



Visage dans étoile,
Pablo Picasso (1947)

TOBIAS BUCK & STEFFEN WOLF



PAINTING INTRINSIC ATTRIBUTES ONTO SDSS OBJECTS

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LARGE SCALE SURVEYS: CHALLENGE FOR CONVENTIONAL ANALYSIS / MODELLING

PHOTOMETRIC DATA FOR MILLIONS OF GALAXIES,
(EUCLID, LSST, DES, COSMOS, DEEP2, BUT ALSO LEGACY DATA LIKE SDSS)

CLASSICAL ANALYSIS/CLASSIFICATION (VISUAL OR GALAXY ZOO LIKE) NOT FEASIBLE

DATA EXPLORATION BEYOND (SIMPLE) MORPHOLOGICAL CLASSIFICATION
▶ RESOLVED GALAXY PROPERTIES

HOW MUCH INFORMATION IS ENCODED IN BROAD BAND GALAXY IMAGES?



IMAGING DATA TO PHYSICAL PROPERTIES

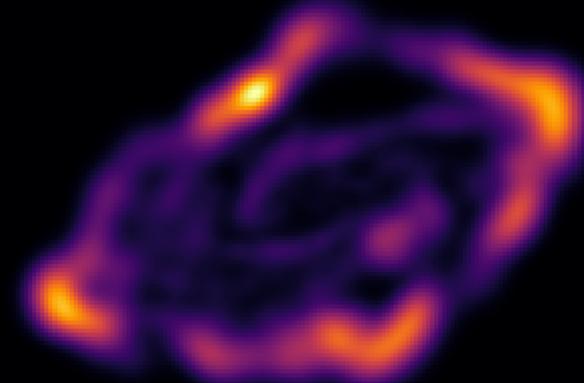
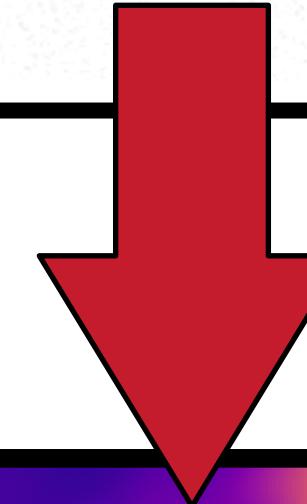
u-band

