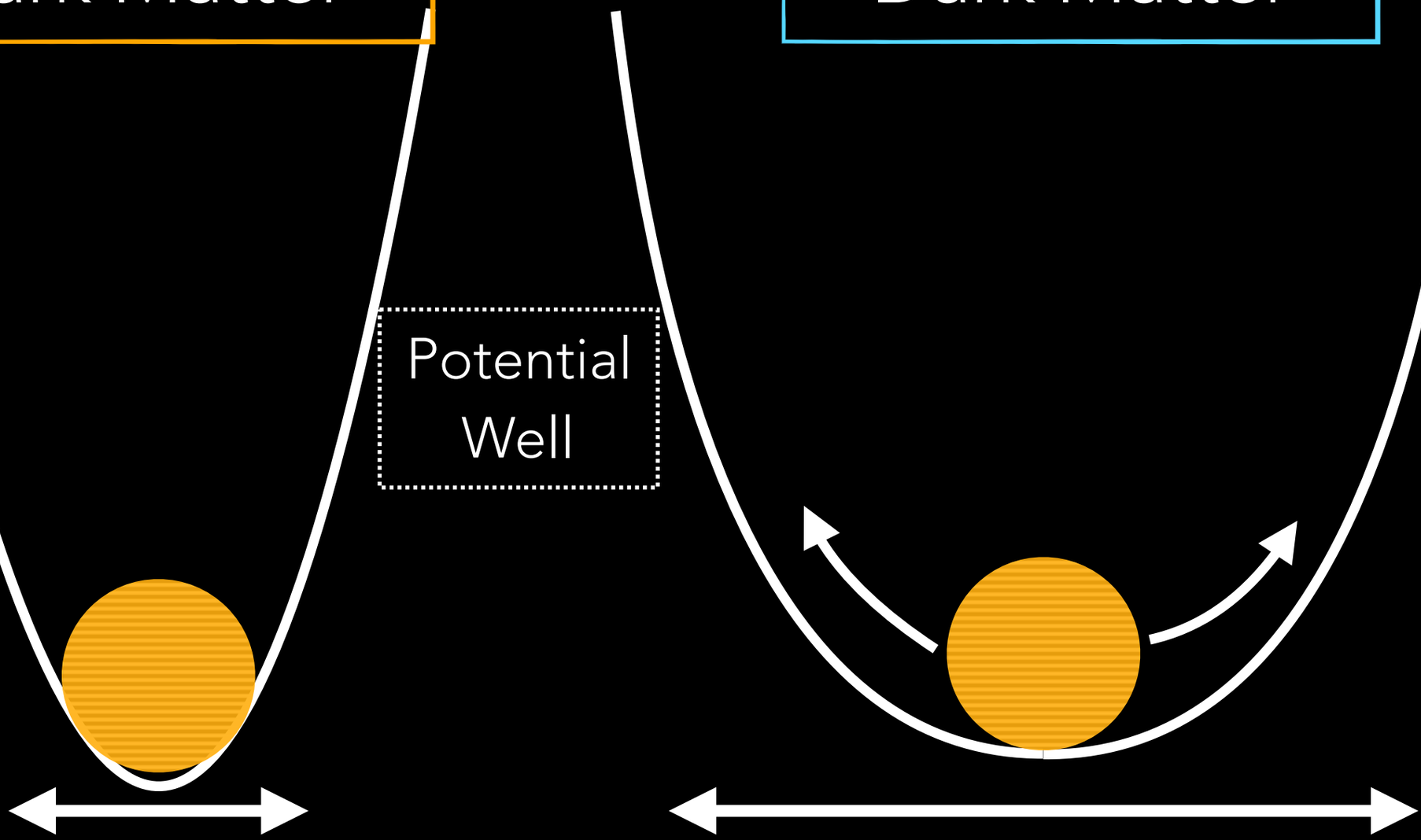


THE ERROR IN THE CENTROID ESTIMATE IS LARGER FOR CORED HALOS

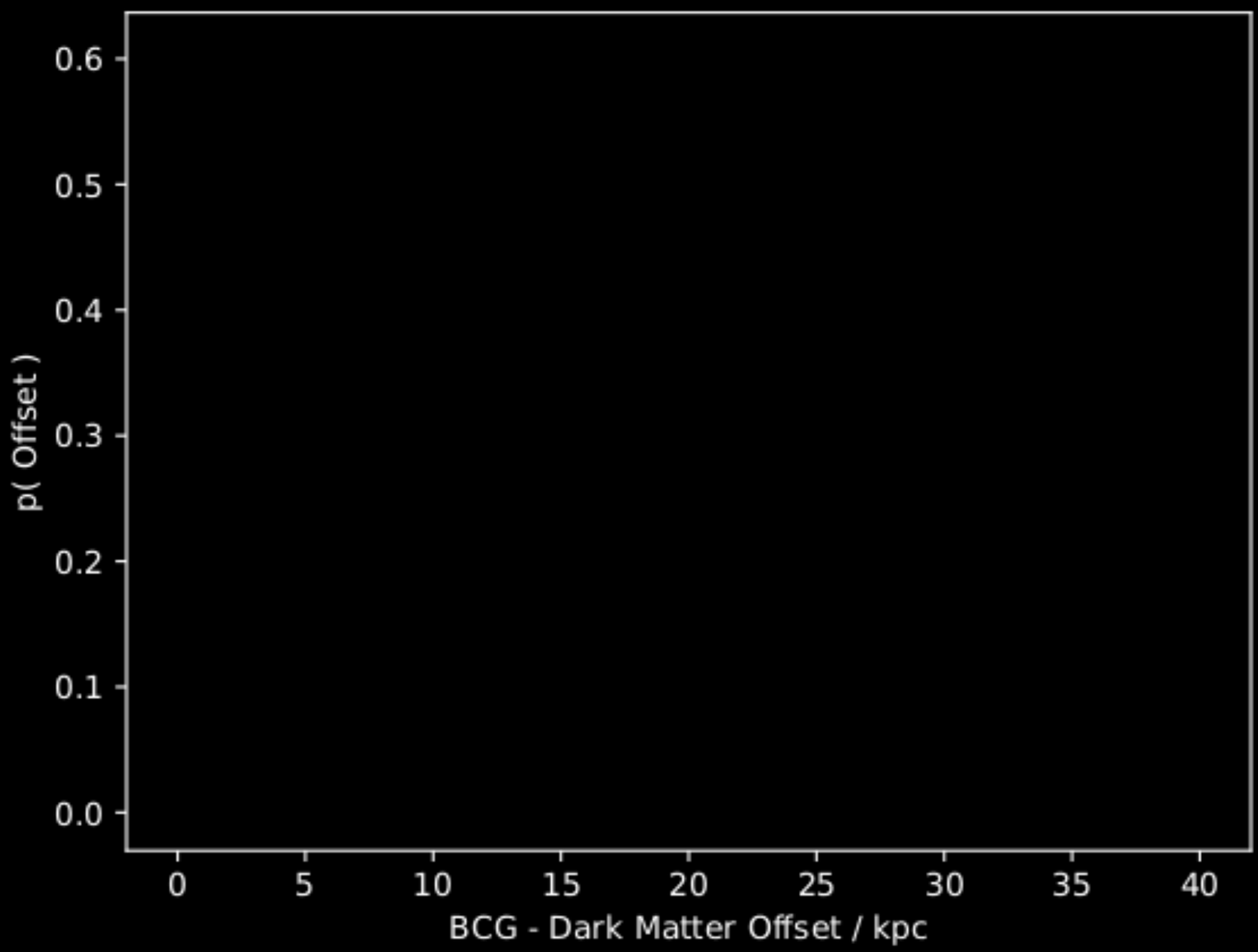
Non interacting Dark Matter

Self Interacting Dark Matter

Potential Well



VARIANCE OF OFFSET DISTRIBUTION EXPECTED TO INCREASE WITH CROSS-SECTION



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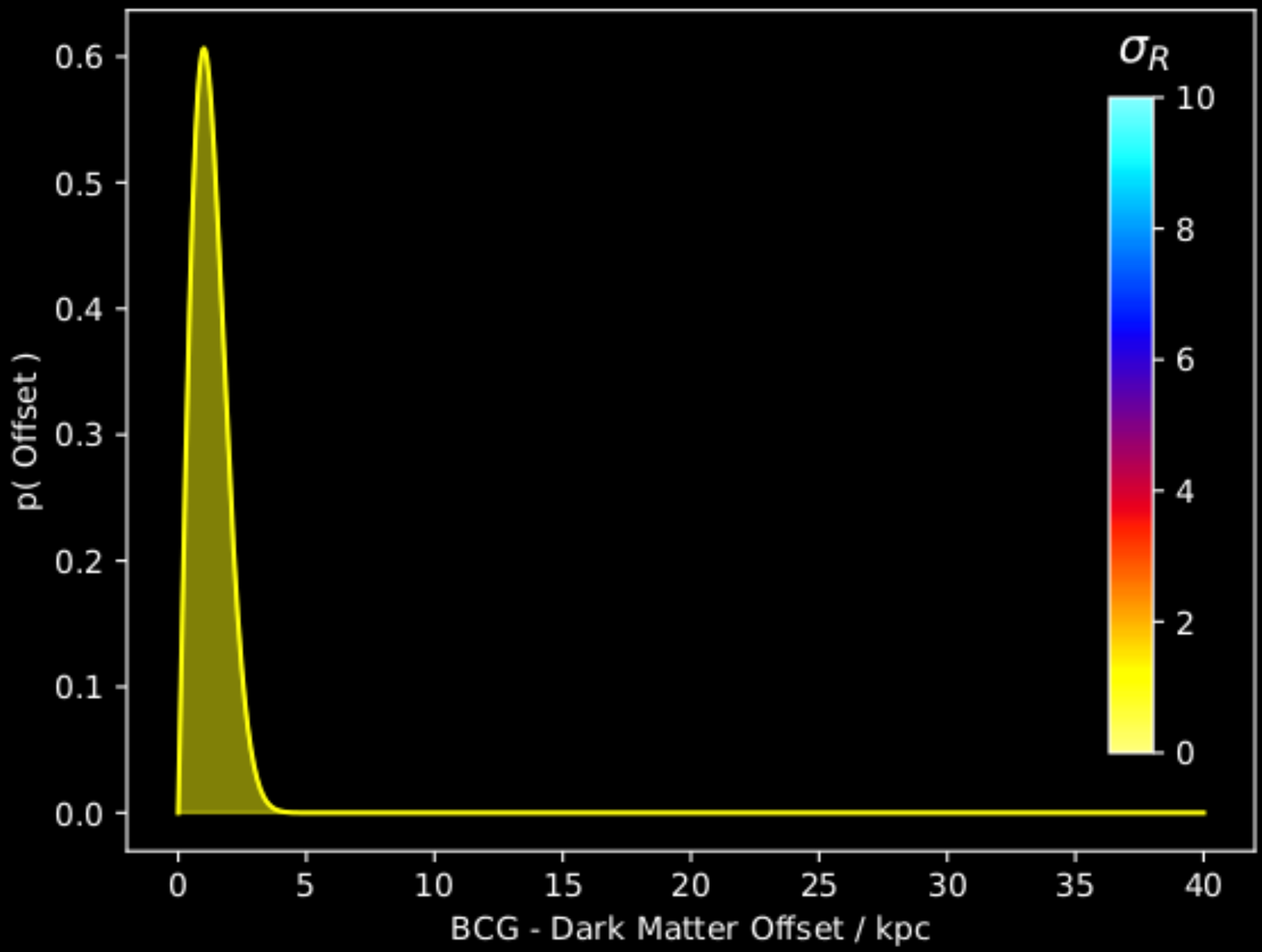

