CONSTRAINING THE EOS FROM GRAVITATIONAL-WAVE AND ELECTROMAGNETIC MEASUREMENTS

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Based on: **Weih**, Most and Rezzolla, ApJ (ApJ 881:73, 2019)

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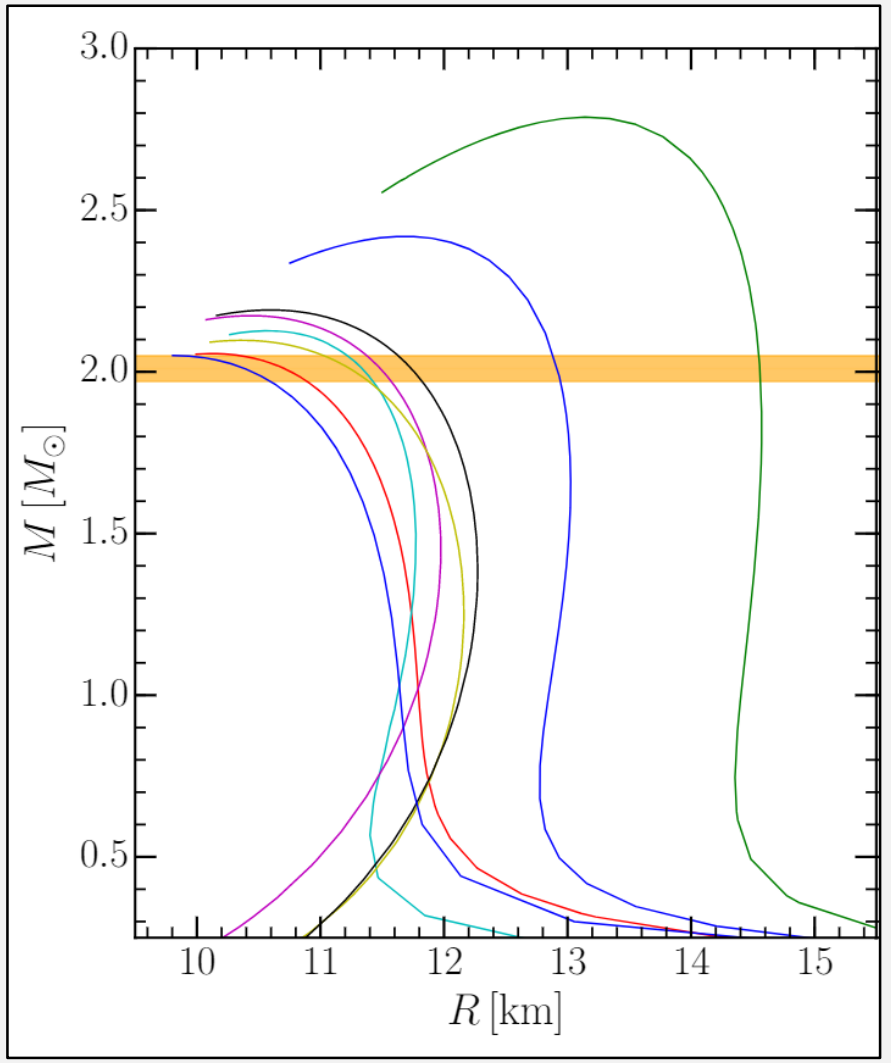
EOS VS. NEUTRON STARS: WHAT HAVE WE ALWAYS KNOWN?

