

Title: Nuclear Equation of State Discussion 1

Date: Jun 20, 2011 12:00 PM

URL: <http://pirsa.org/11060075>

Abstract:

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# MICRA 2011



# Discussions



# Nuclear EOS Discussion Points

- EOS requirements for simulations: What is needed?
- Low-density non-NSE EOS: Matching issues to NSE EOS.  
How do people deal with this?
- Future directions: **What's next?**  
(theory/experiment/simulations)
- other things?

# Nuclear EOS Discussion Points

- NS/supernova EOS:  
What do the astrophysical/experimental/theoretical constraints mean for simulations?
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**MICRA 2011** Discussions

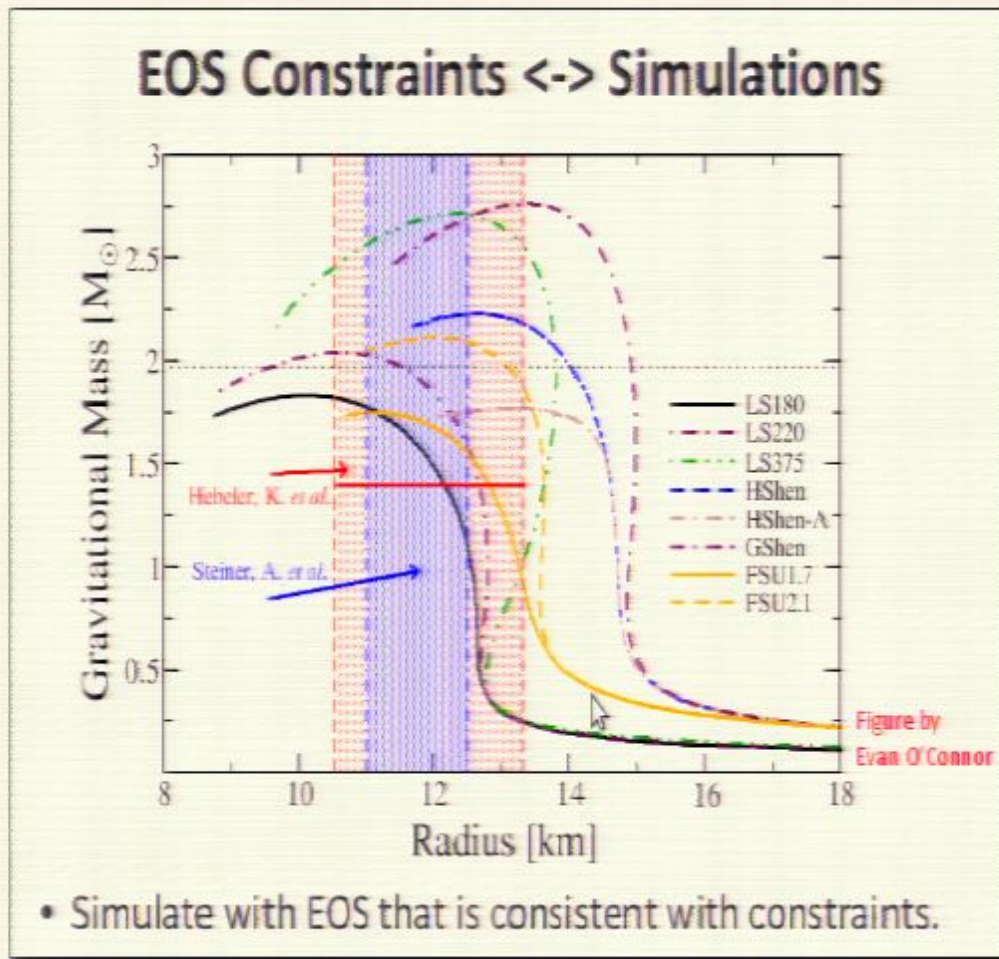
Slide 2

Recent EOS Discussions/Notes

Slide 3

EOS Constraints <-> Simulations

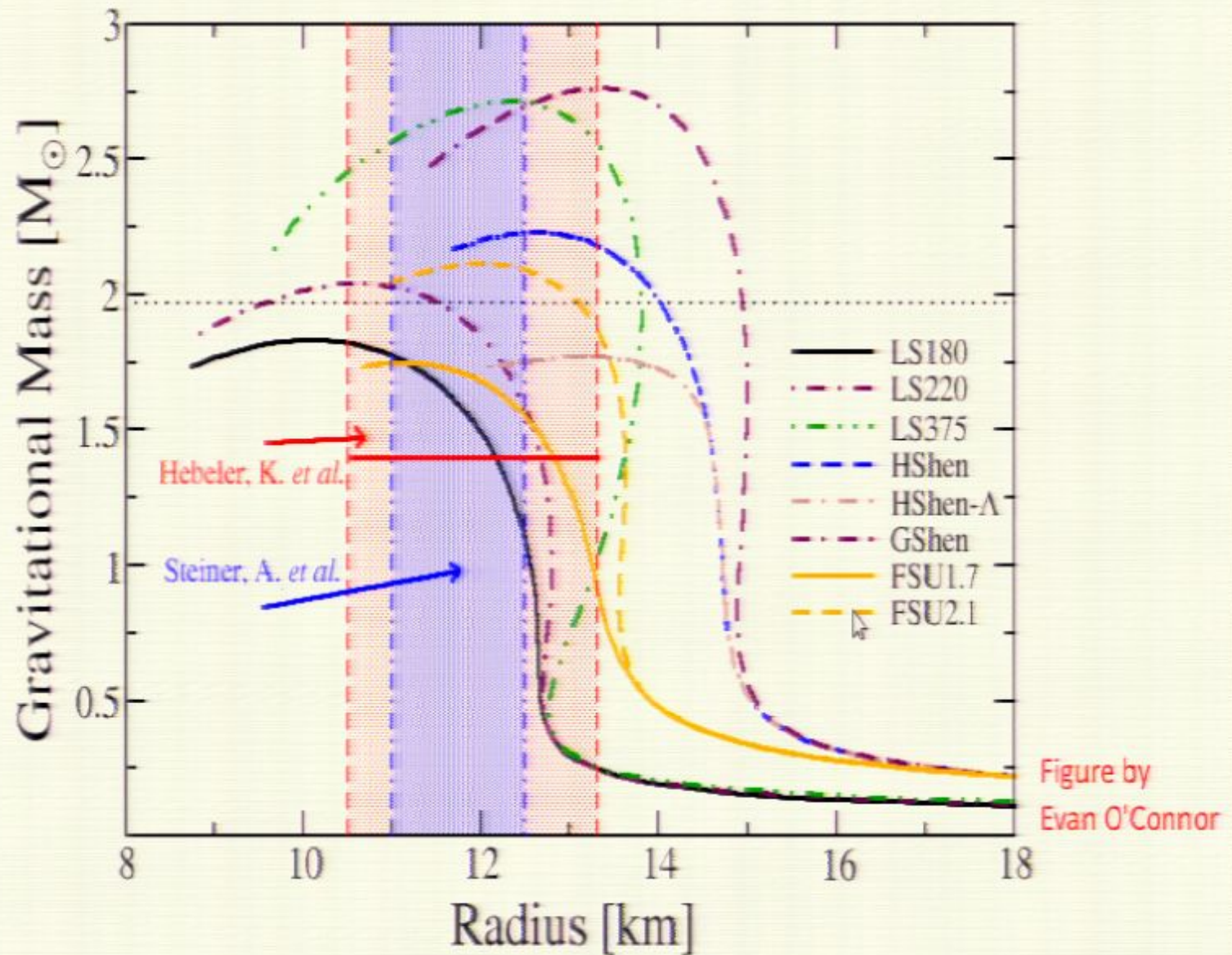
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# EOS Constraints <-> Simulations