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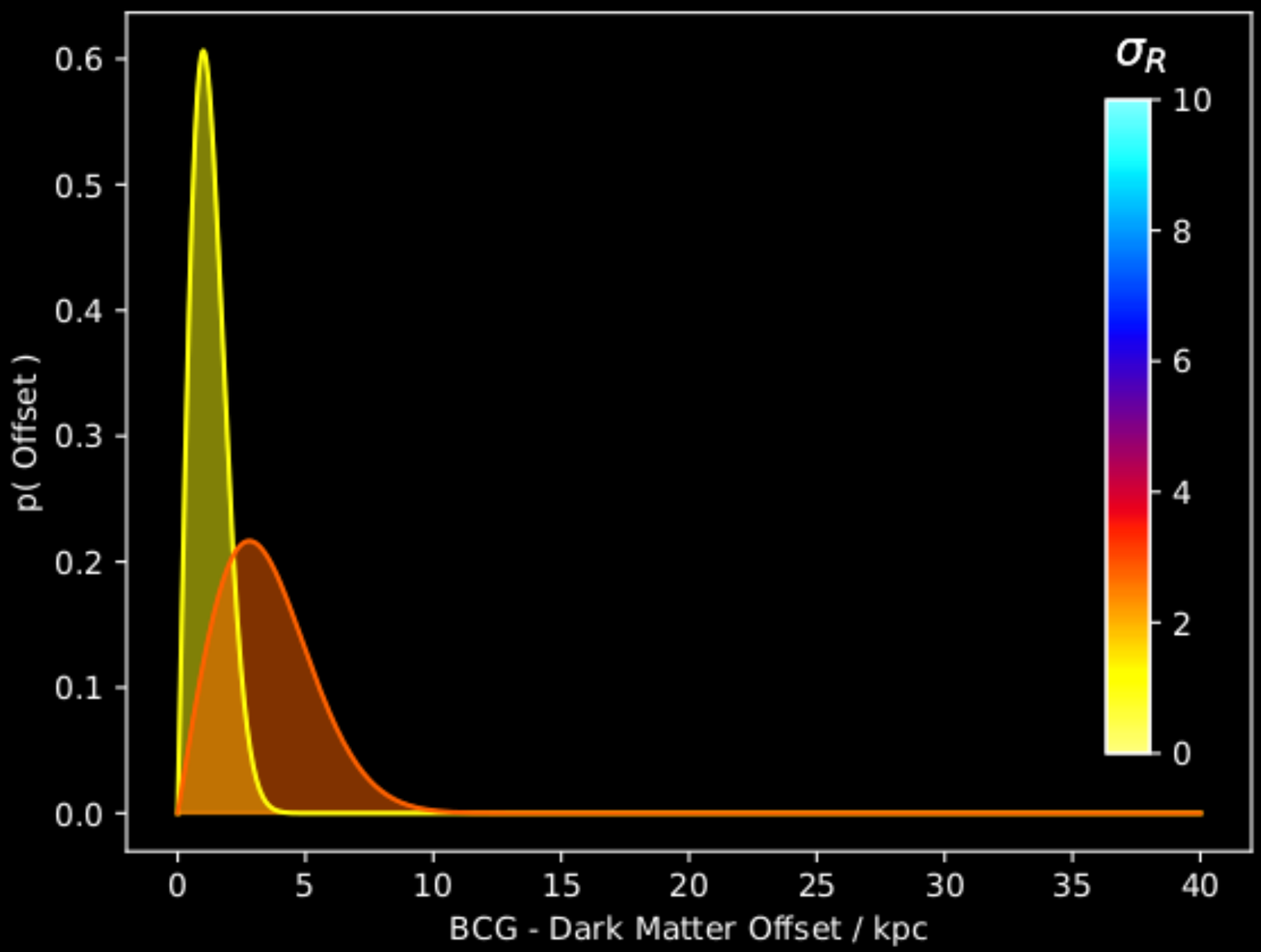

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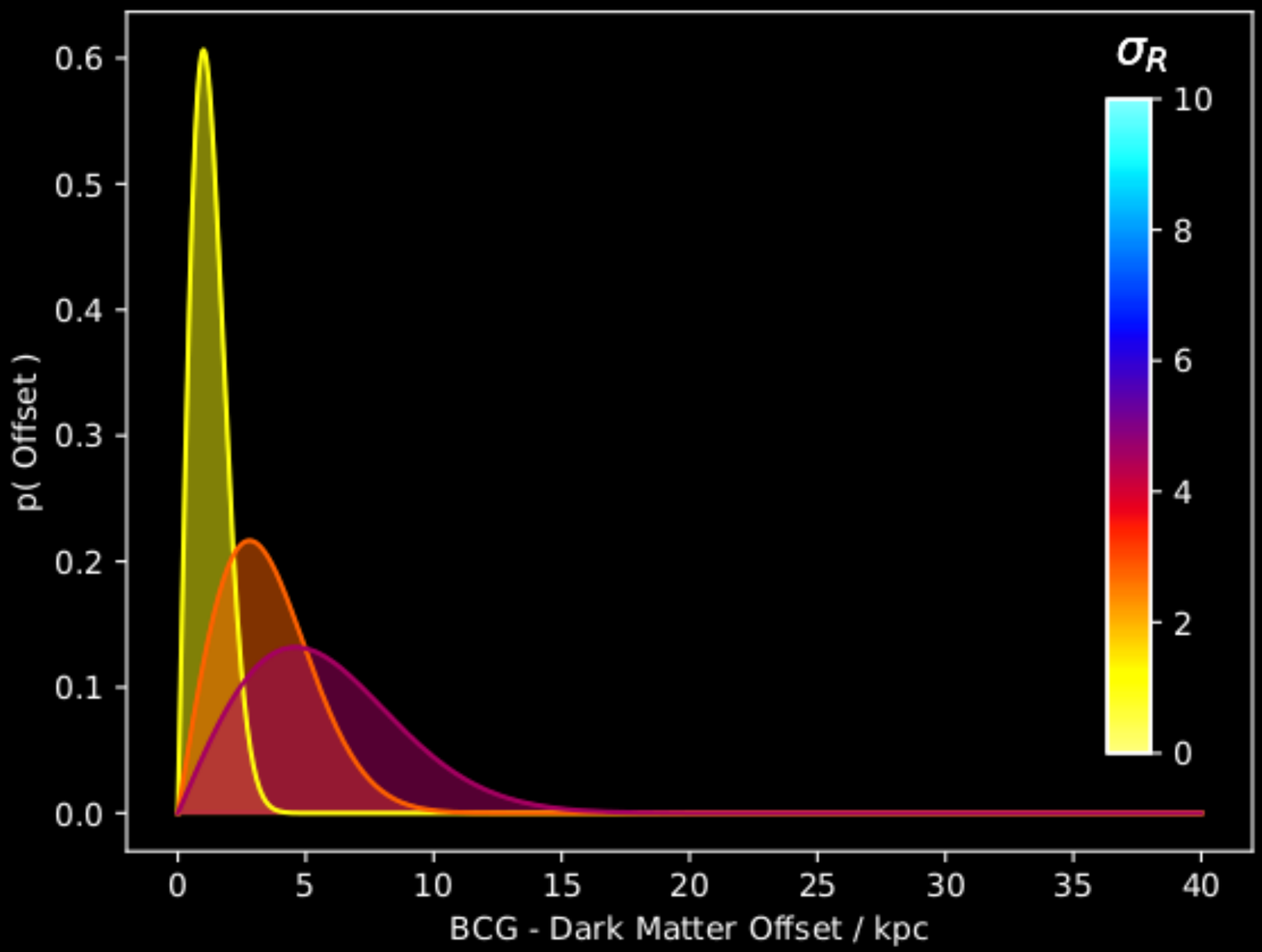

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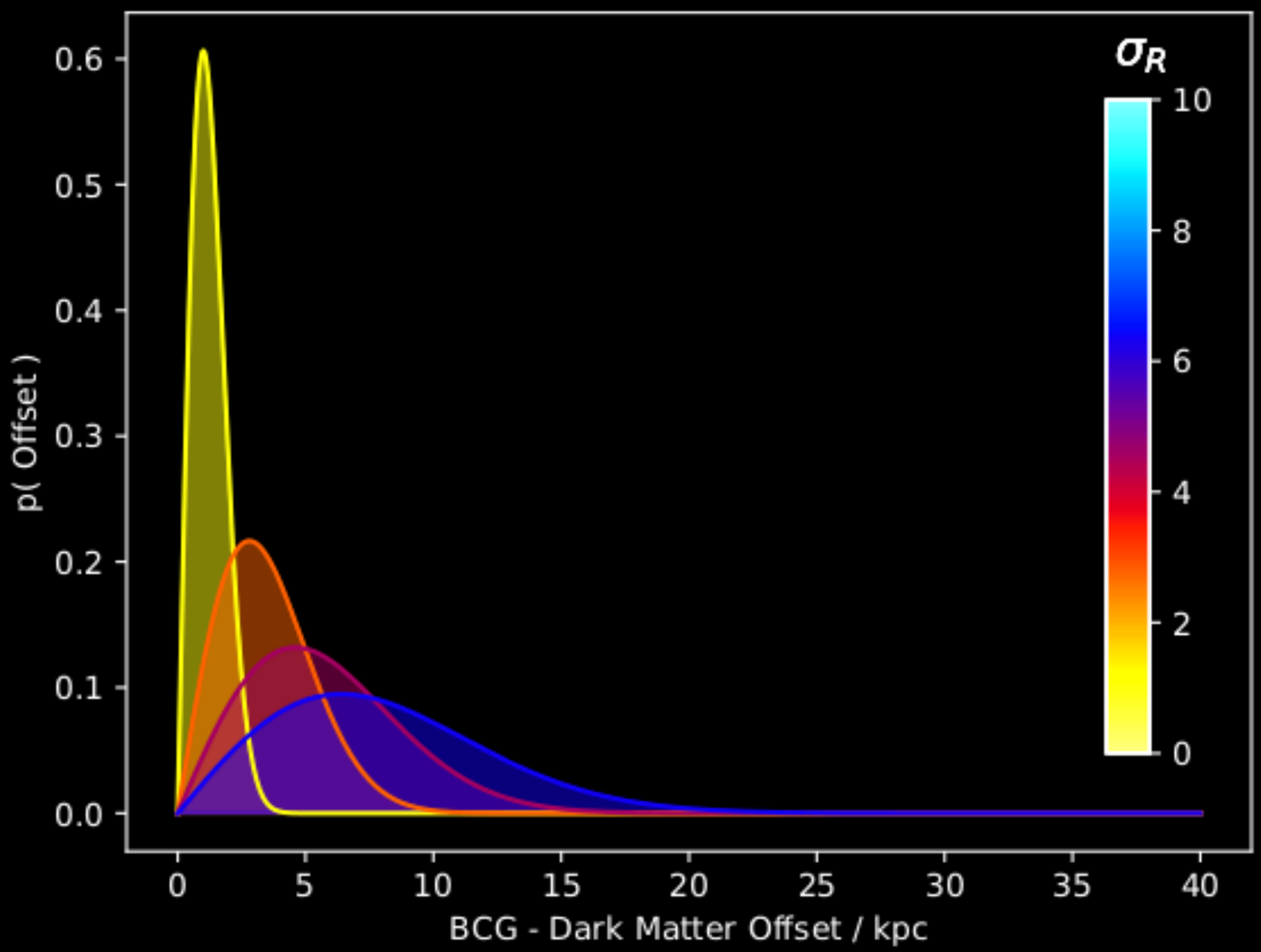

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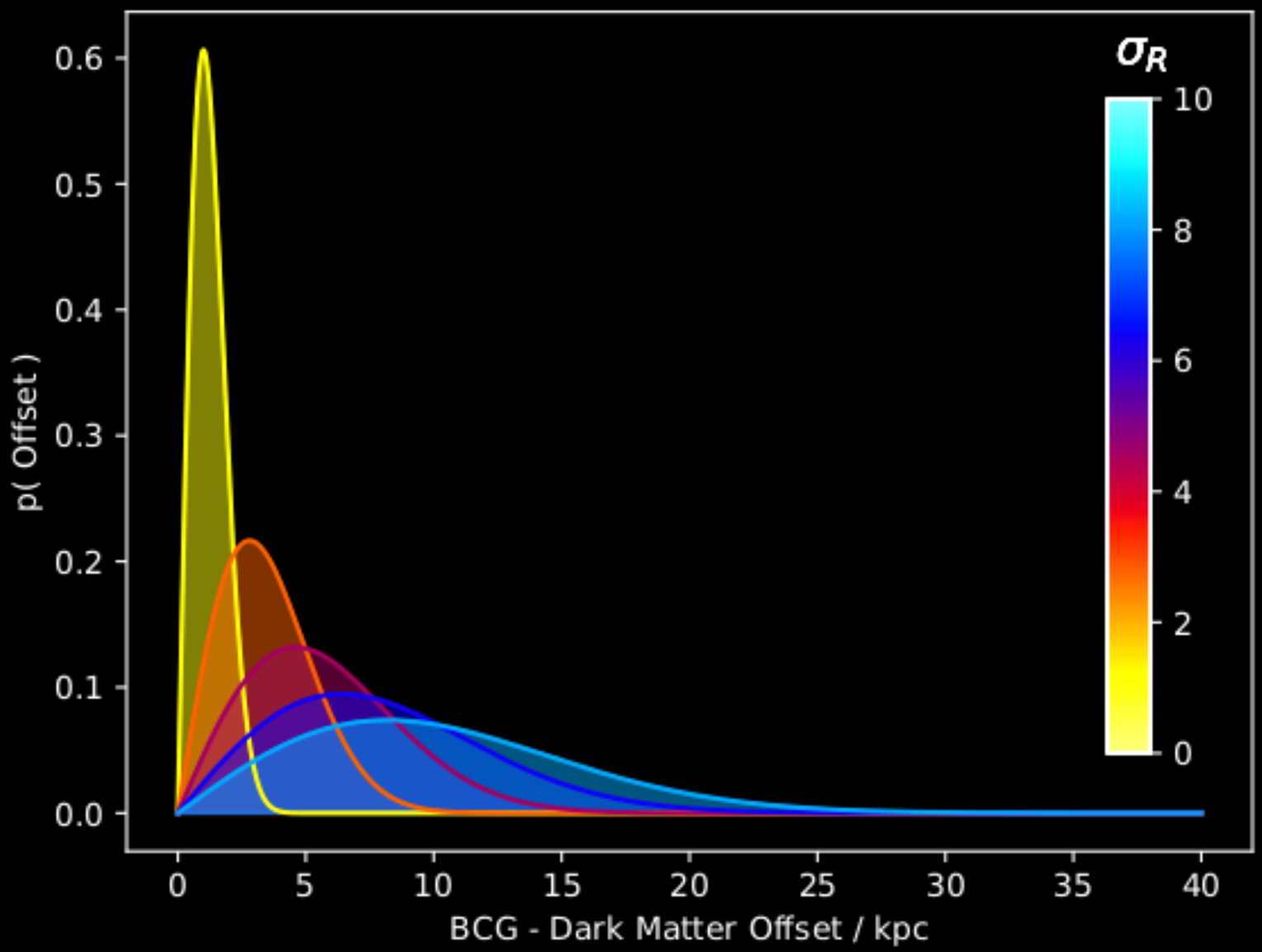