1.) Antoniadis et al. (2013): $M_{TOV} > 1.97$

2.) Causality: $c_S < 1$

3.) pQCD: $c_S \to 1/\sqrt{3}$

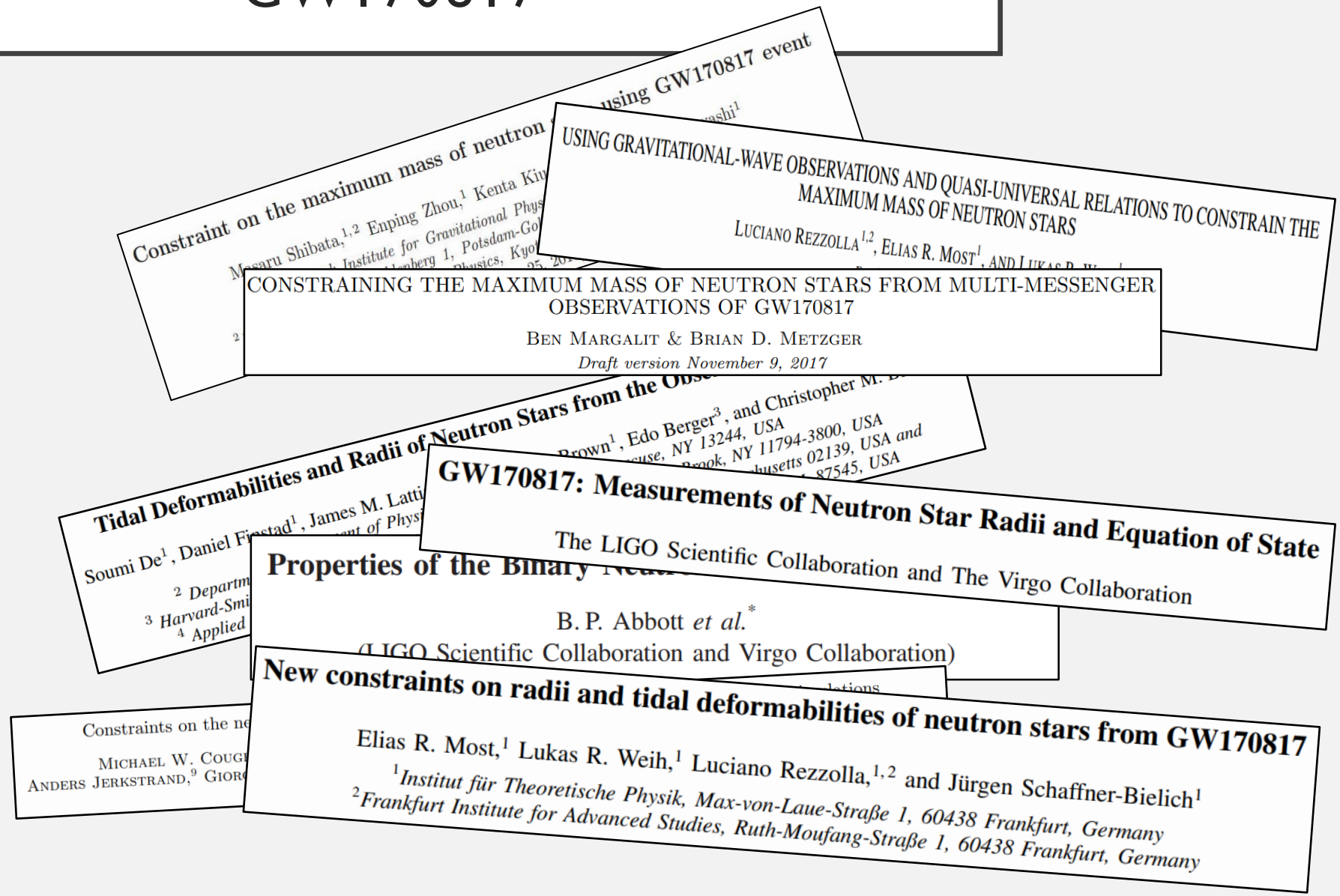


RECAP: WHAT DO WE KNOW FROM GW170817

1.) $M_{TOV} < 2.2$

2.) $\Lambda_{1.4} < 580$