g-band

r-band

i-band

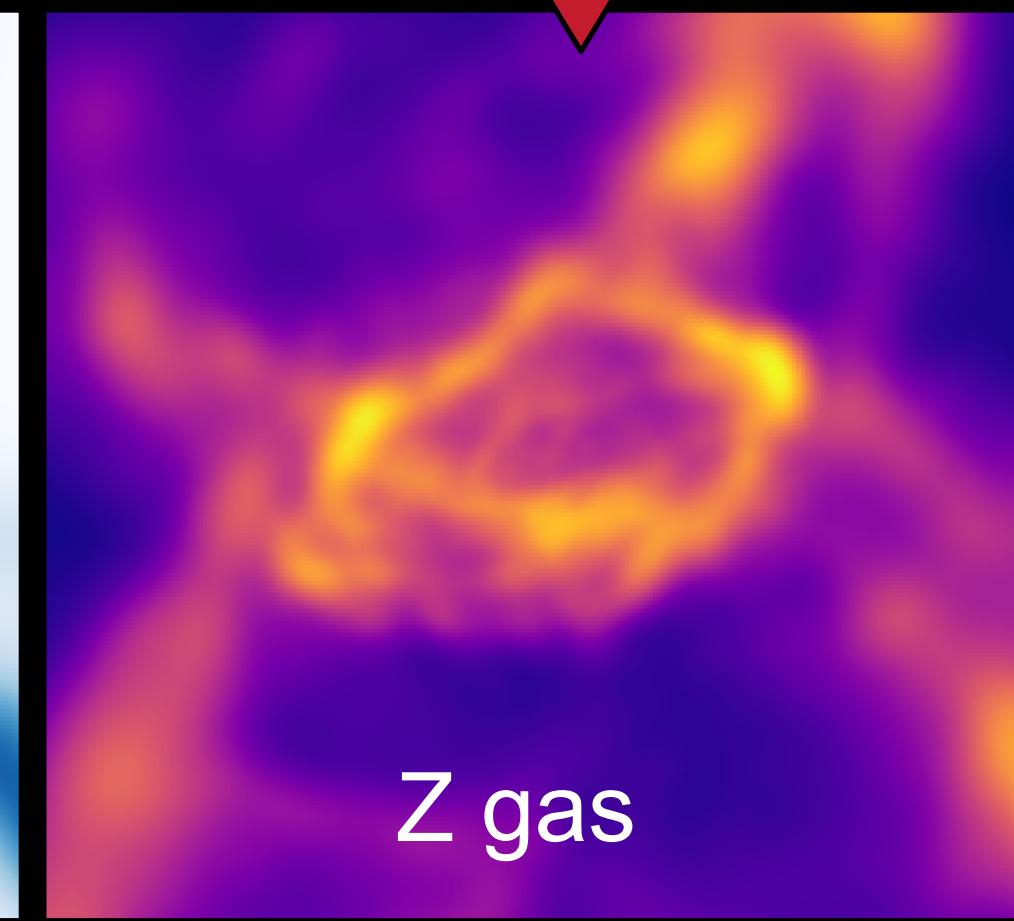
z-band



SFR



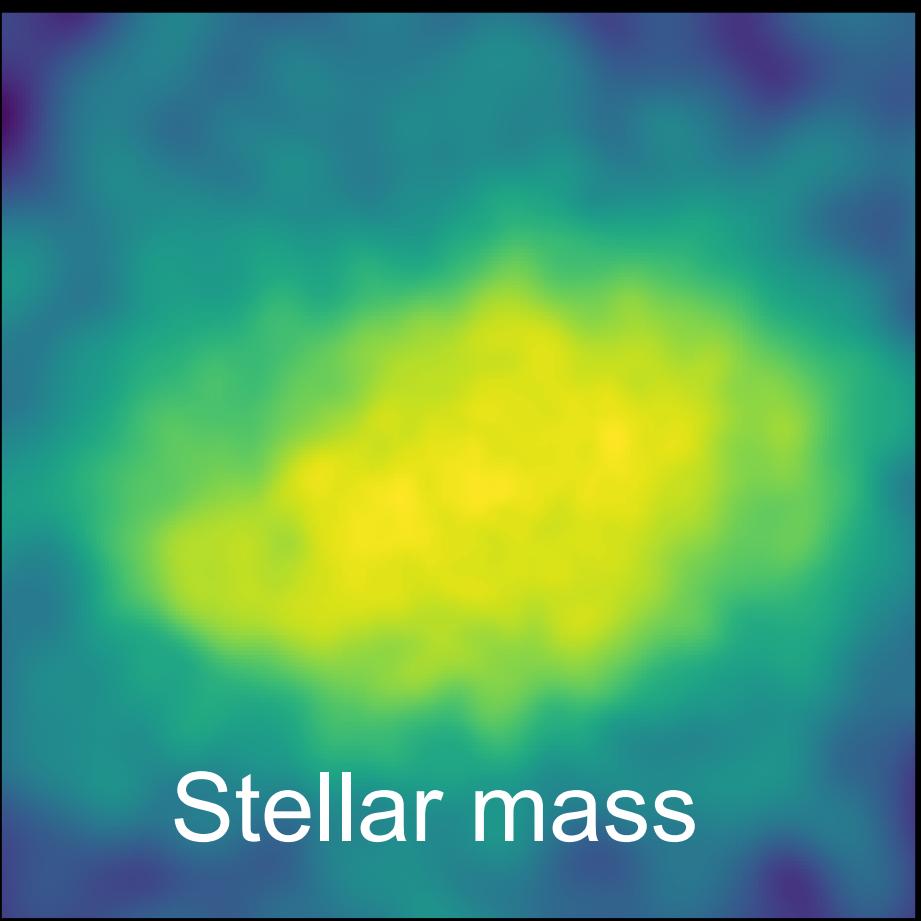
HI abundance



Z gas



Z star



Stellar mass

IMAGING DATA TO PHYSICAL PROPERTIES

u-band

g-band

r-band

i-band

z-band

- ▶ SDSS MOCK IMAGES 256X256 PIXELS TORREY+2014, SNYDER+2015
- ▶ RADIATIVE TRANSFER, BACKGROUND STARS, PSF, NOISE,
SURFACE BRIGHTNESS CUT
- ▶ PHYSICAL PROPERTIES ON SAME SCALE

SFR

HI abundance

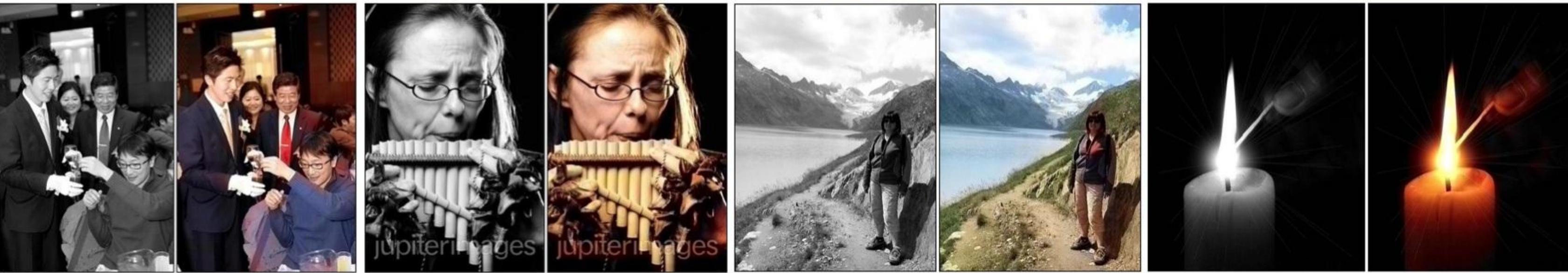
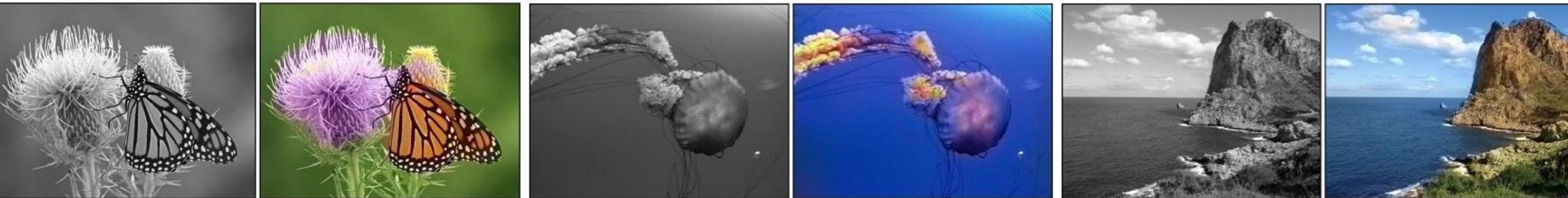
Z gas