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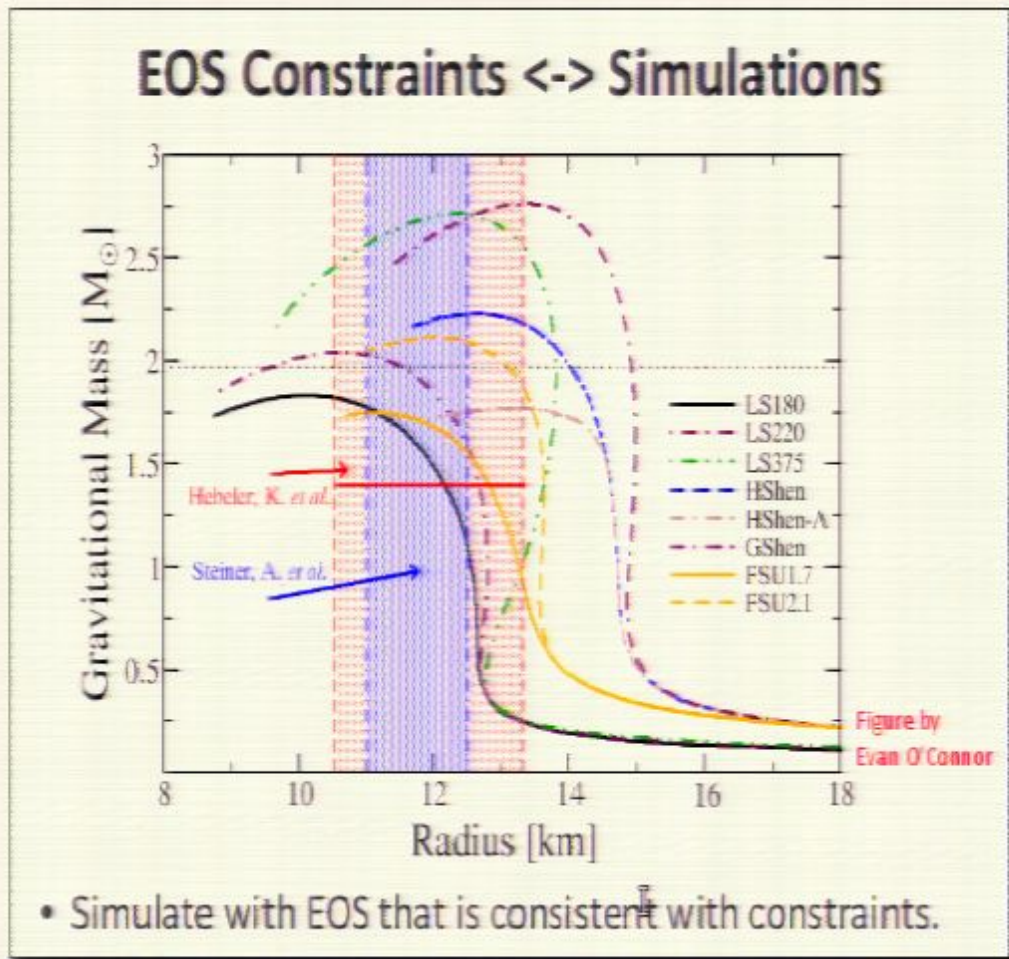
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Recent OOP Discussion Papers

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EOS Constraints <-> Simulations

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• Simulate with EOS that is consistent with constraints.



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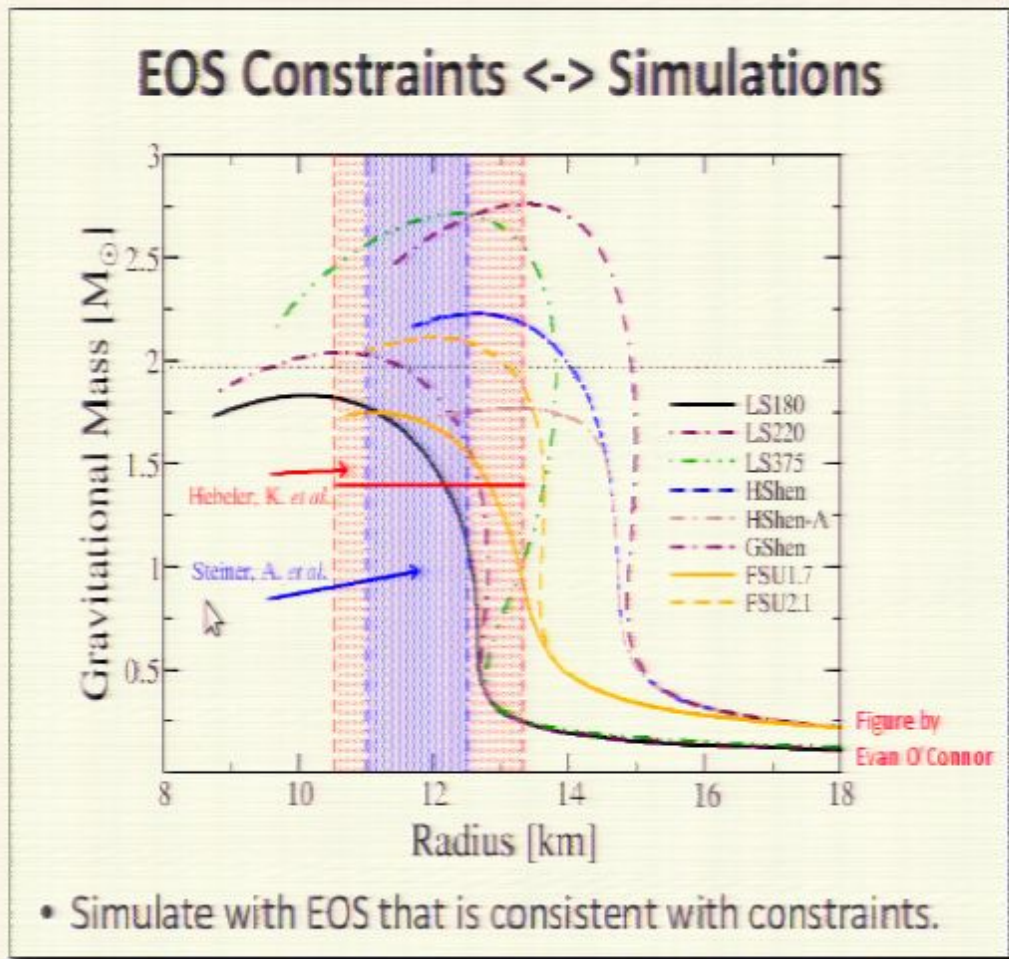
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EOS Constraints <-> Simulations