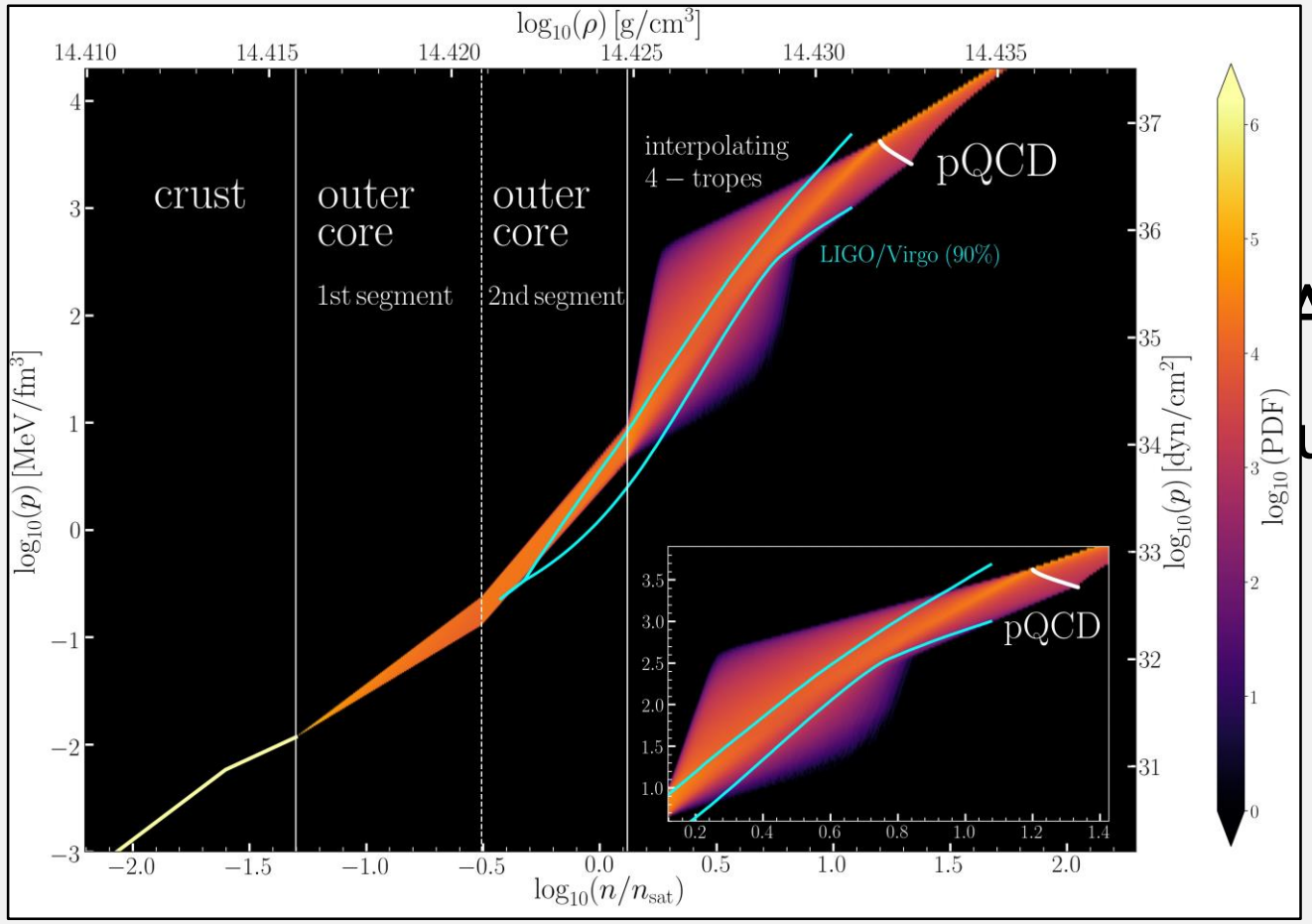
3.) $\Lambda_{1.4} > 290$



GIVEN THESE CONSTRAINTS, HOW WELL WILL NS-RADIUS MEASUREMENTS FURTHER CONSTRAIN THE EOS?

HOW DO WE ASSESS THIS?

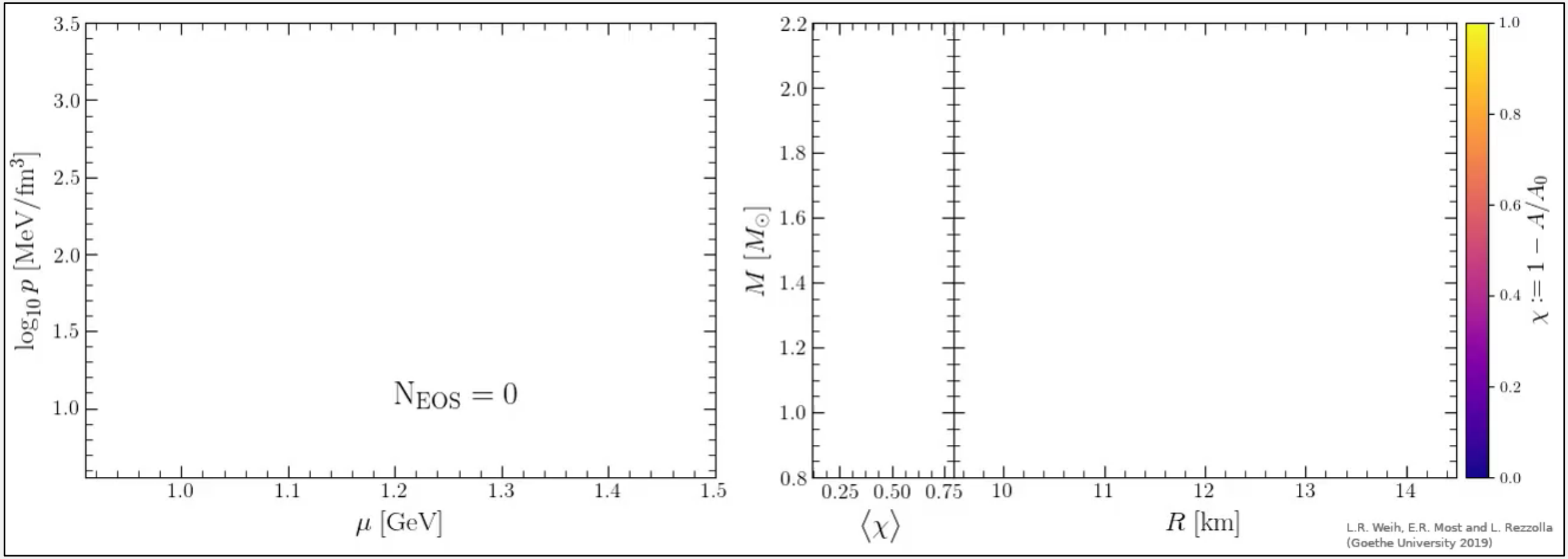
1.) Compute EOSs (~10^7) via parametrization