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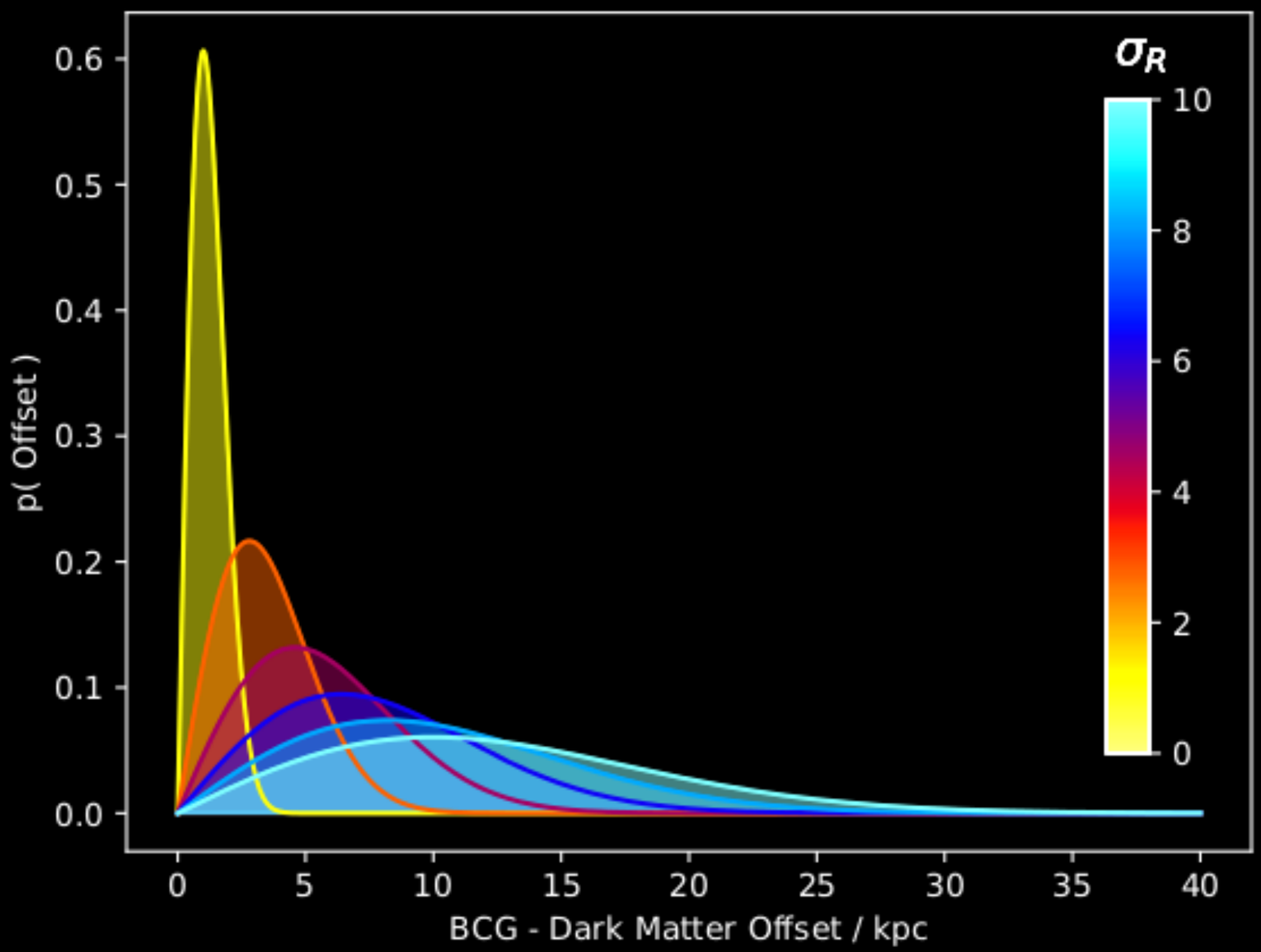

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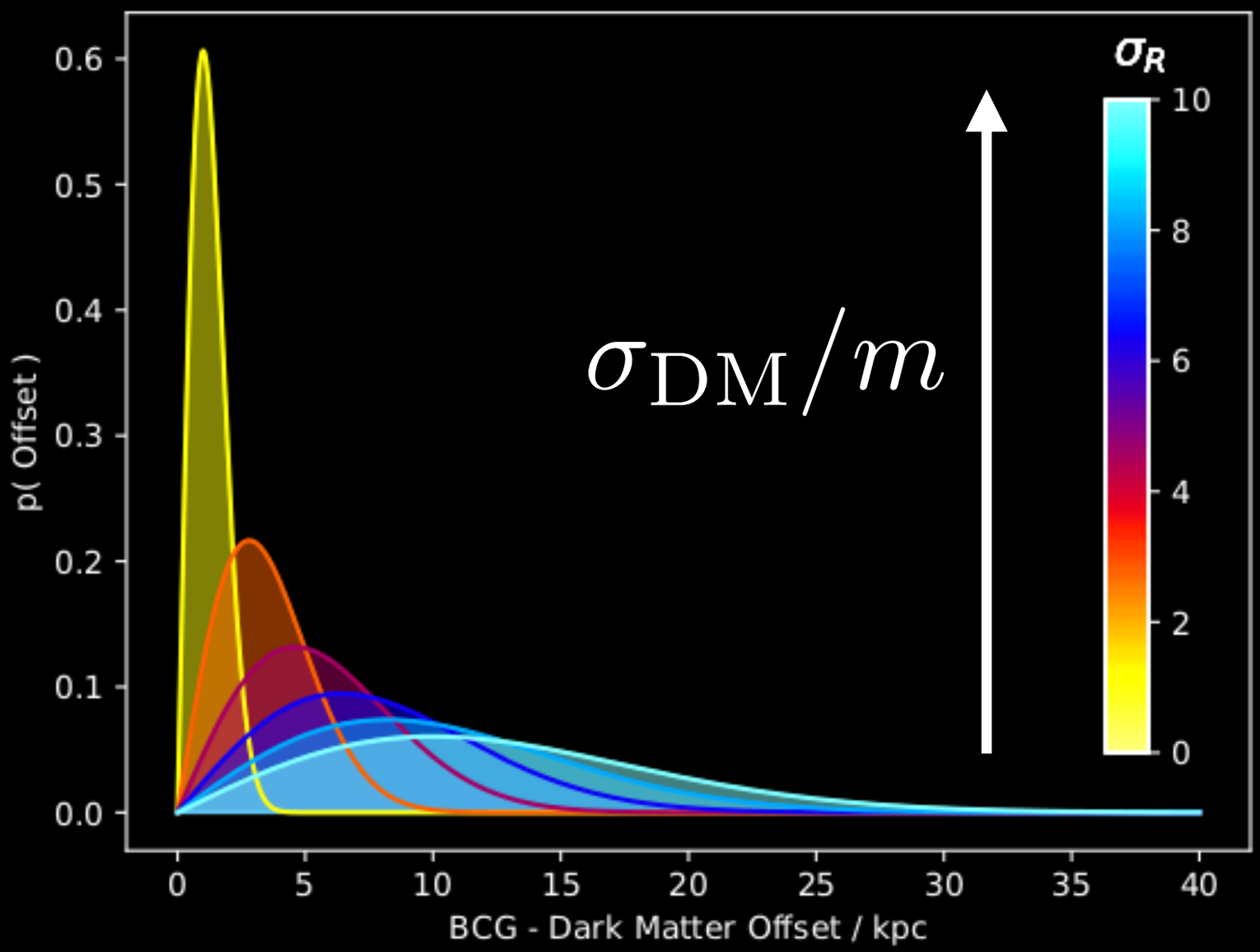
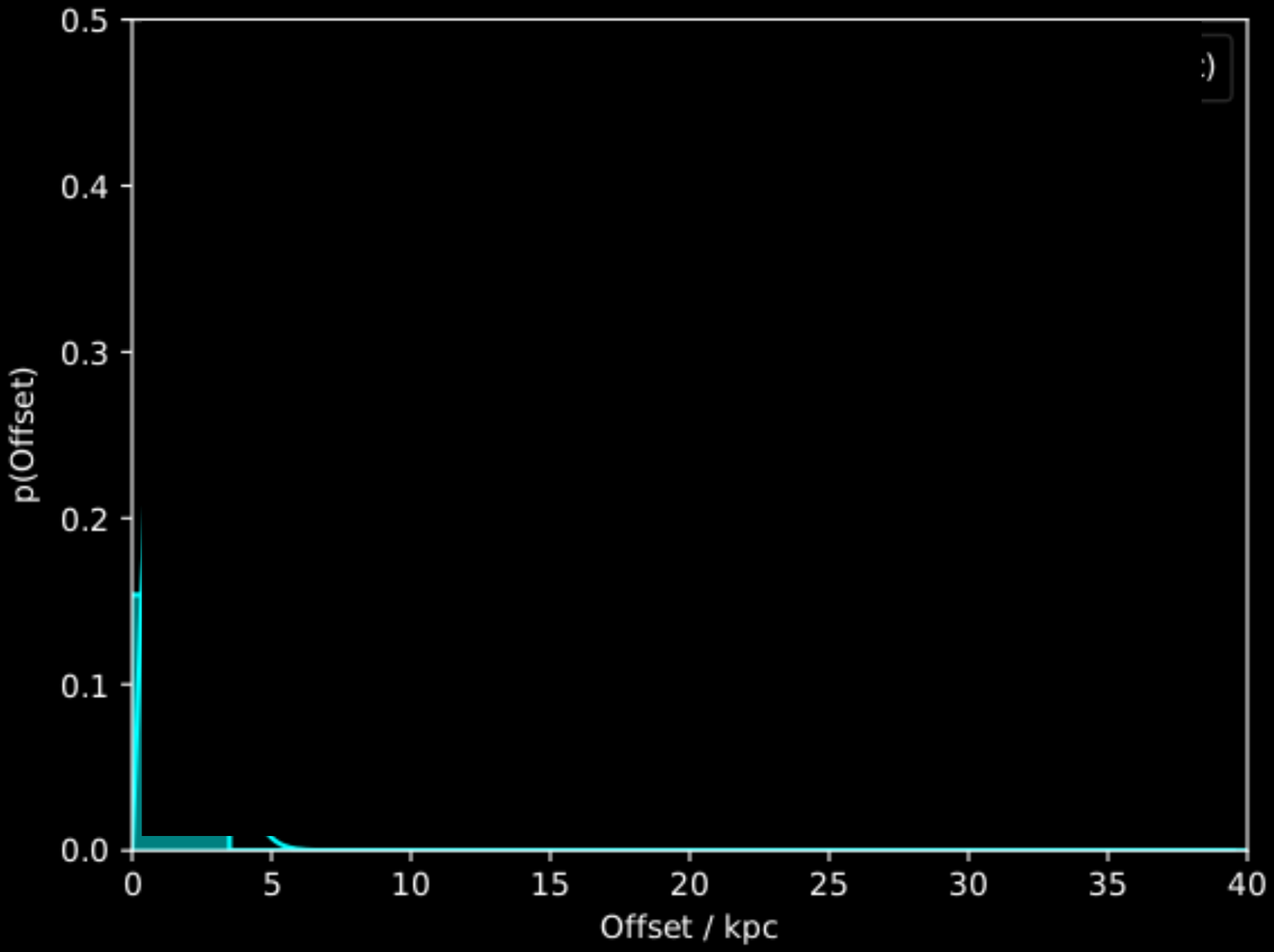