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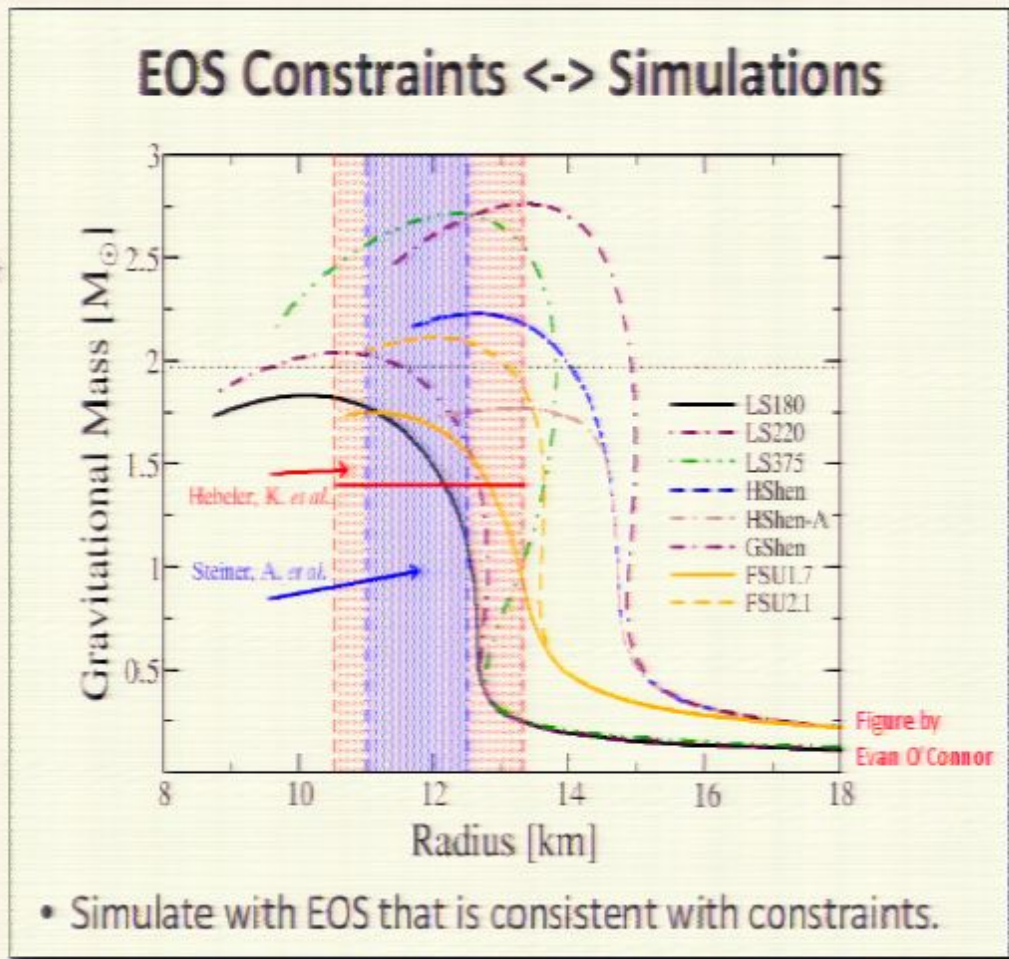
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EOS Constraints <-> Simulations