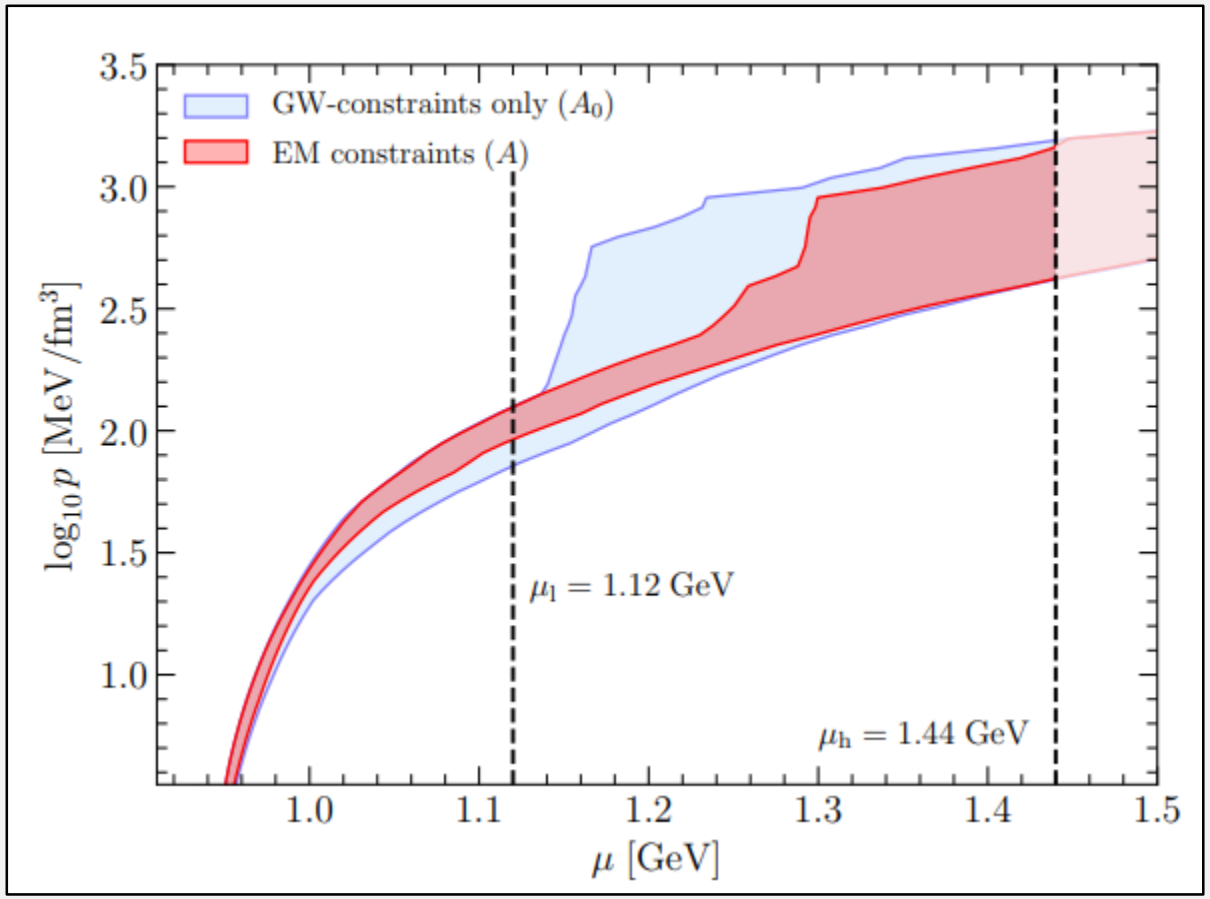
A_0

us measurement

HOW DO WE ASSESS THIS?



LOW- AND HIGH-DENSITY REGIME



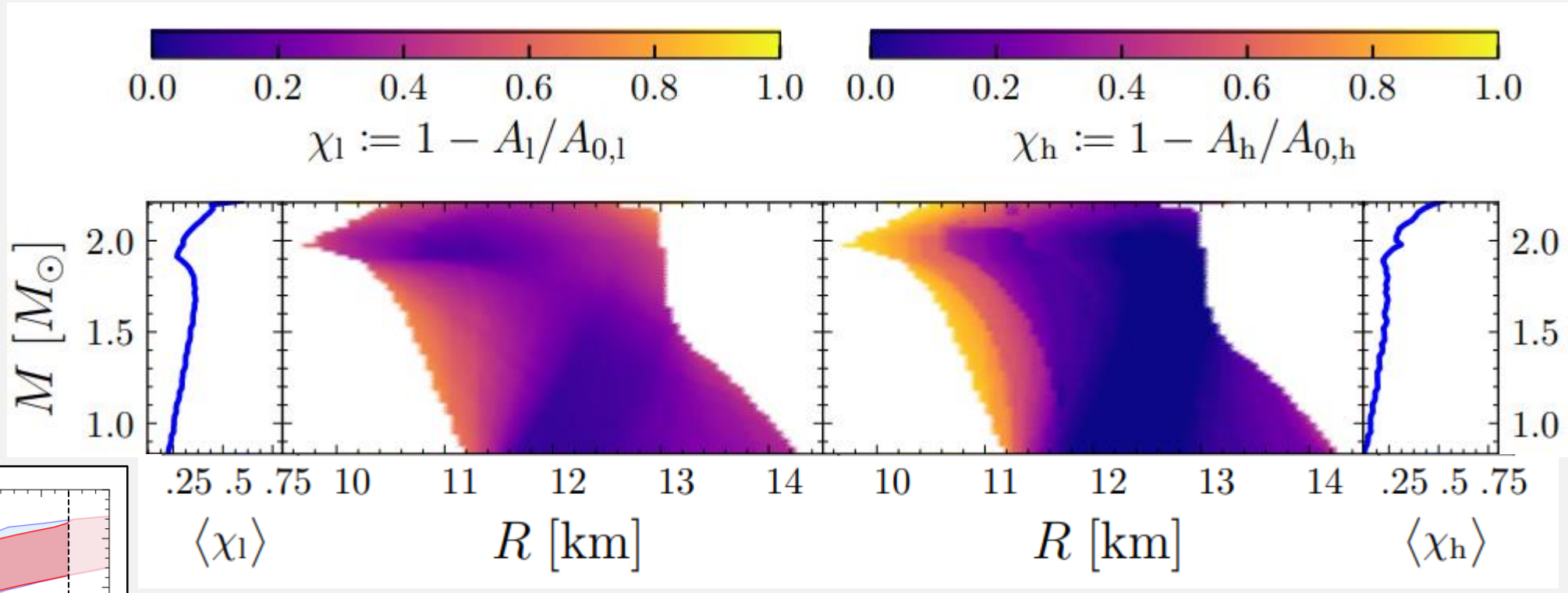
Low density:

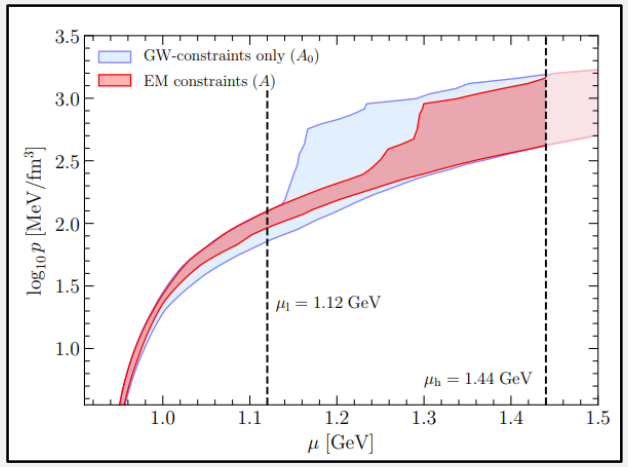
$\mu < 1.12 GeV$

High density:

$1.12\text{GeV} < \mu < 1.44 GeV$

RESULTS





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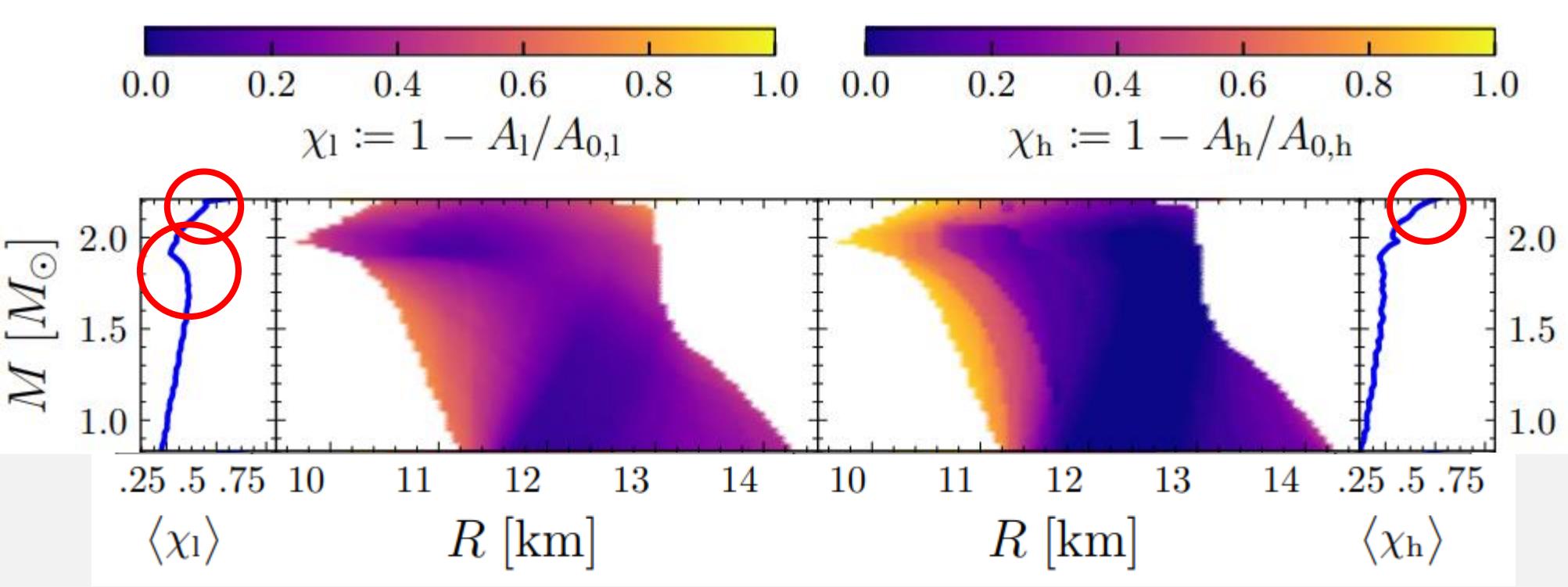
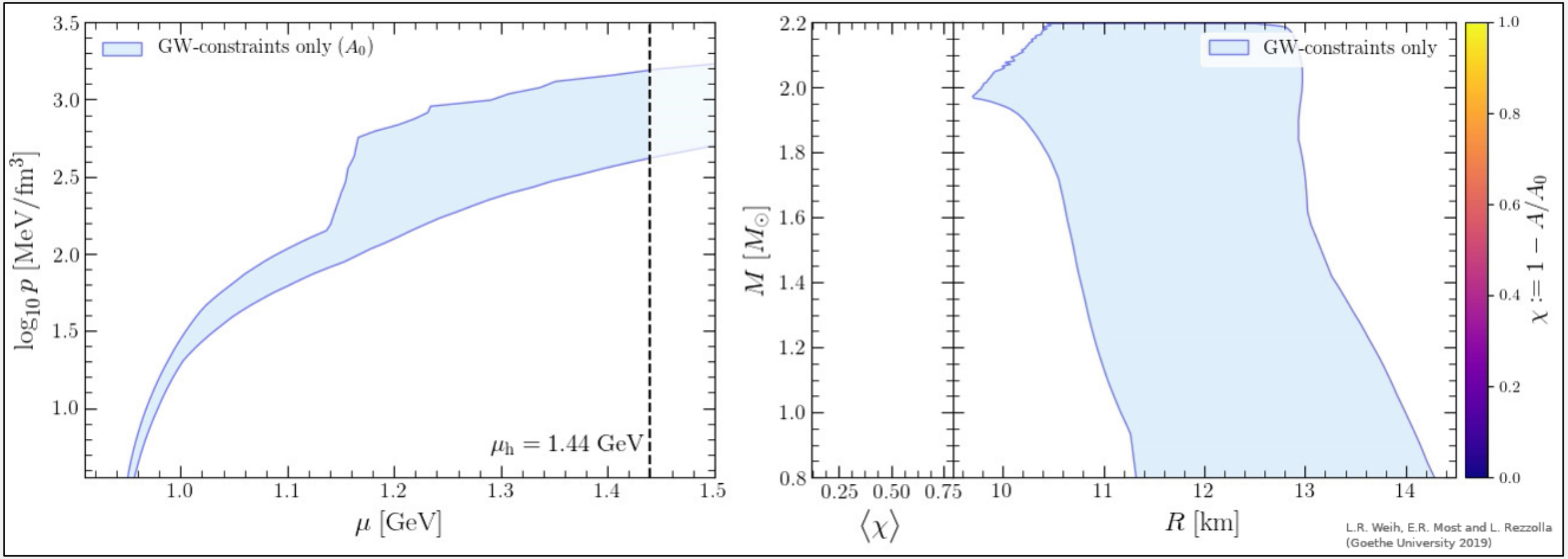


High mass gives best constraints

Optimal range at $M \sim 1.8 M_\odot$ for low density

WHAT IF WE ALREADY HAVE A MEASUREMENT?