WE USE THE BAHAMAS SIMULATIONS TO TEST THIS HYPOTHESIS



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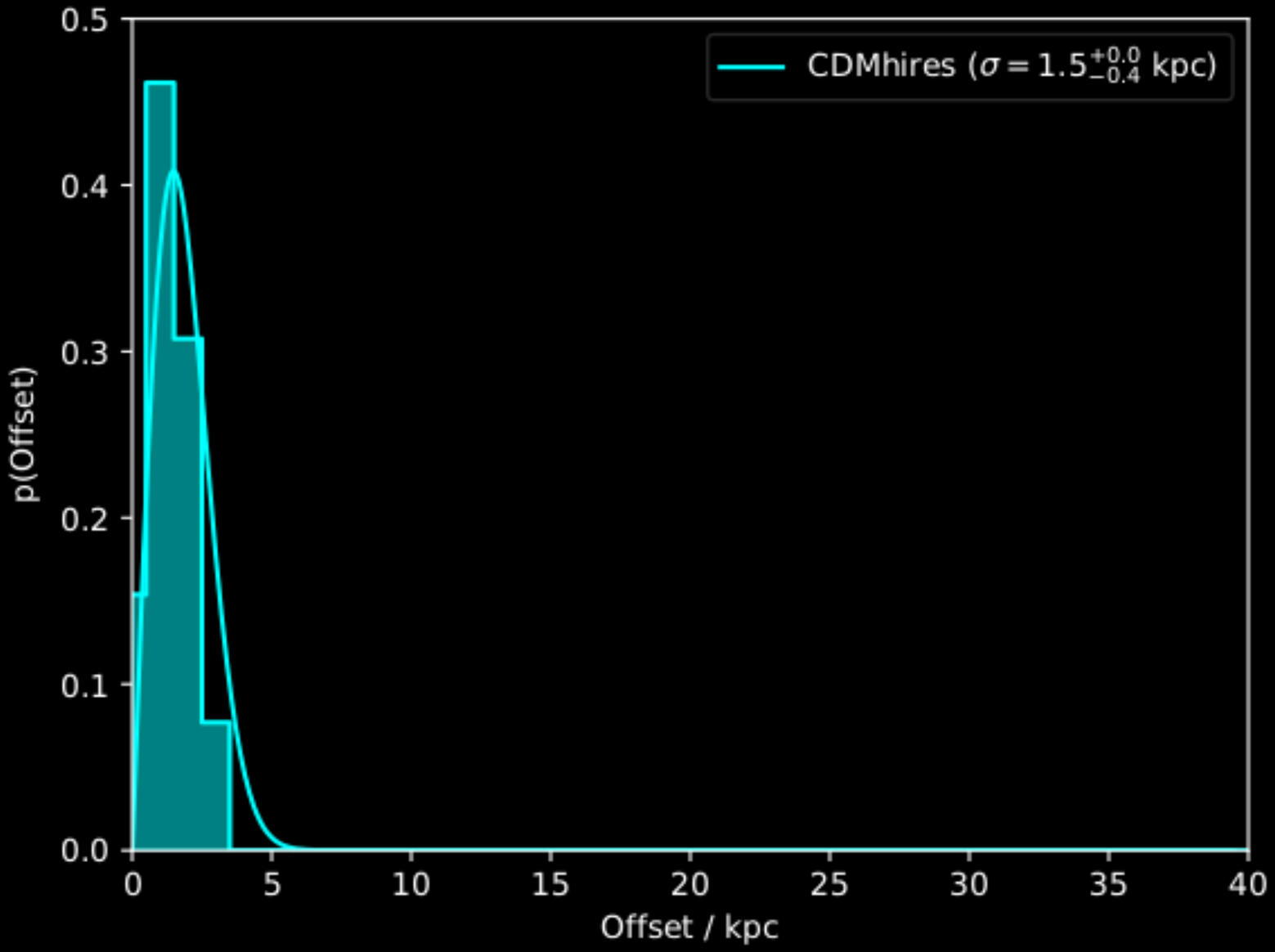

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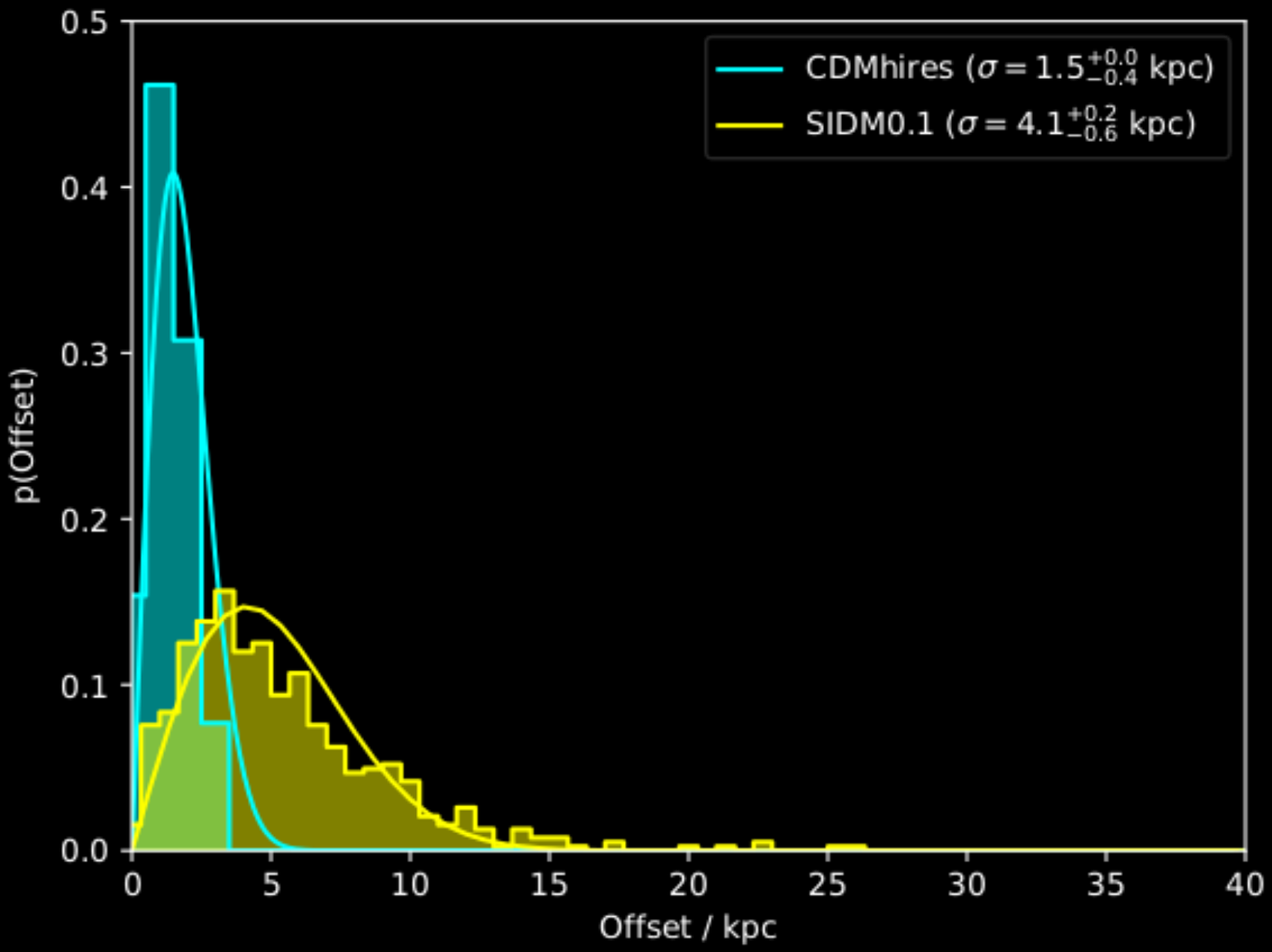

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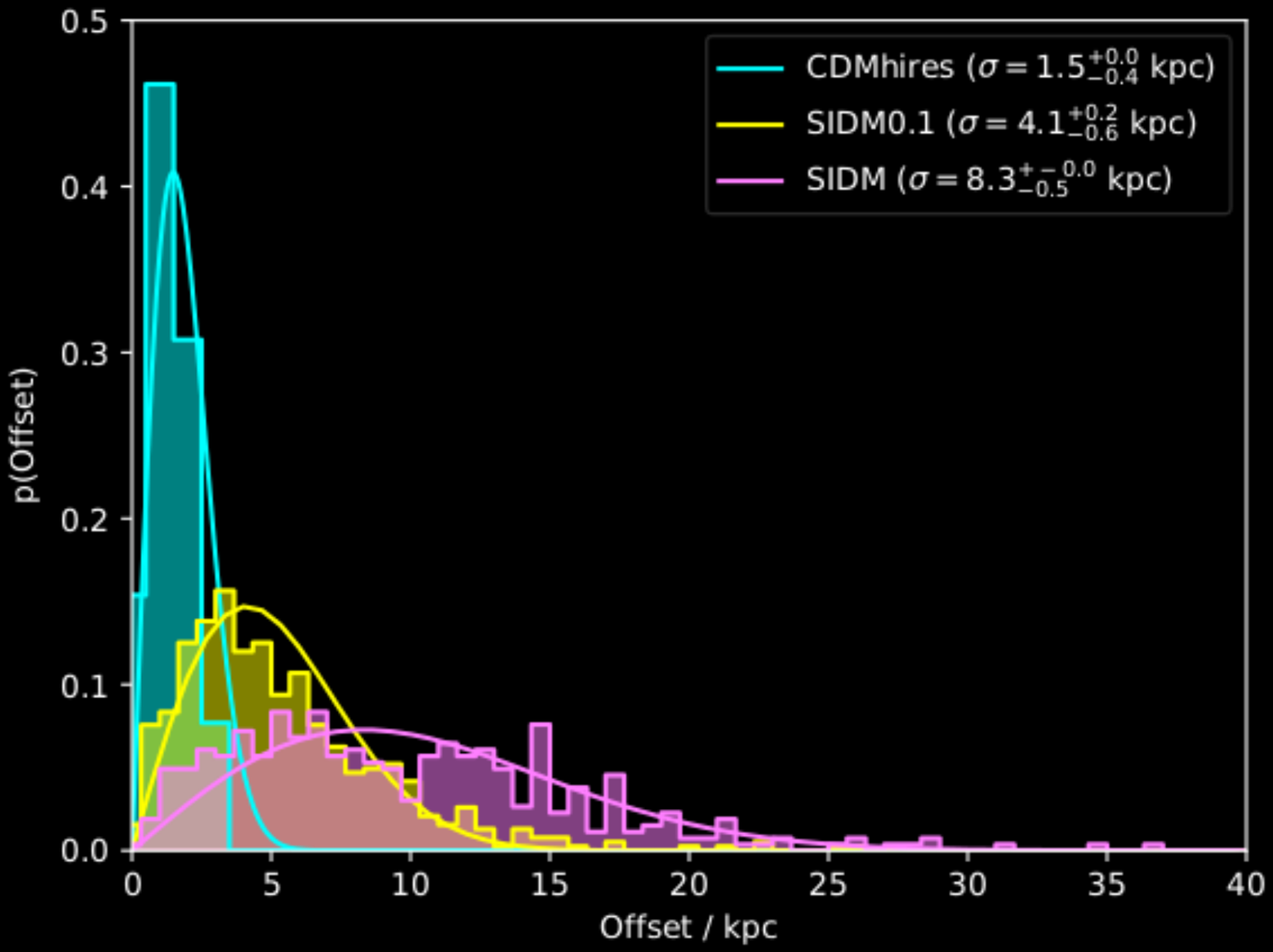
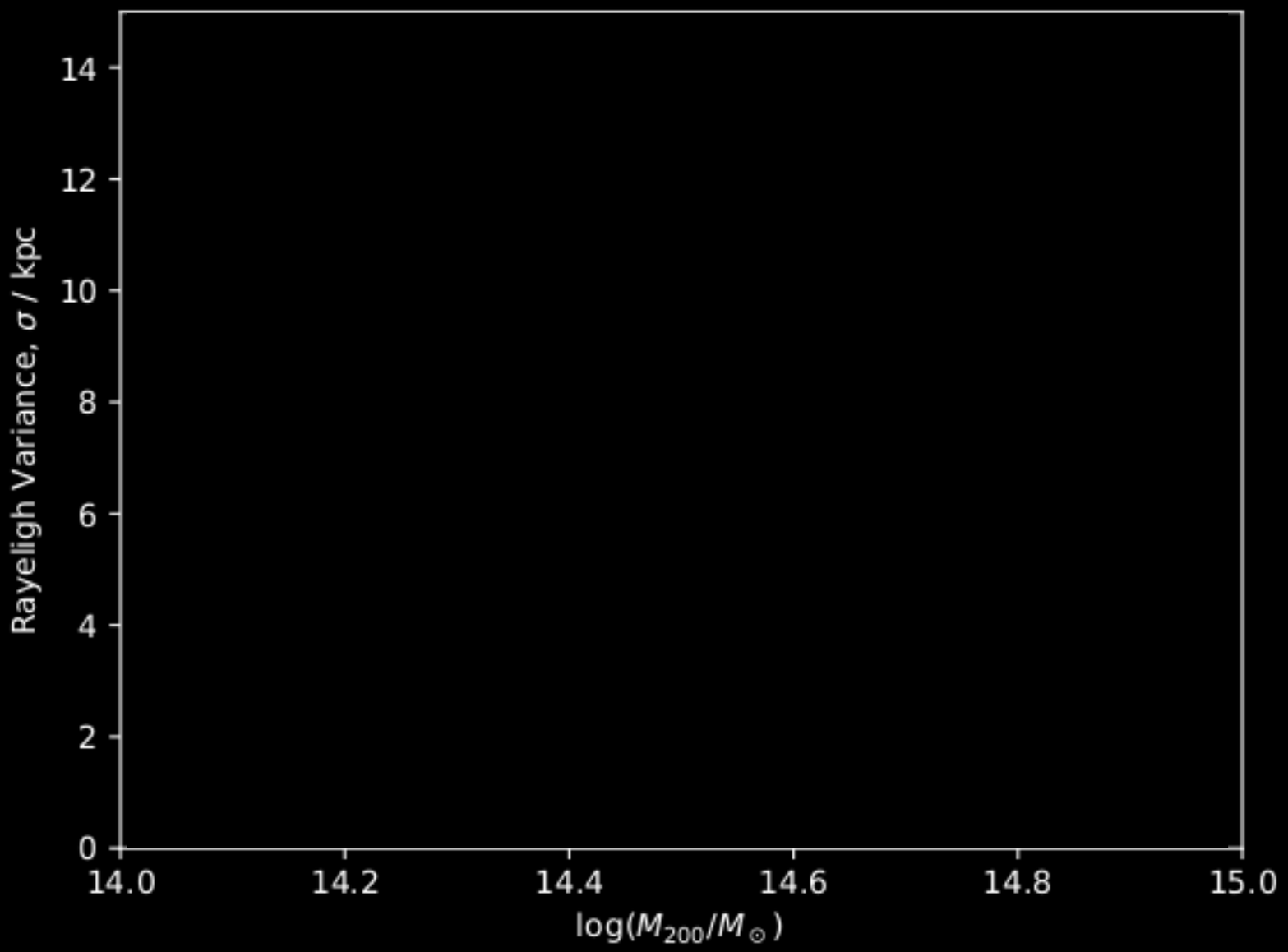