Z star

Stellar mass

SIMILAR APPLICATIONS

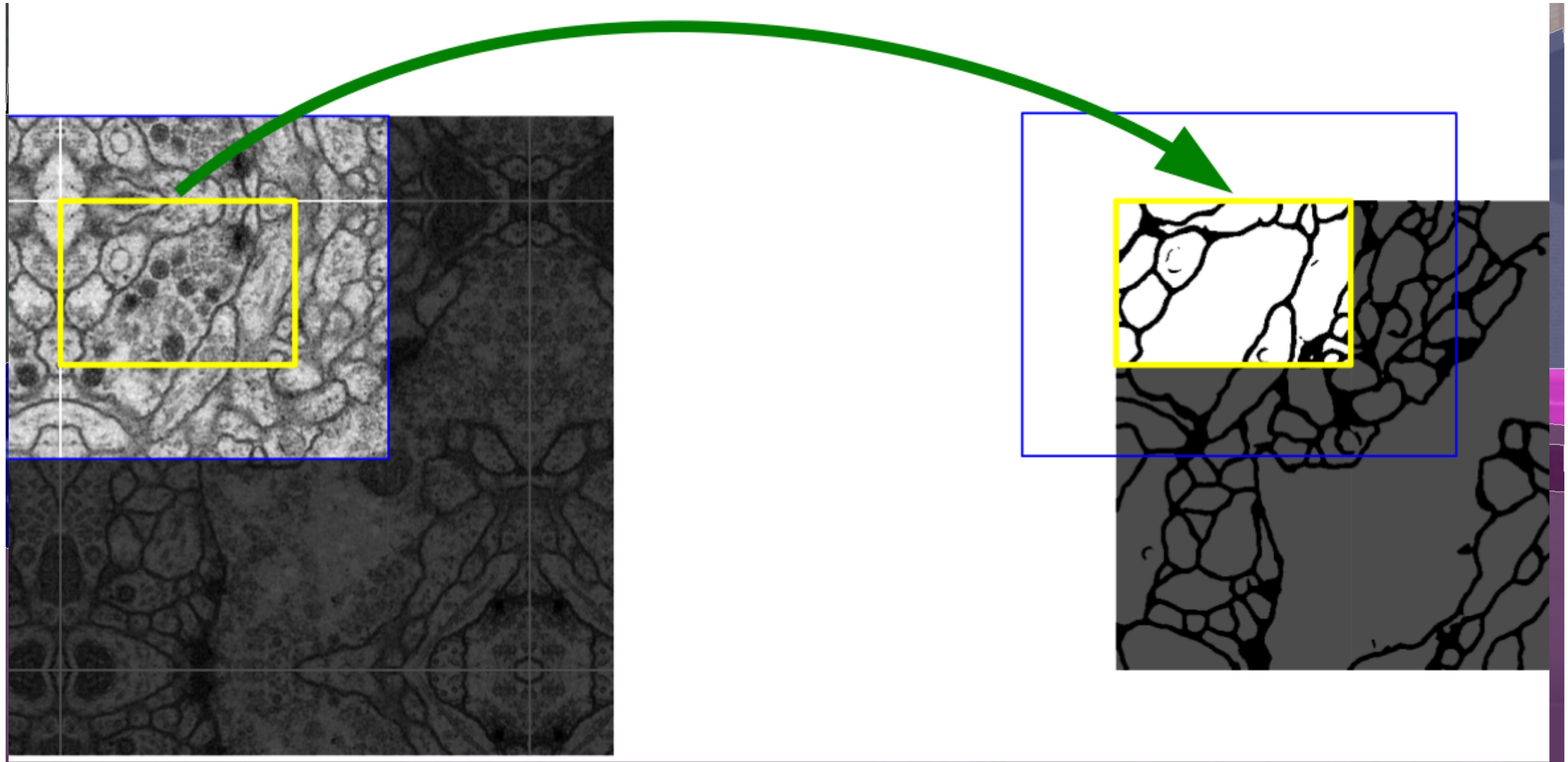
SIMILAR APPLICATIONS



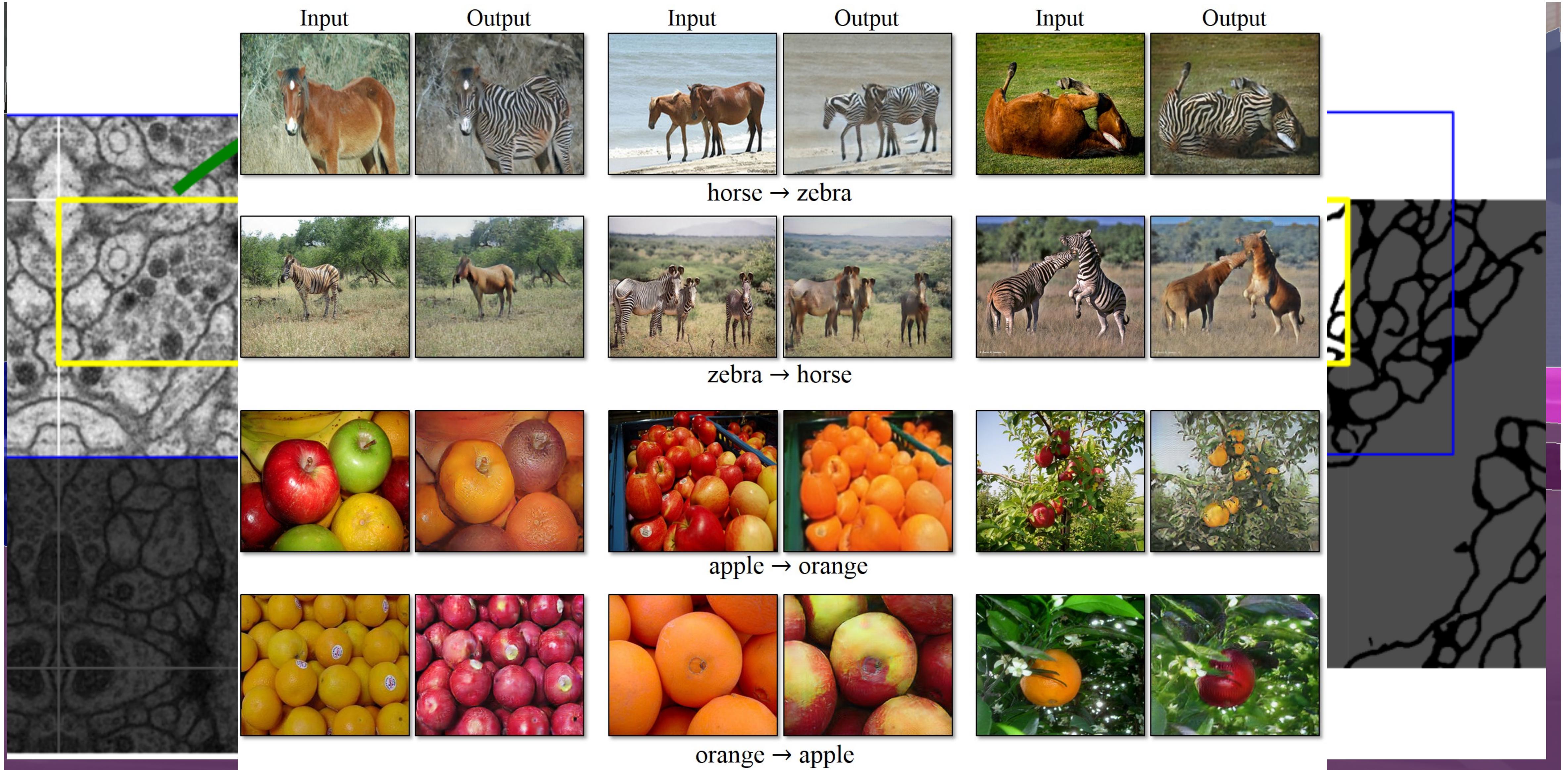
SIMILAR APPLICATIONS



SIMILAR APPLICATIONS



SIMILAR APPLICATIONS



SIMILAR APPLICATIONS