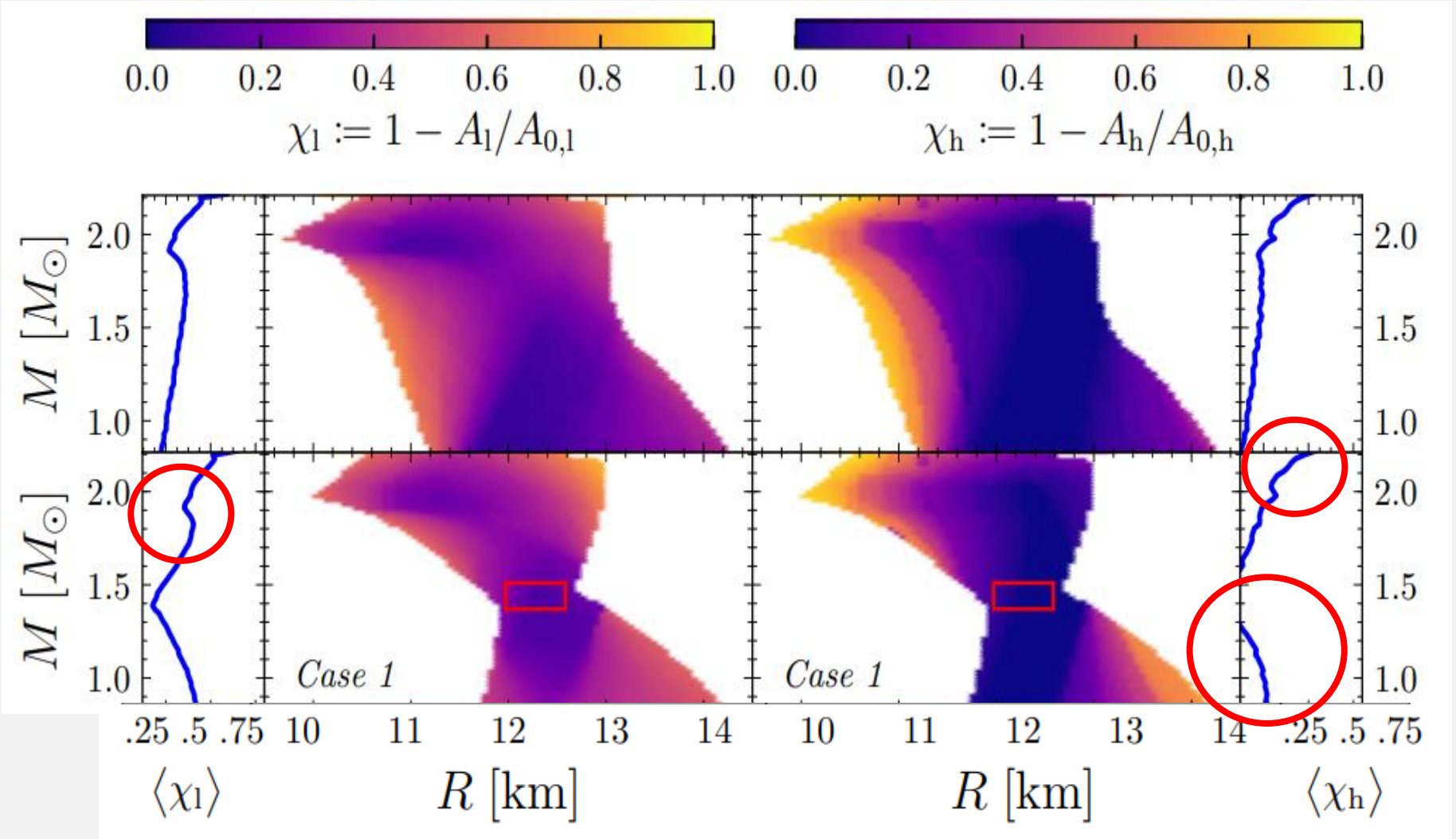


RESULTS

Optimal range at $M \sim 1.8 M_\odot$ for low density