THIS VARIANCE IS ALSO A FUNCTION OF MASS



Harvey et al 2017, 2018b

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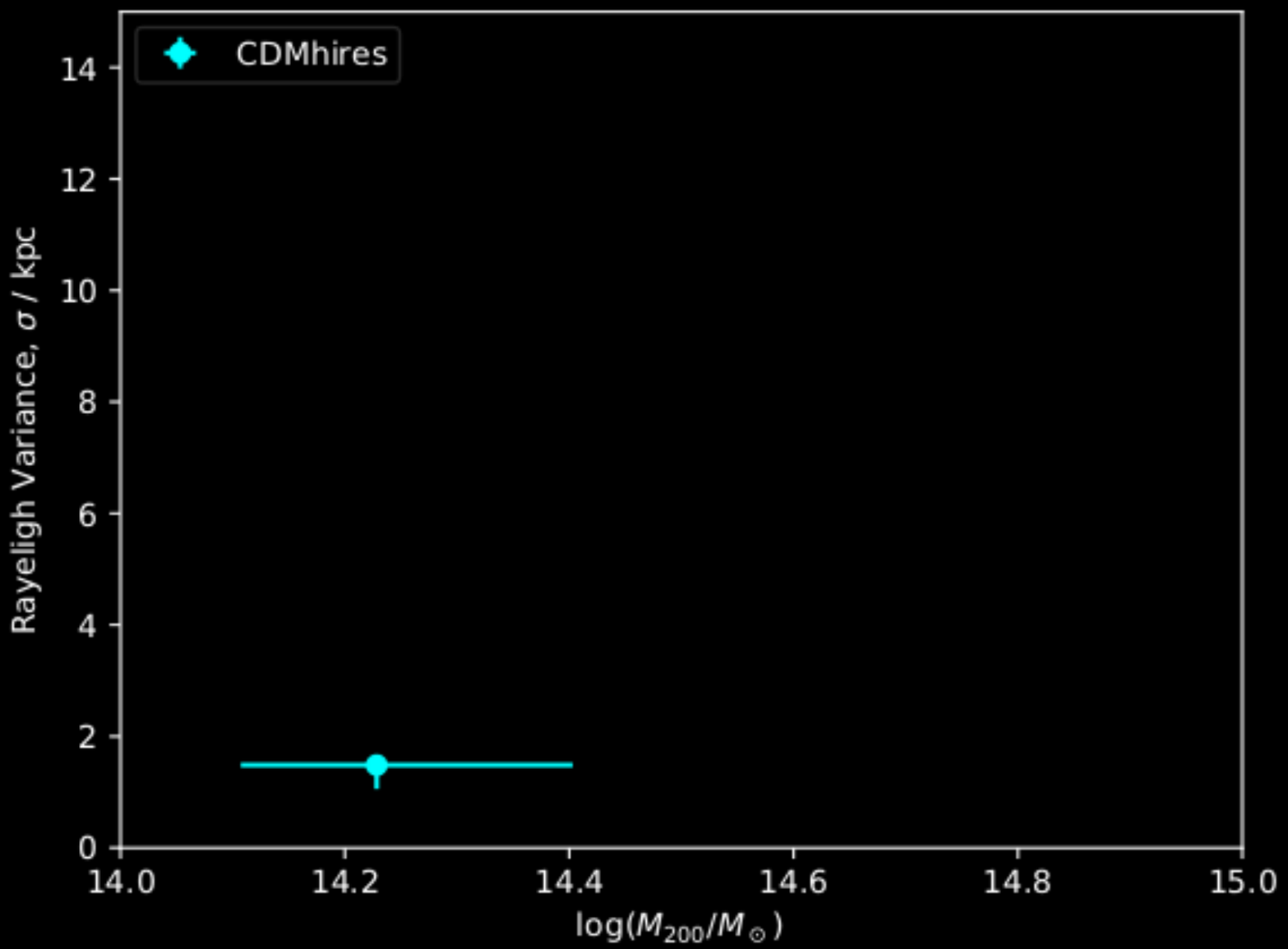

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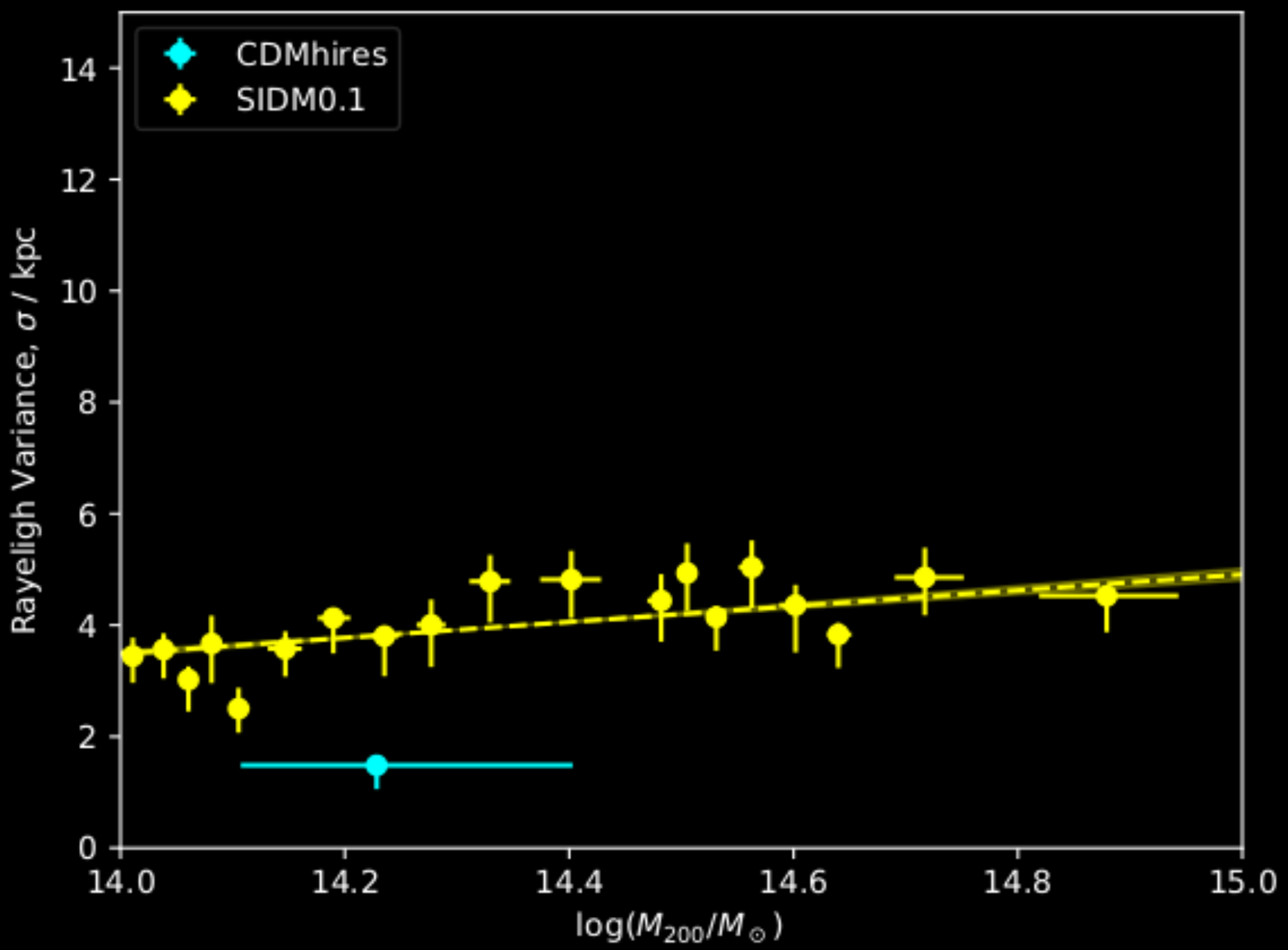

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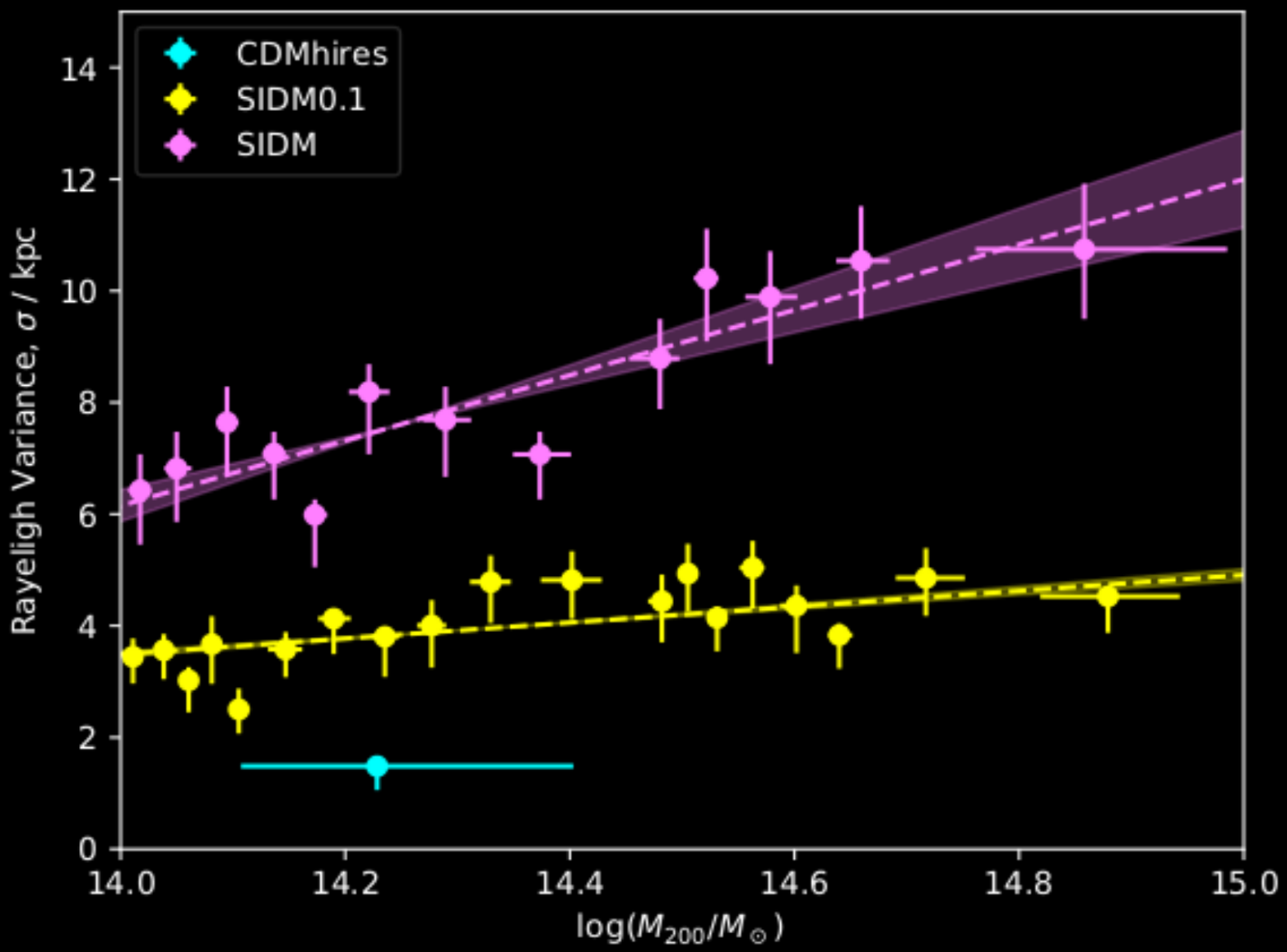