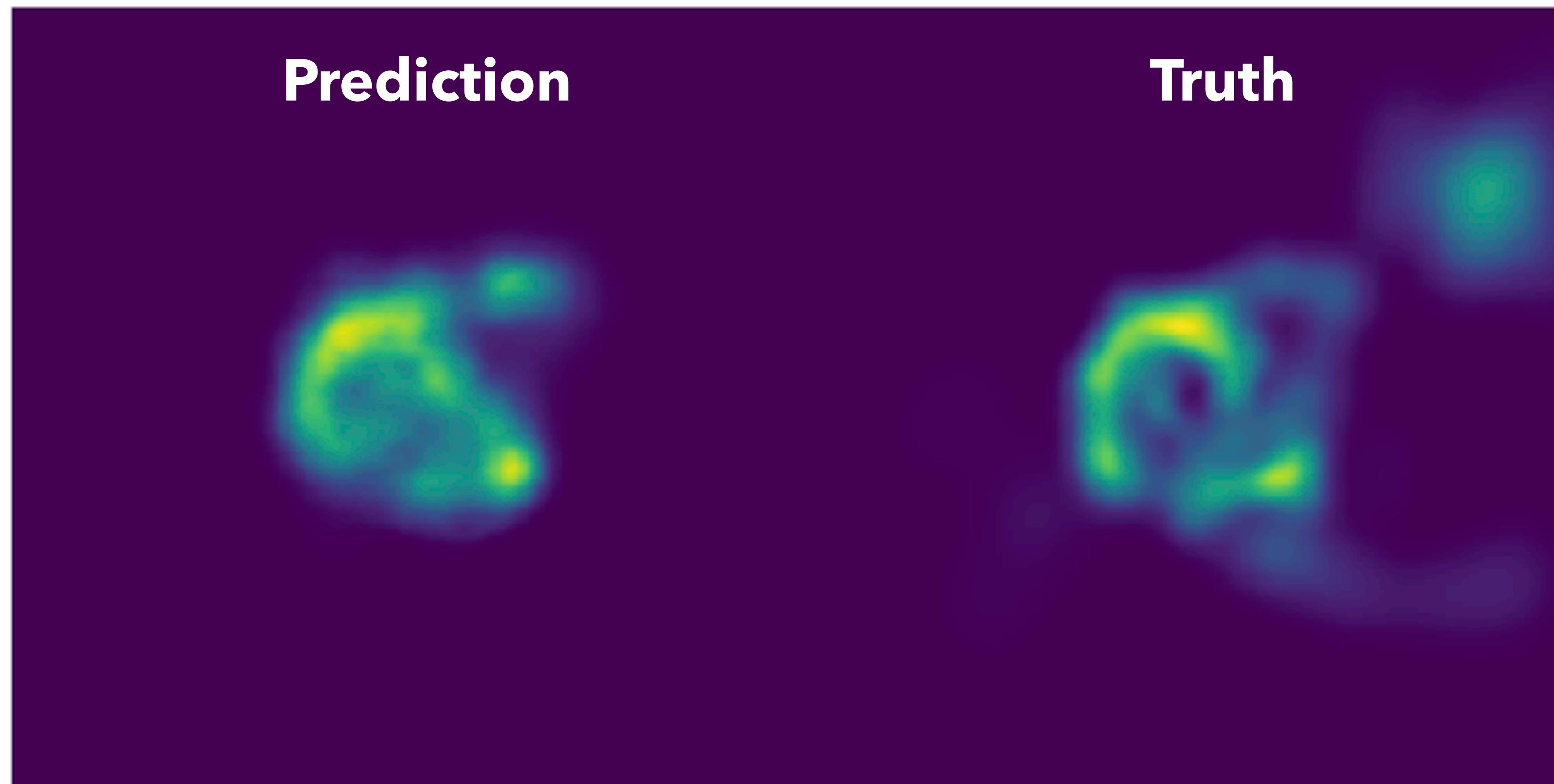
RESULTS

THE DATA CLEARLY PROVES THAT—

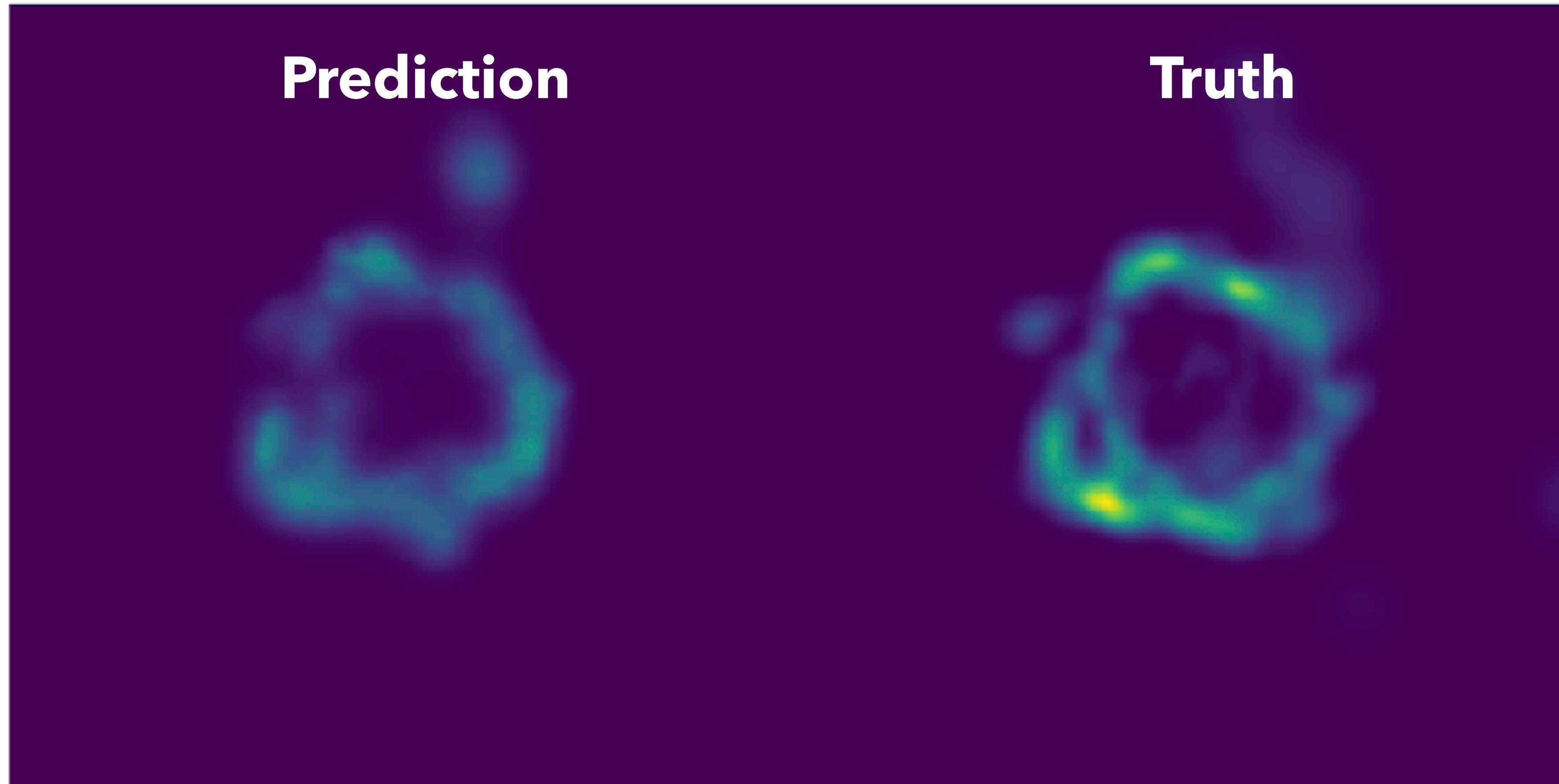
ARE YOU INDIANA JONES?
BECAUSE YOU'VE GOT A
LOT OF ARTIFACTS THERE,
AND I'M PRETTY SURE YOU
DIDN'T HANDLE THEM RIGHT.