High mass gives best constraints

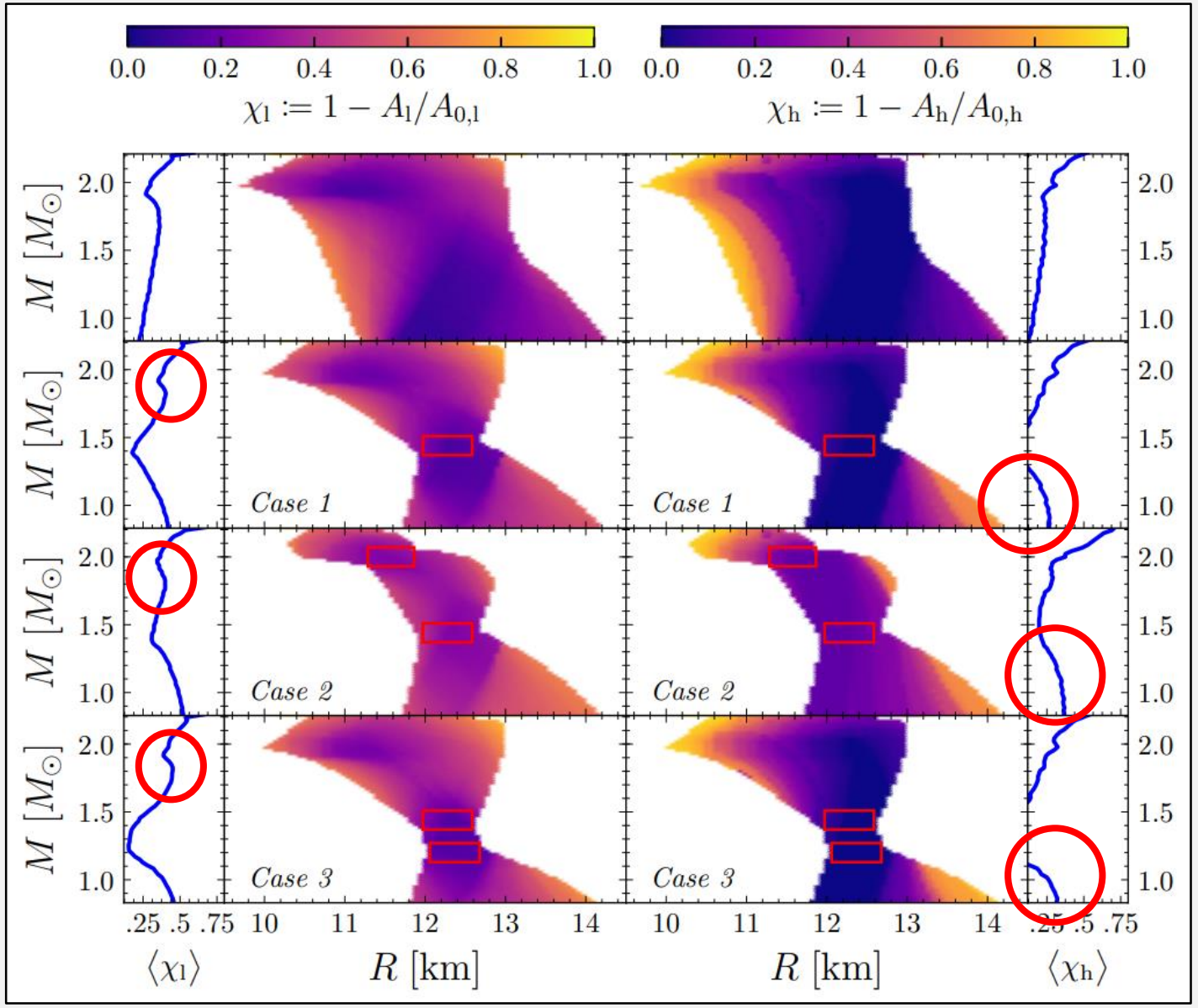
Low mass stars also seem to give good constraints