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CONVOLVING WITH OBSERVATIONAL ERRORS TO GAIN CONSTRAINTS

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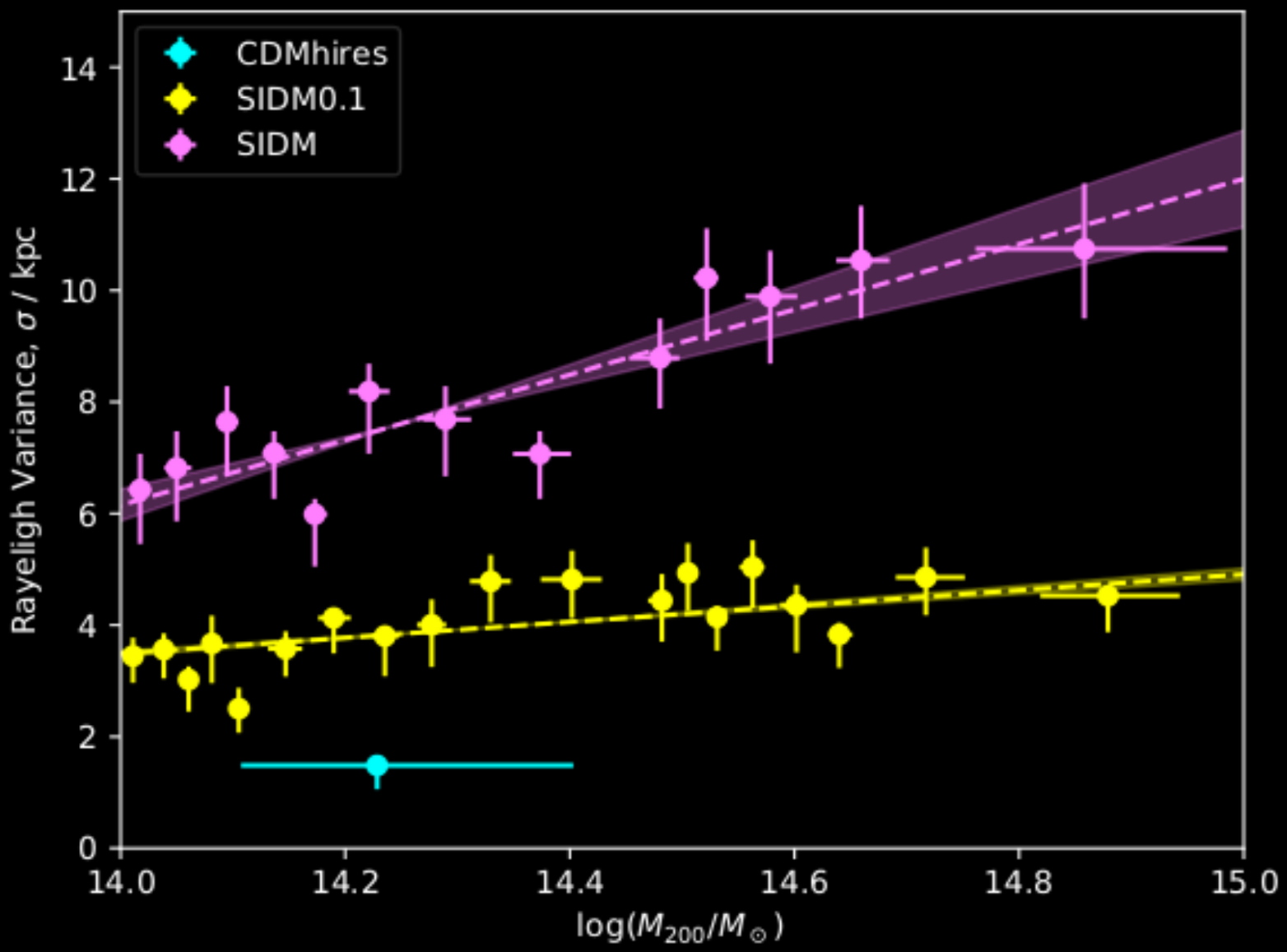

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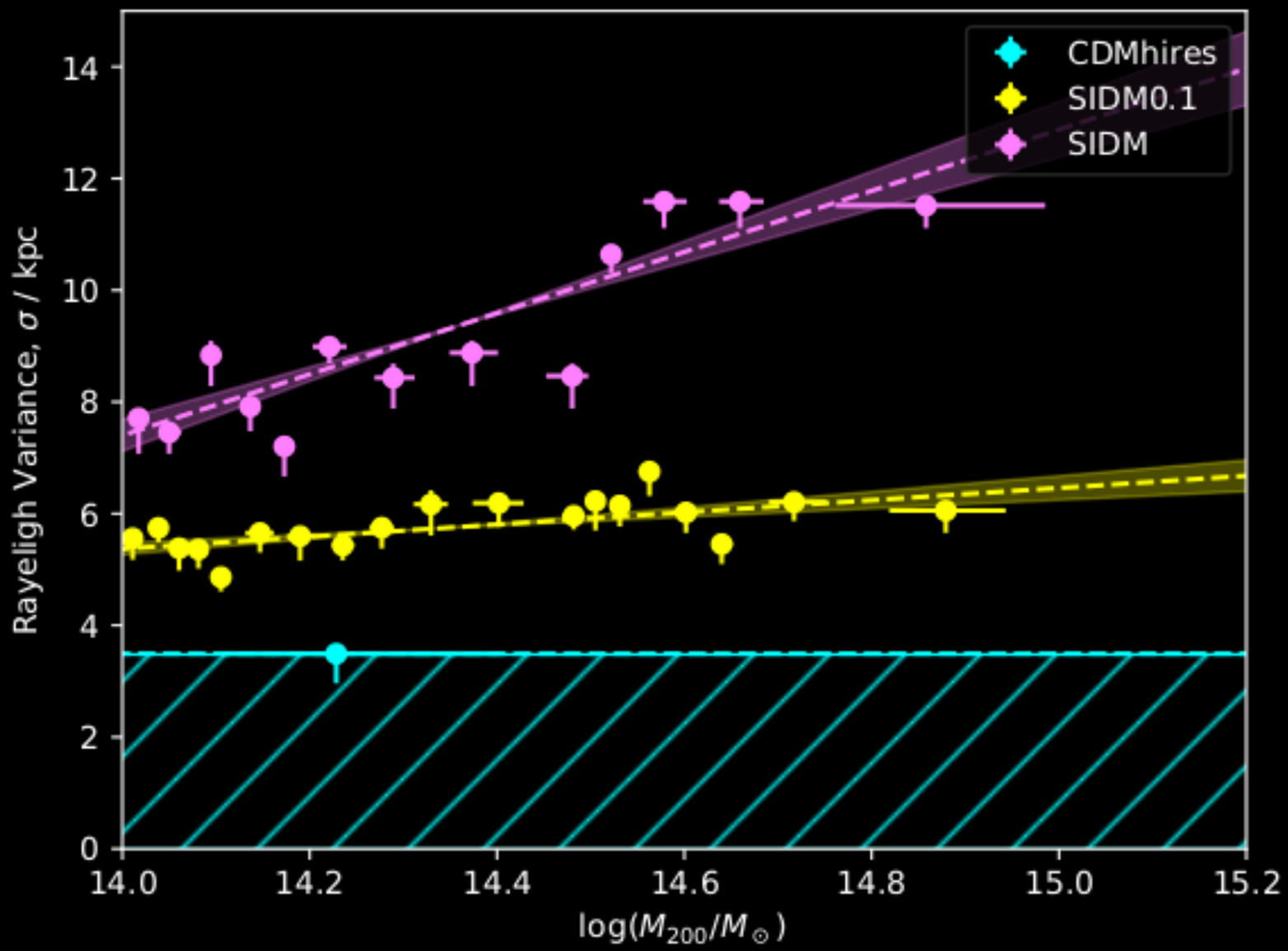

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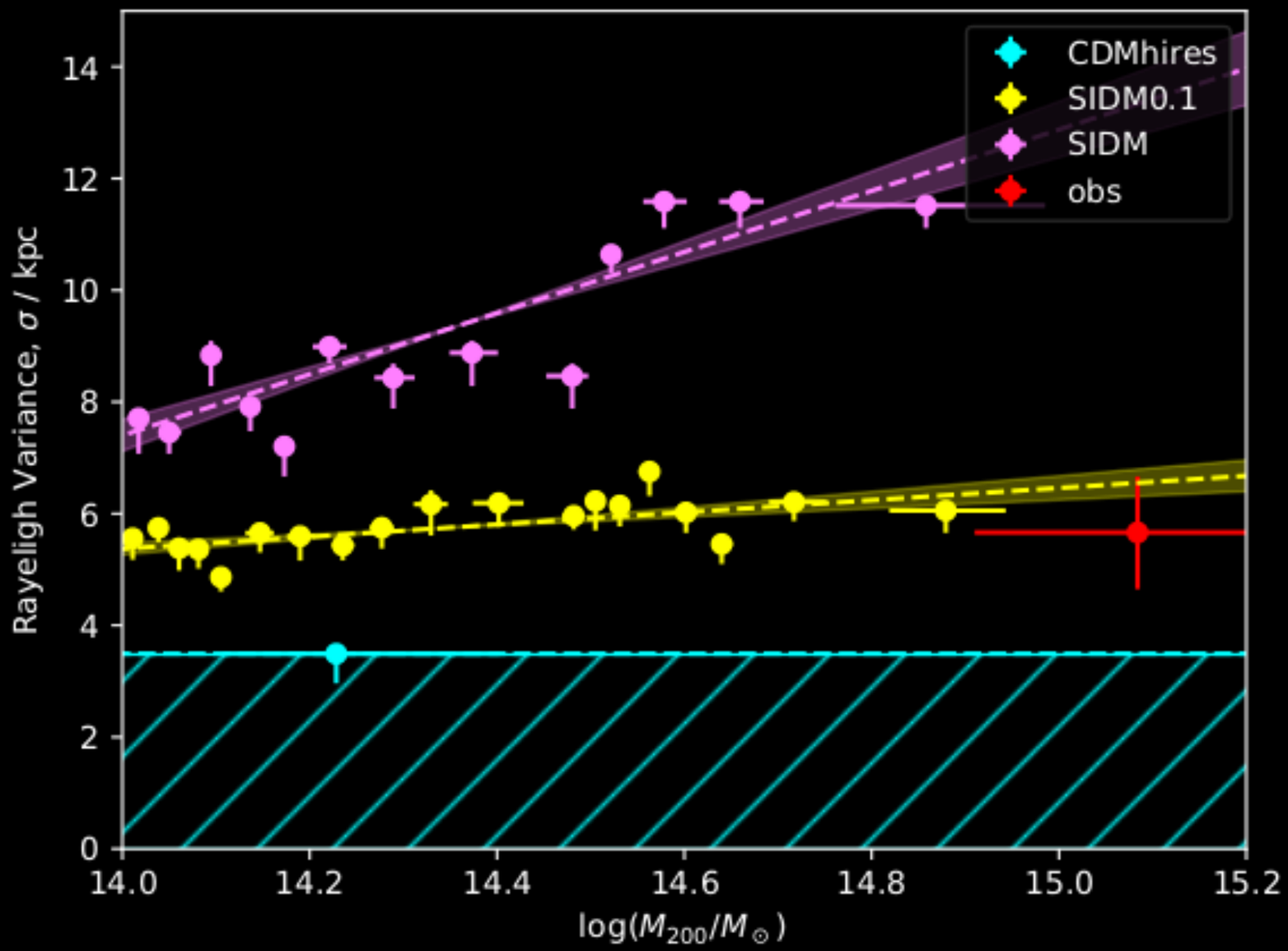