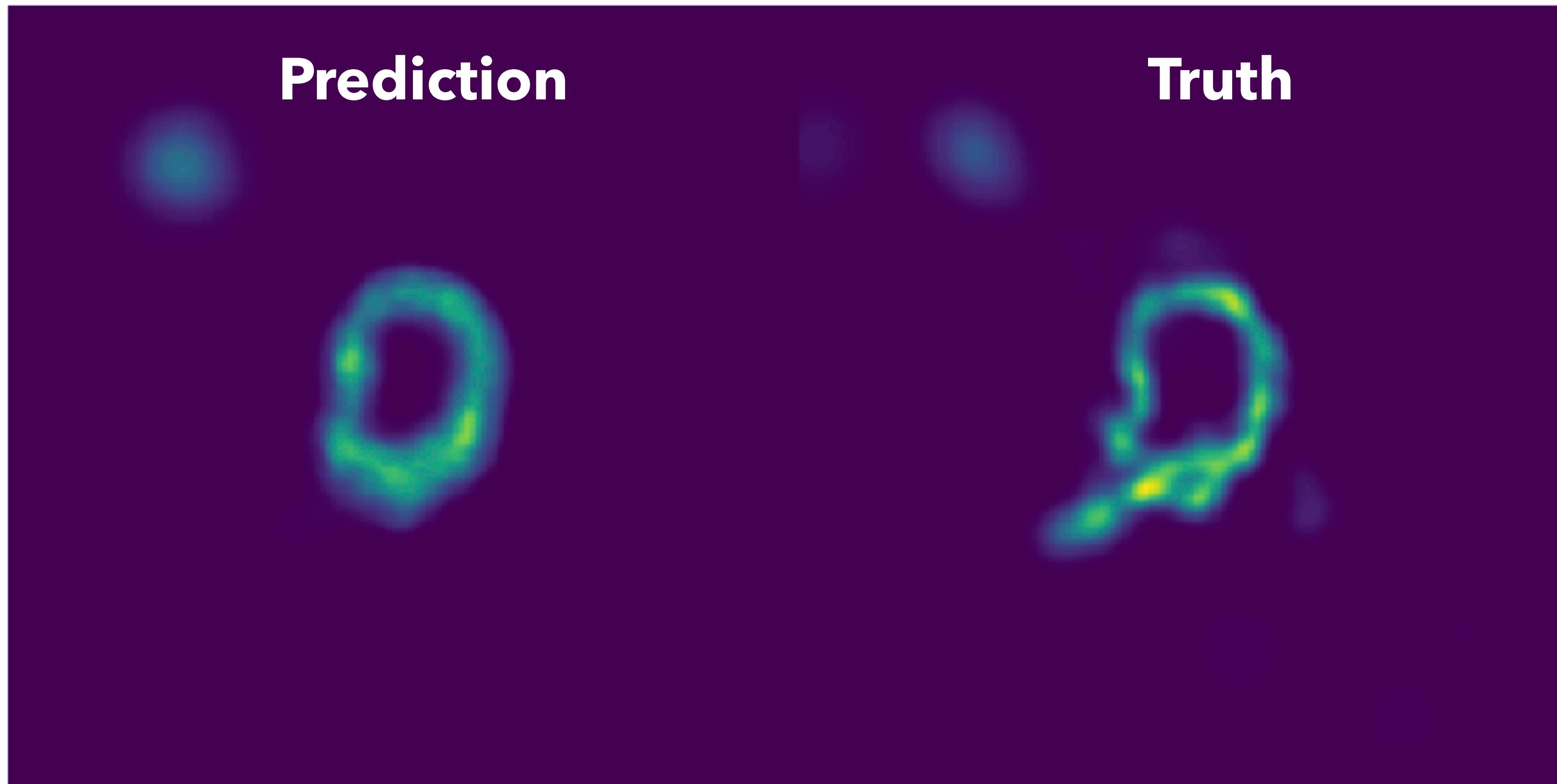
COMPARING TRUE AND PREDICTED SFR - 100TH QUANT.