RESULTS

Same behavior for all cases considered

Averages should be interpreted carefully!

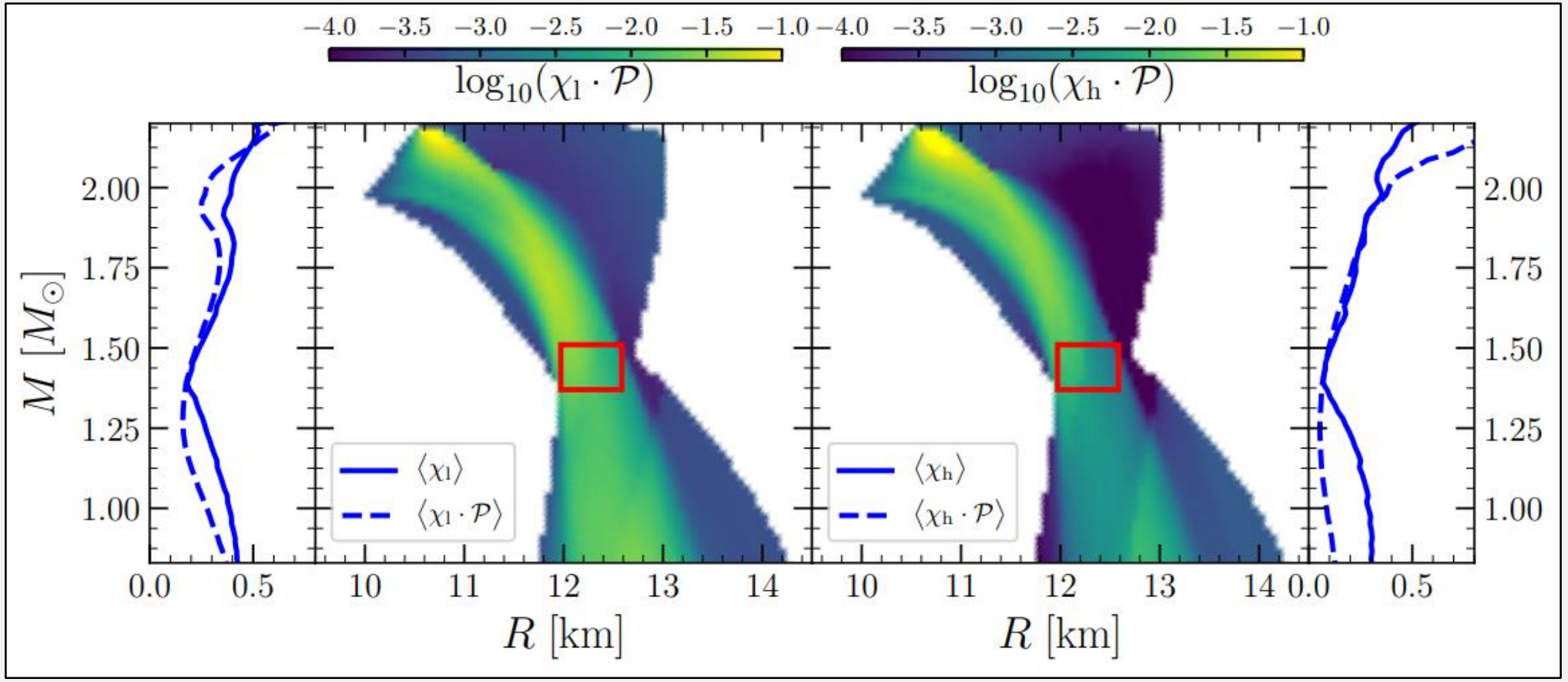


RESULTS

Averages should be interpreted carefully!

How likely does an observation of a NS with given mass yield good constraints?

Probability weighted χ



CONCLUSION

1.) Massive NS give best constraints

2.) Optimal range at $M \sim 1.8 M_{\odot}$ for low density

3.) Low-mass NS might give good constraints, but unlikely

OUTLOOK

Do the same thing for whatever type of constraint and decide wheather it‘s worth the effort