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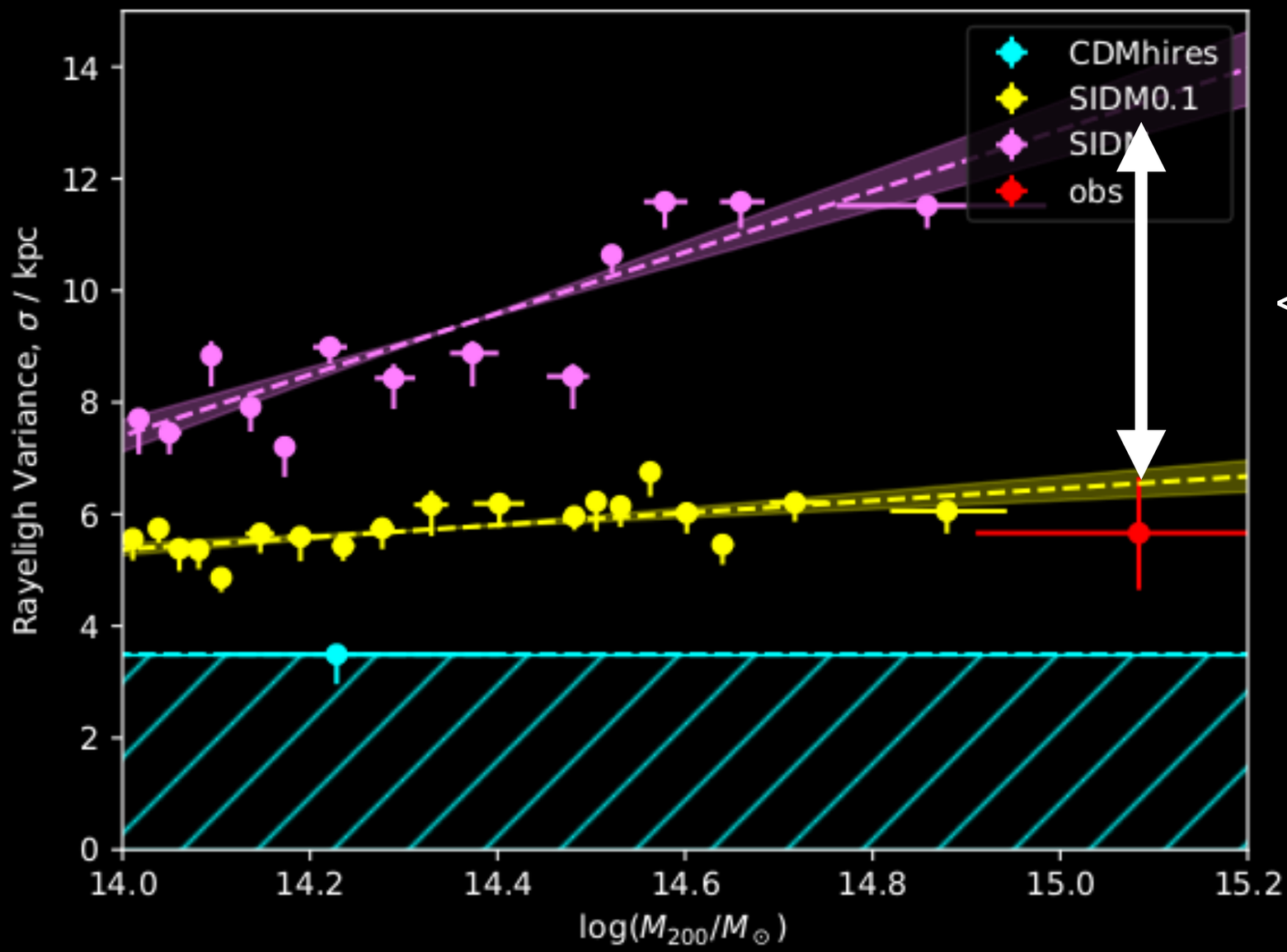

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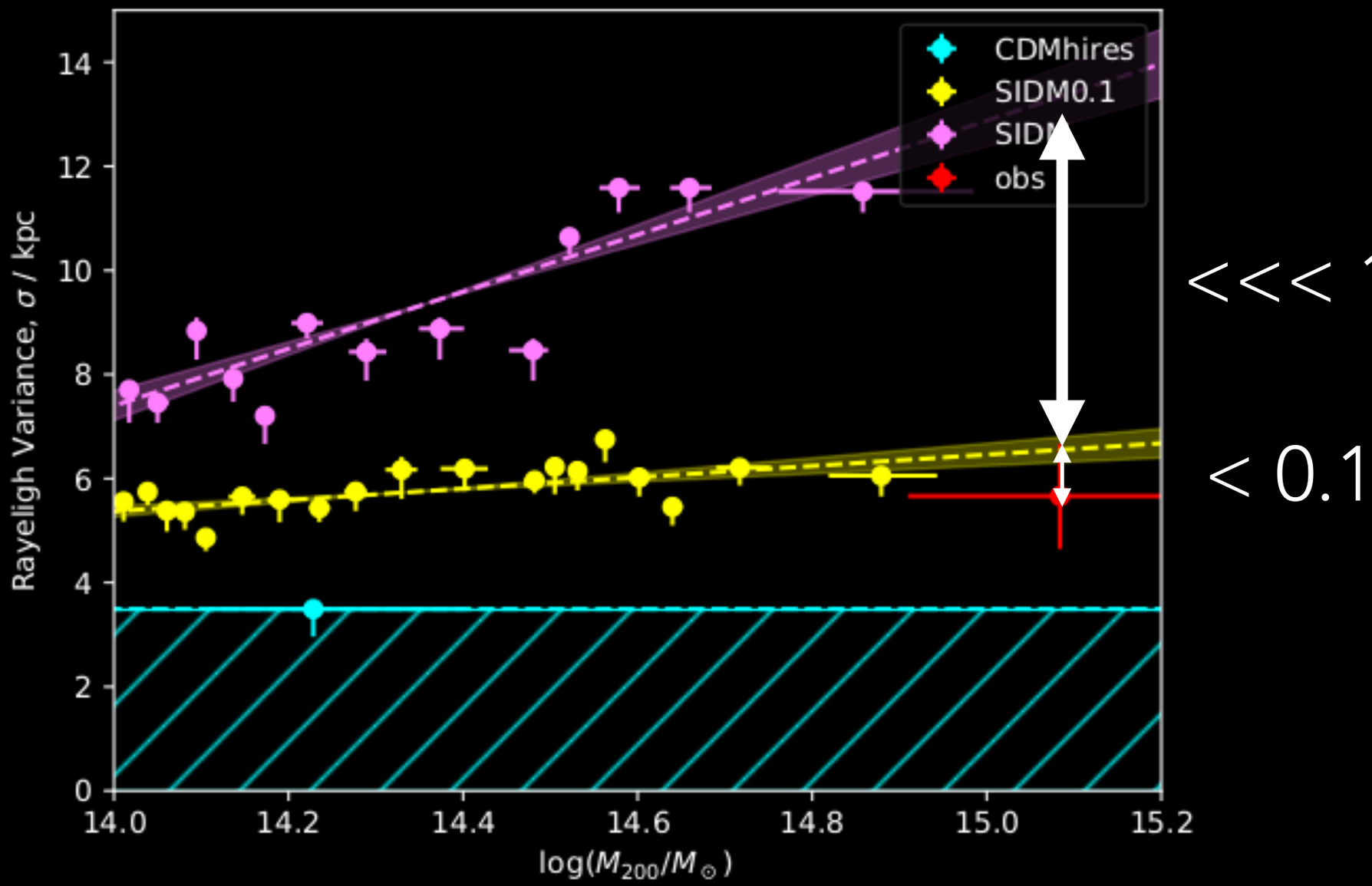

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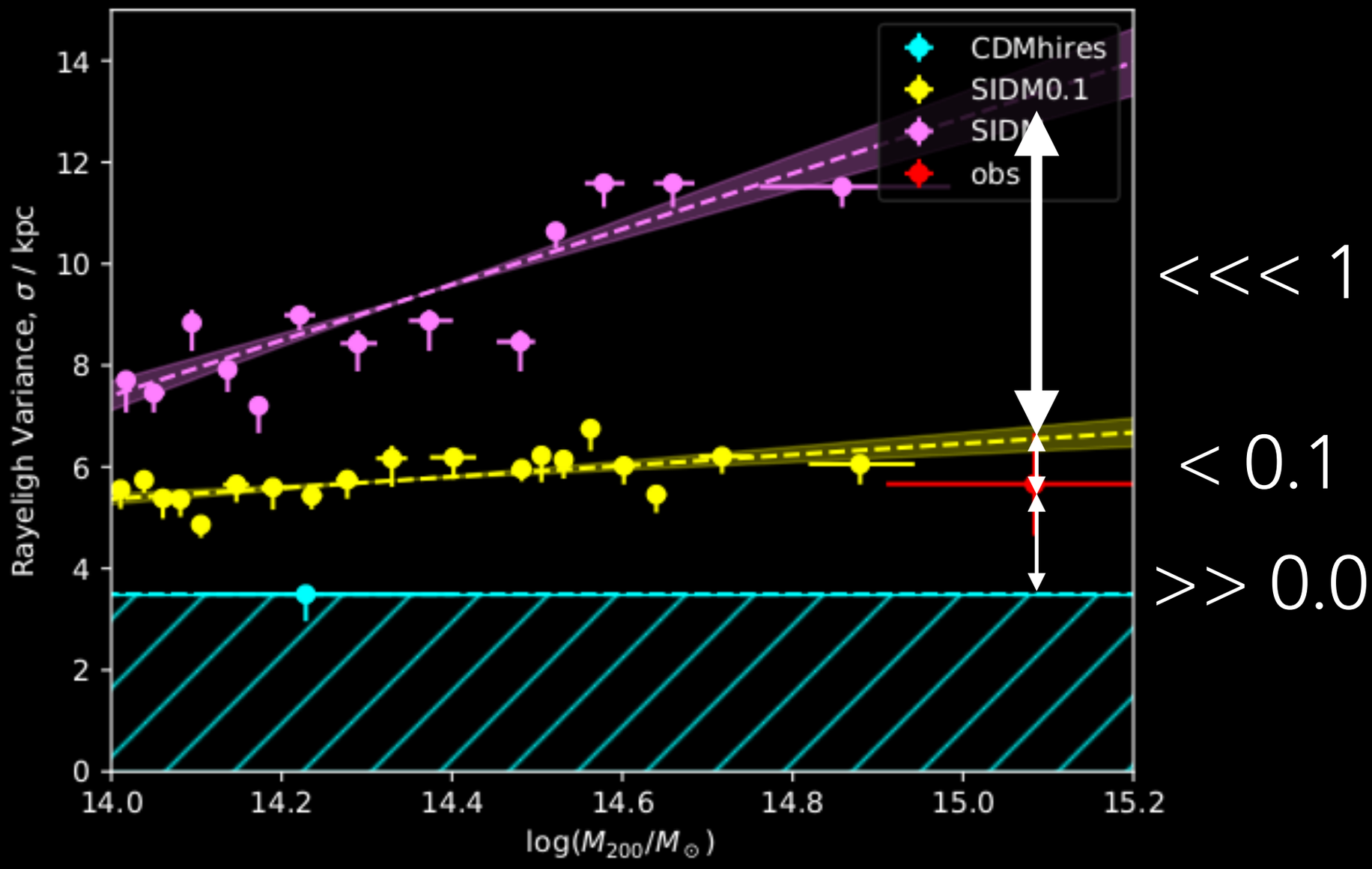

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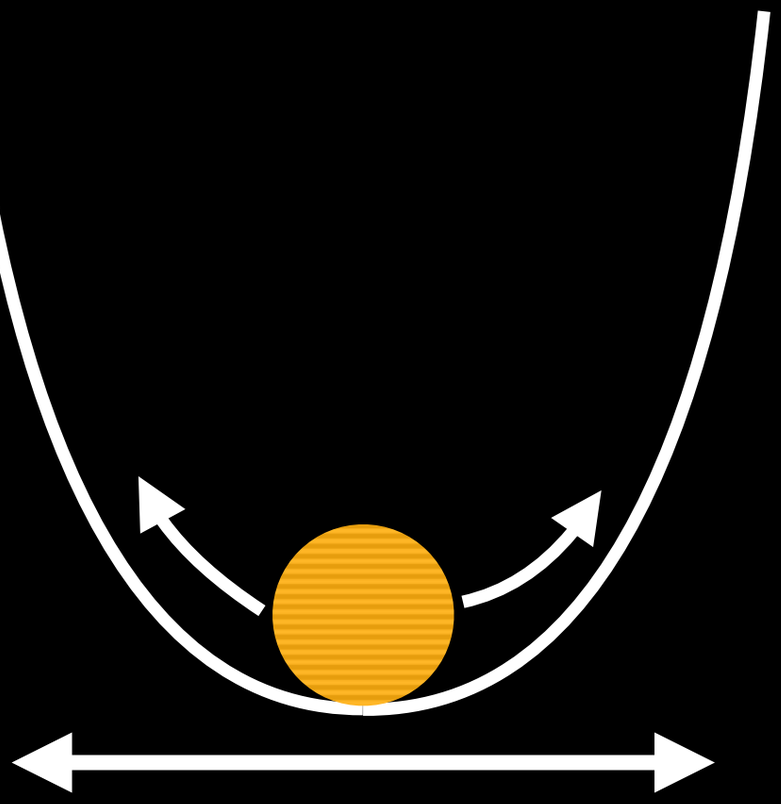