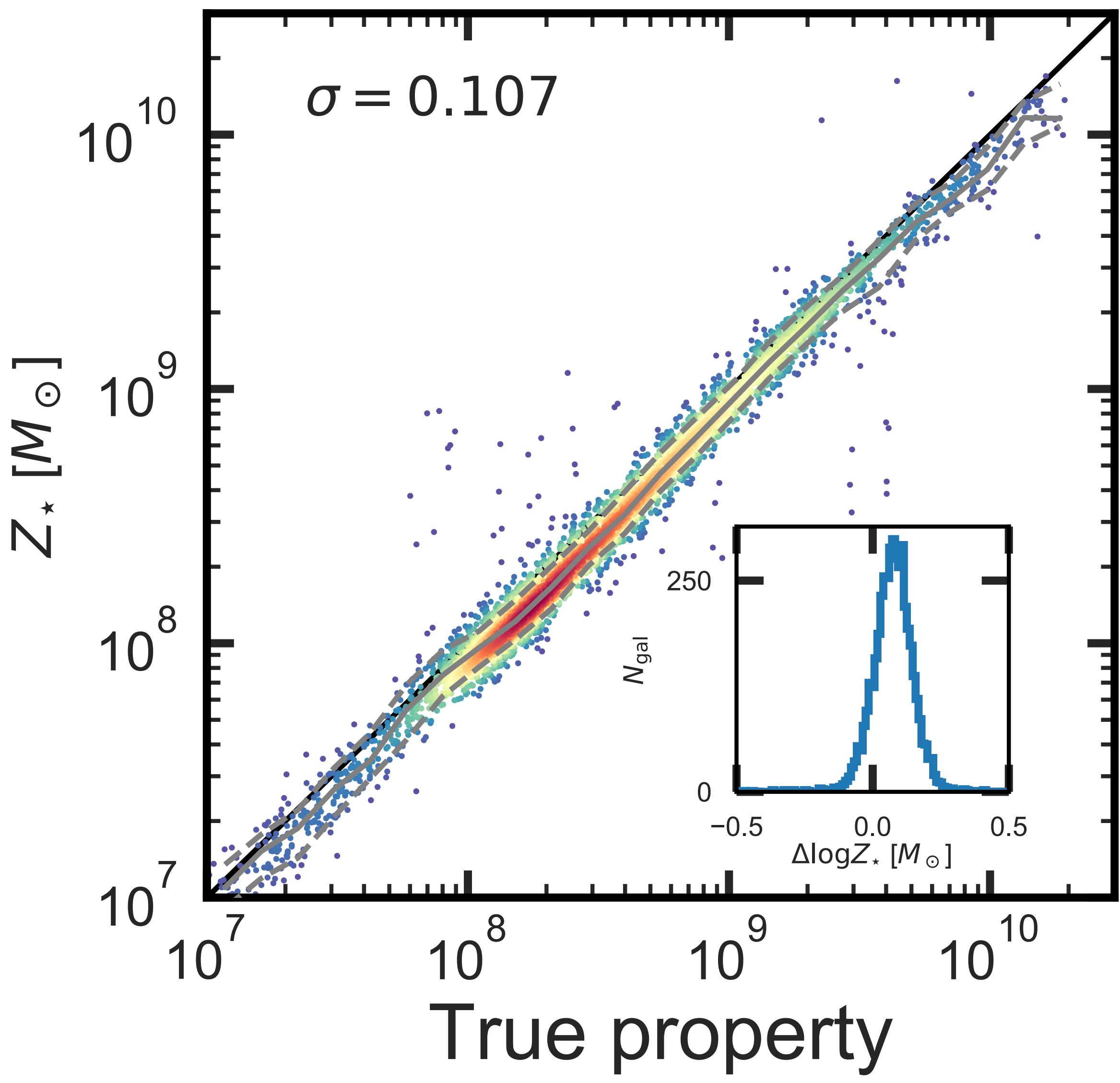
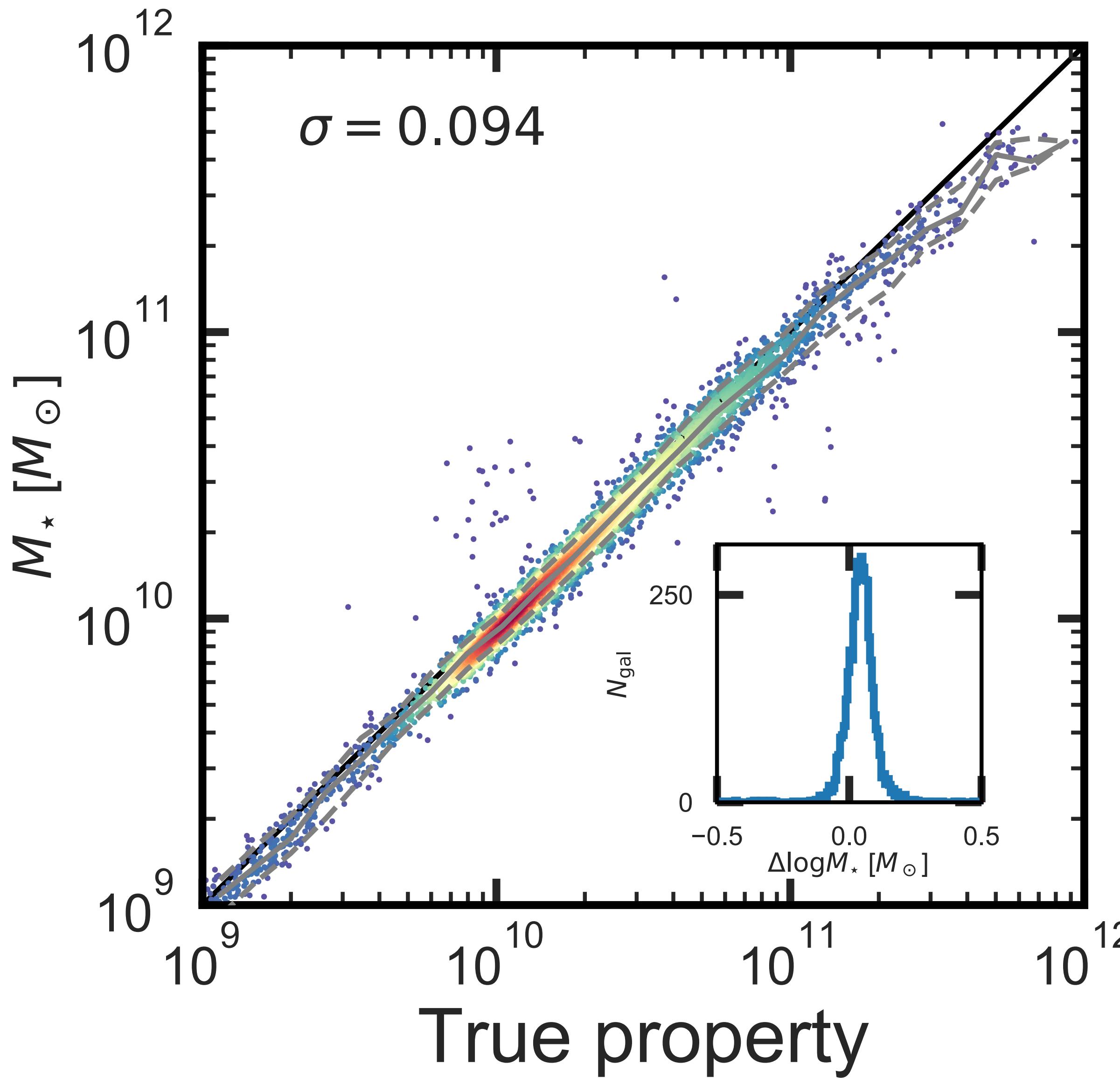
COMPARING TRUE AND PREDICTED SFR - 70TH QUANT.