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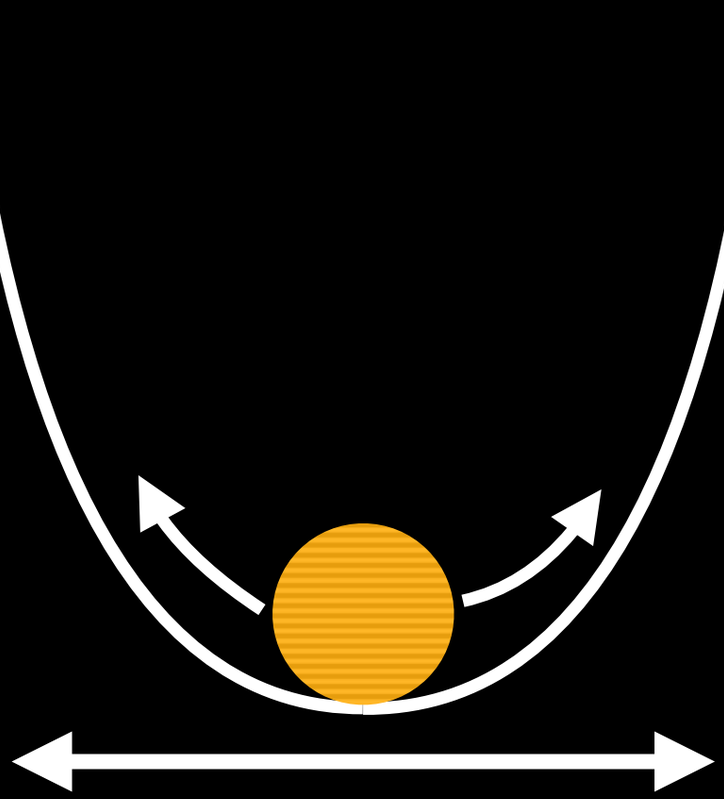

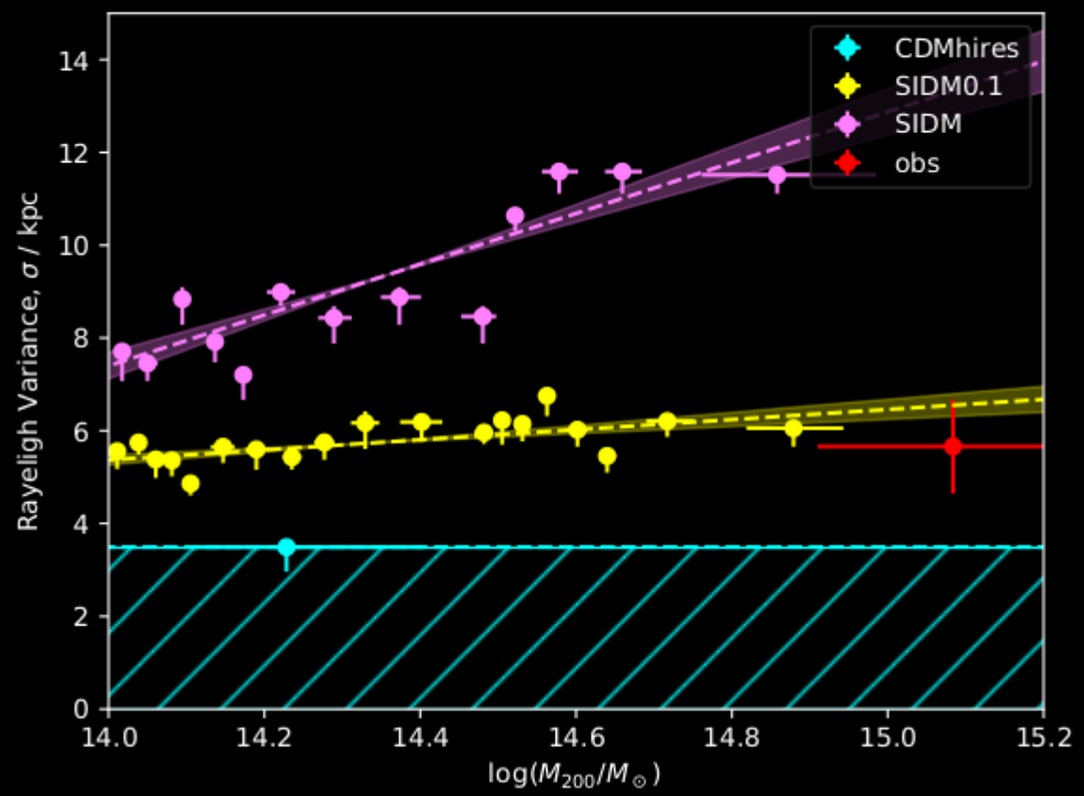

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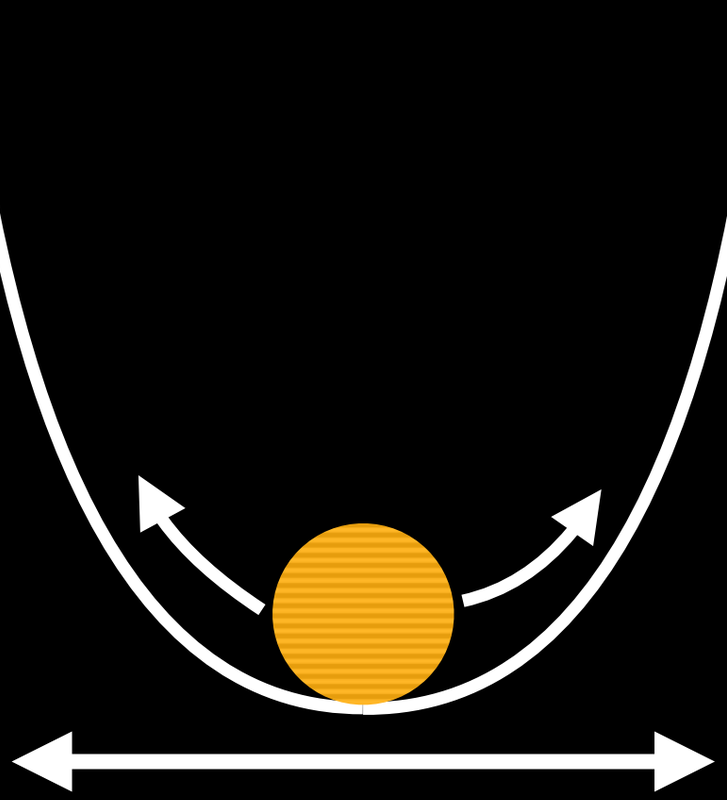

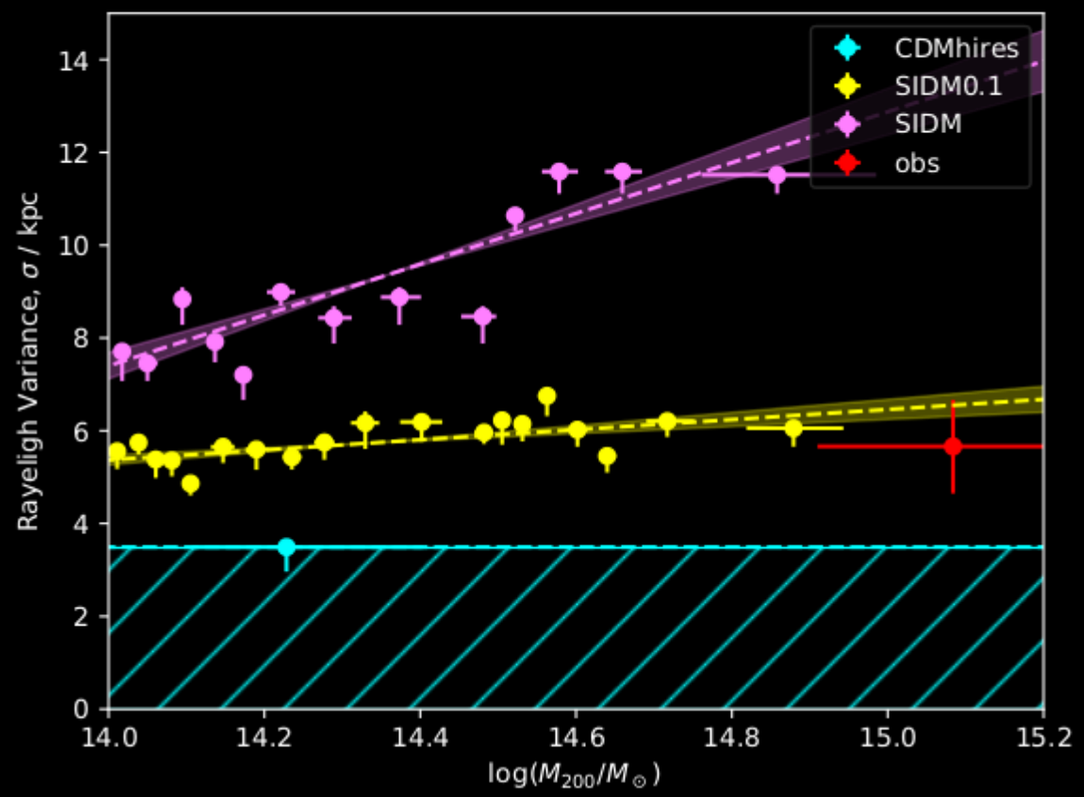

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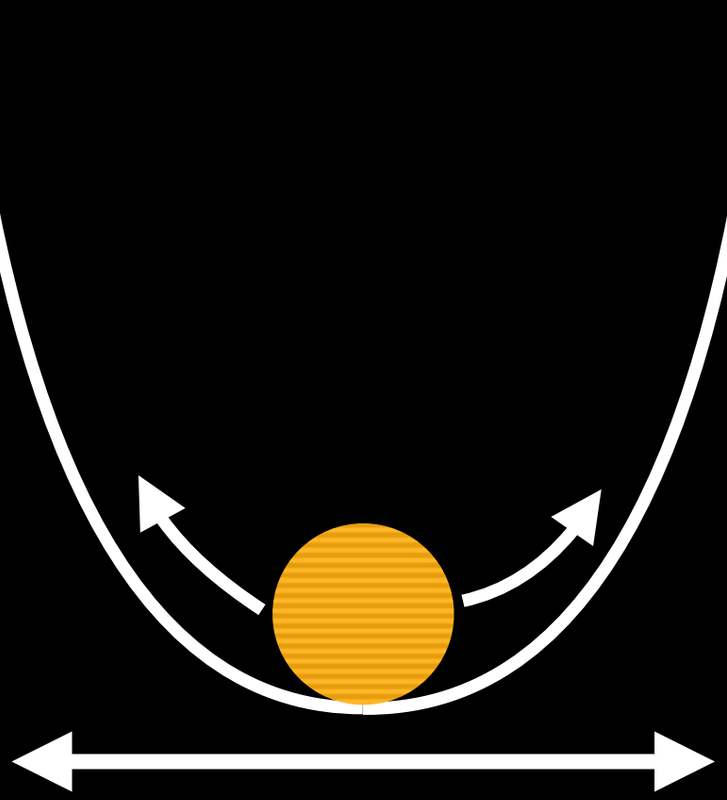

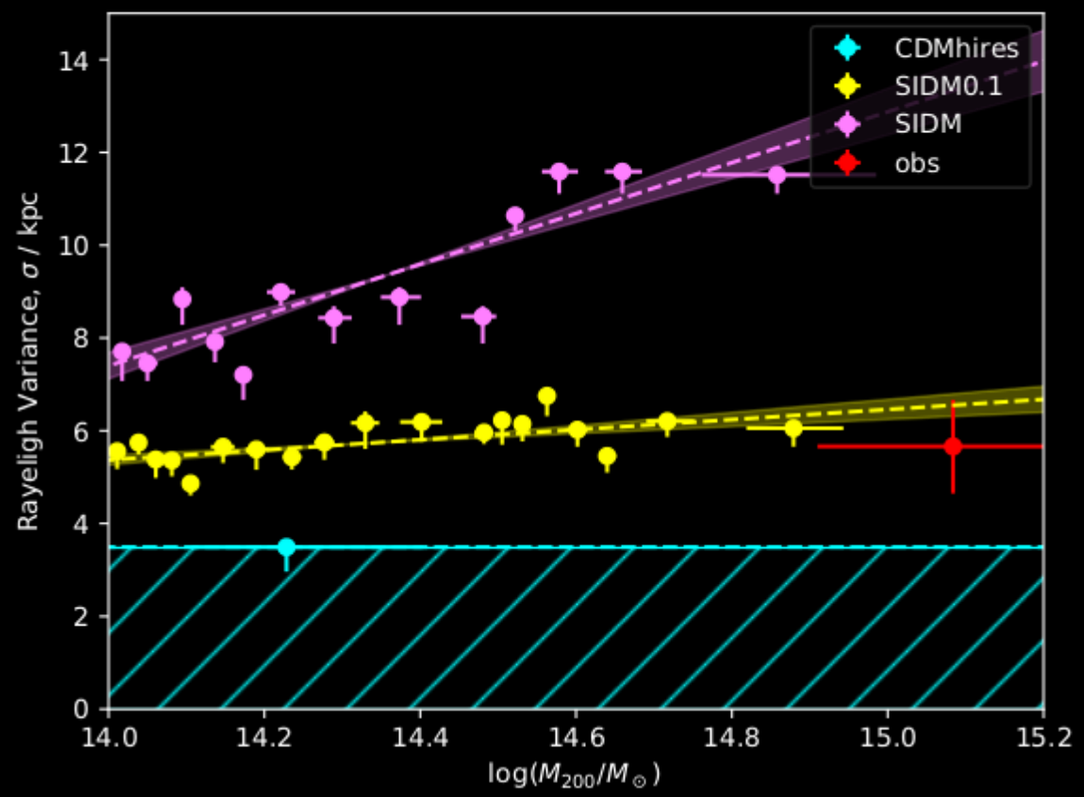

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