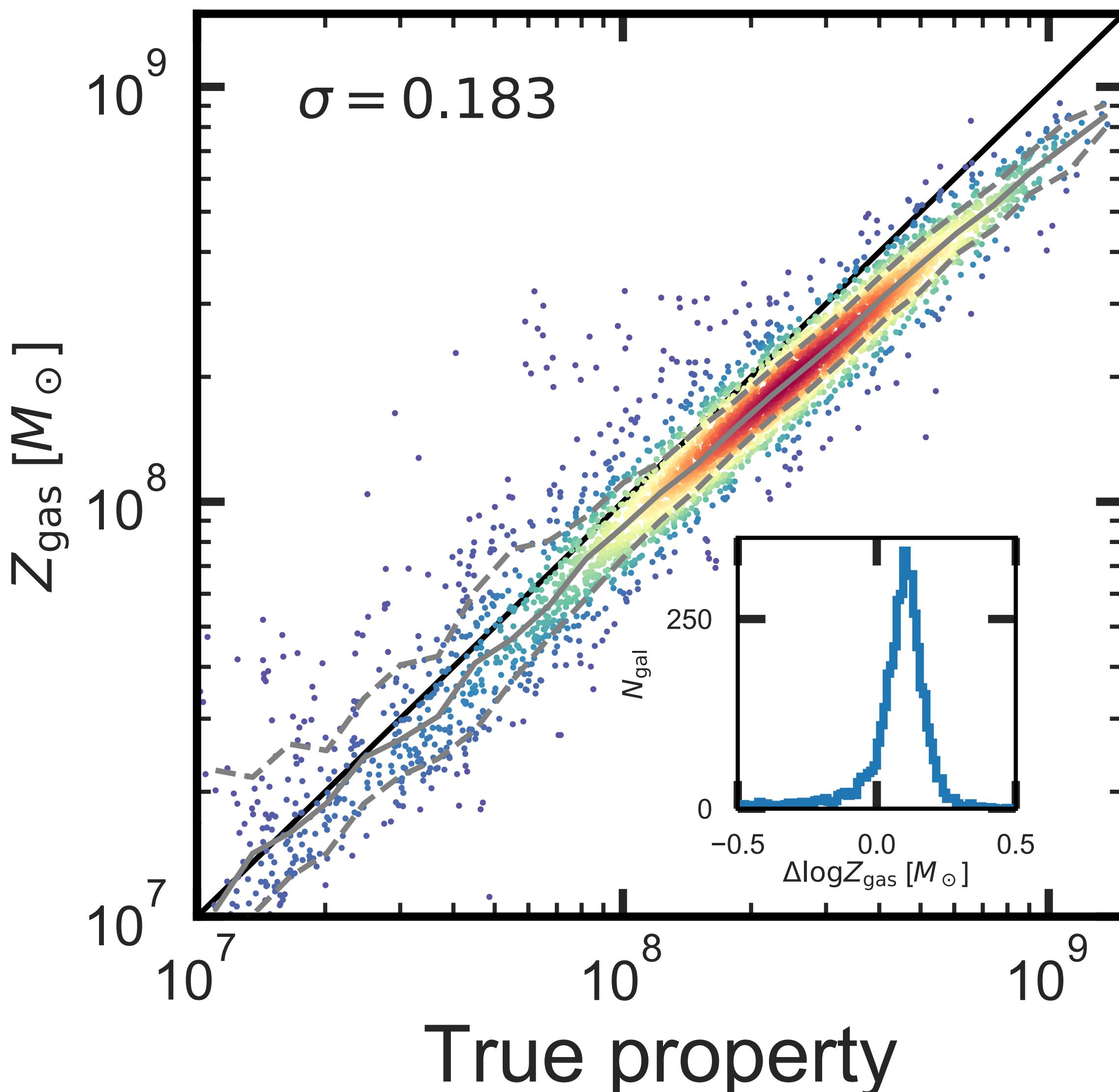
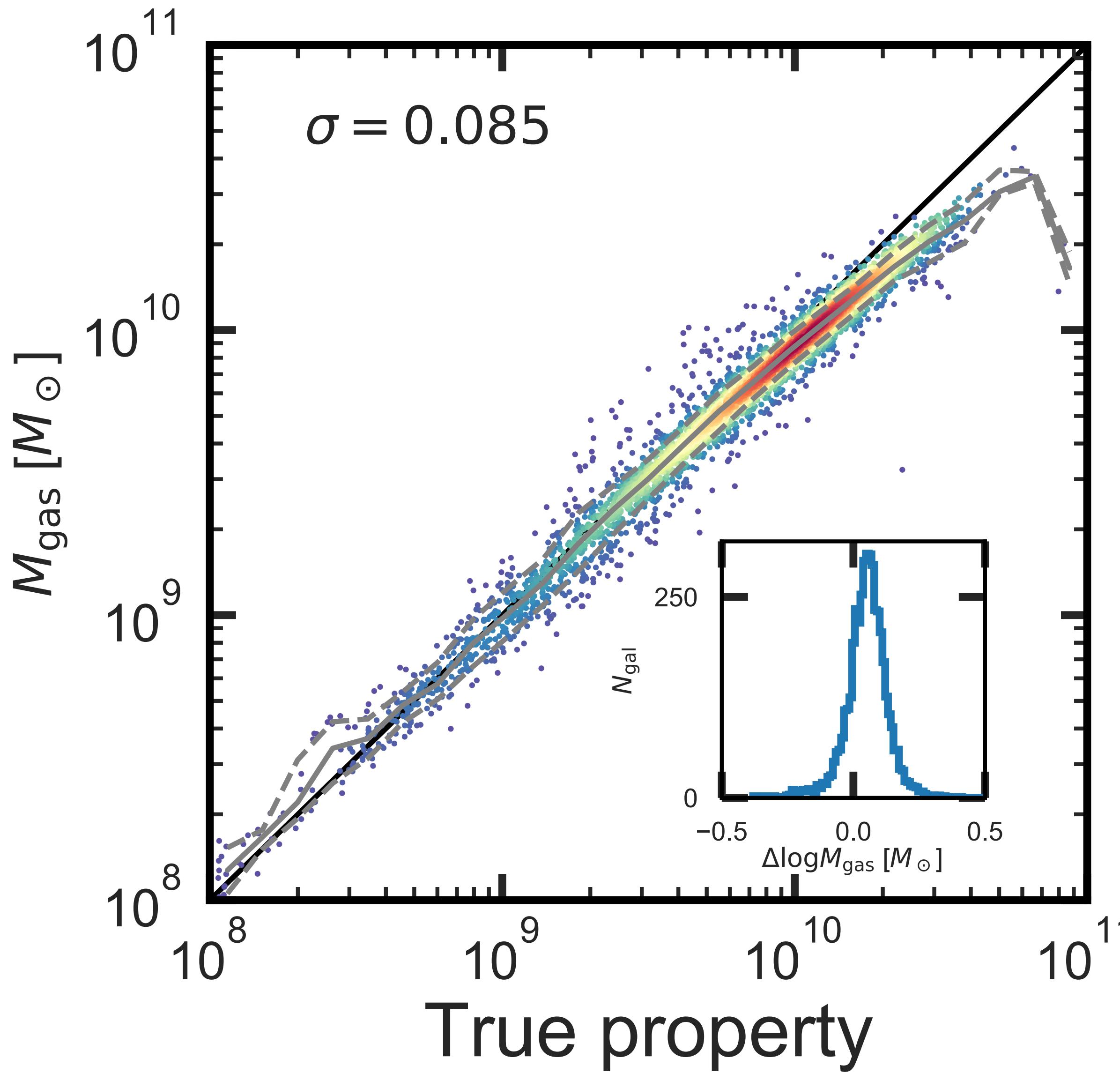
COMPARING TRUE AND PREDICTED SFR - 40TH QUANT.



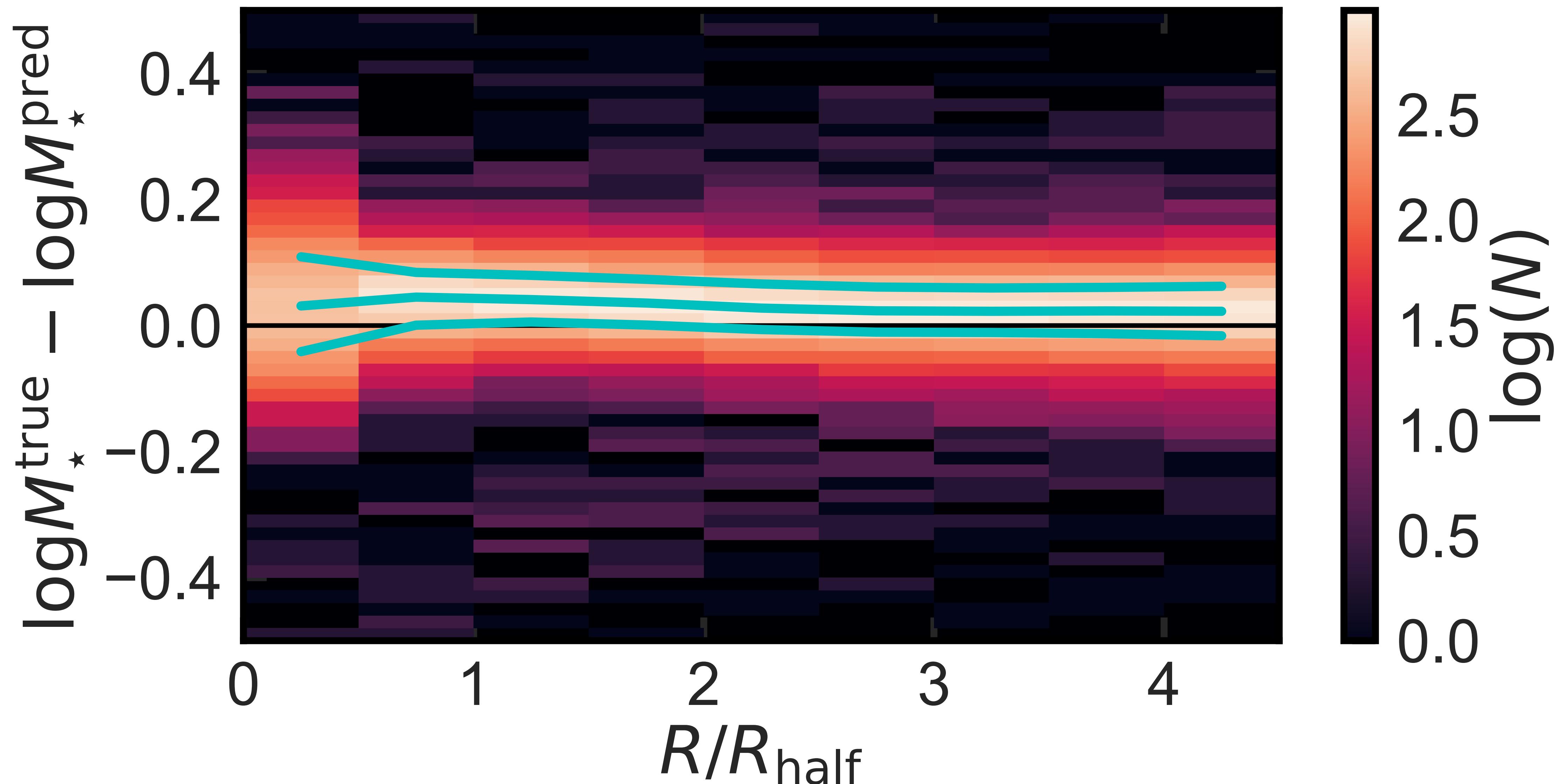
STELLAR PROPERTIES



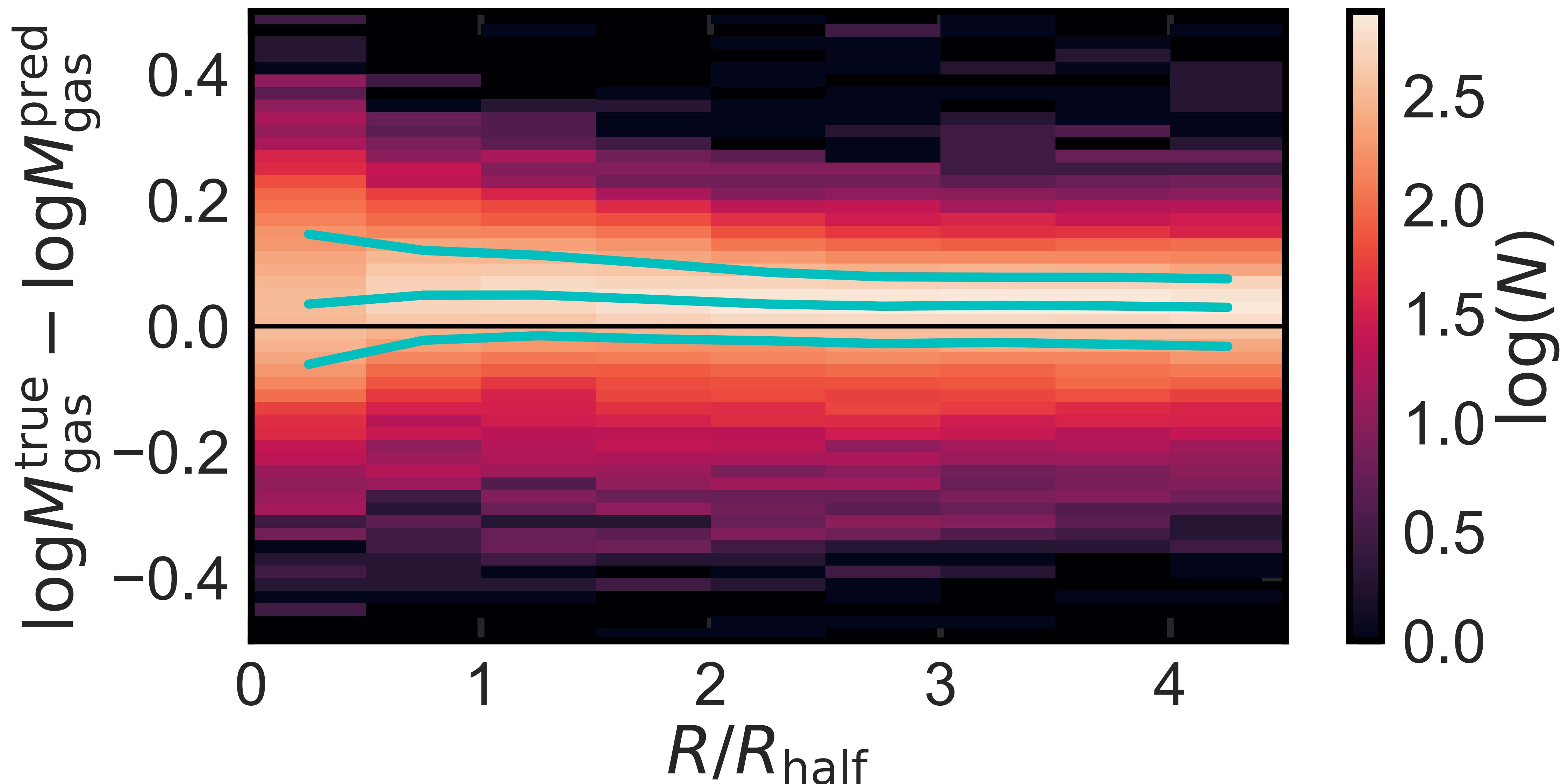
GASEOUS PROPERTIES



RADIAL SYSTEMATICS?



RADIAL SYSTEMATICS?



CONCLUSION

SDSS (MOCK) U, G, R, I, Z IMAGES CONTAIN ENOUGH INFORMATION TO *PREDICT* PHYSICAL PROPERTIES OF GALAXIES ON A *PIXEL-BY-PIXEL* BASIS

NEXT STEPS: REAL LIFE APPLICATION

USE PICASSO ON REAL SDSS IMAGES WITH SDSS MANGA, SAMI, OR CALIFA AS TRAININGS SAMPLE