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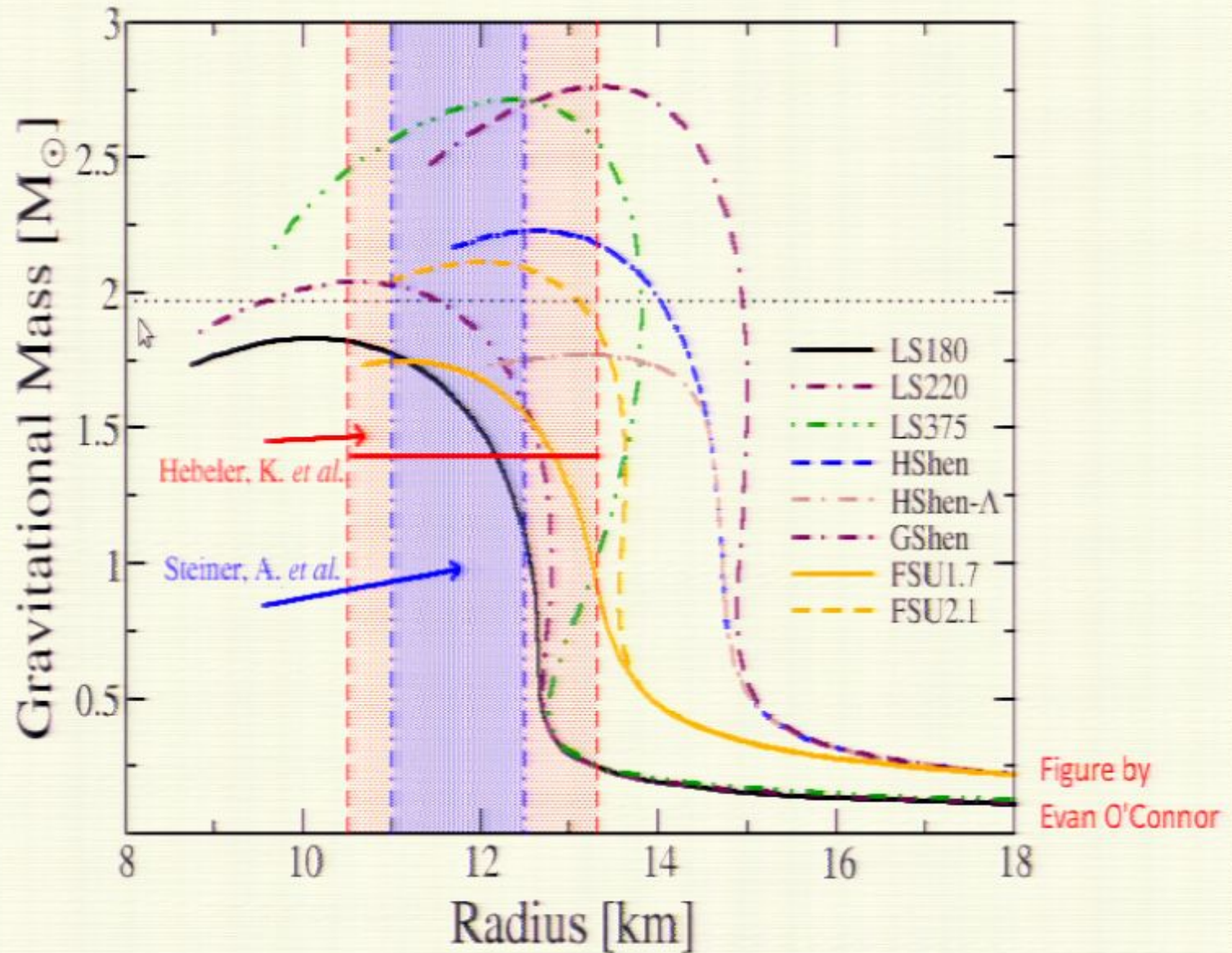
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# EOS Constraints <-> Simulations



# What can be done about this?

- Intermediate/Long term:  
What knobs can we turn?  
What can be improved?  
What's missing?

# What can be done about this?

- Short term: LS 220 okay.  
What if maximum mass larger than  $2 M_{\text{Sun}}$ ?  
Make new LS EOS with different  $S_V, K_0$ ?
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Discussions

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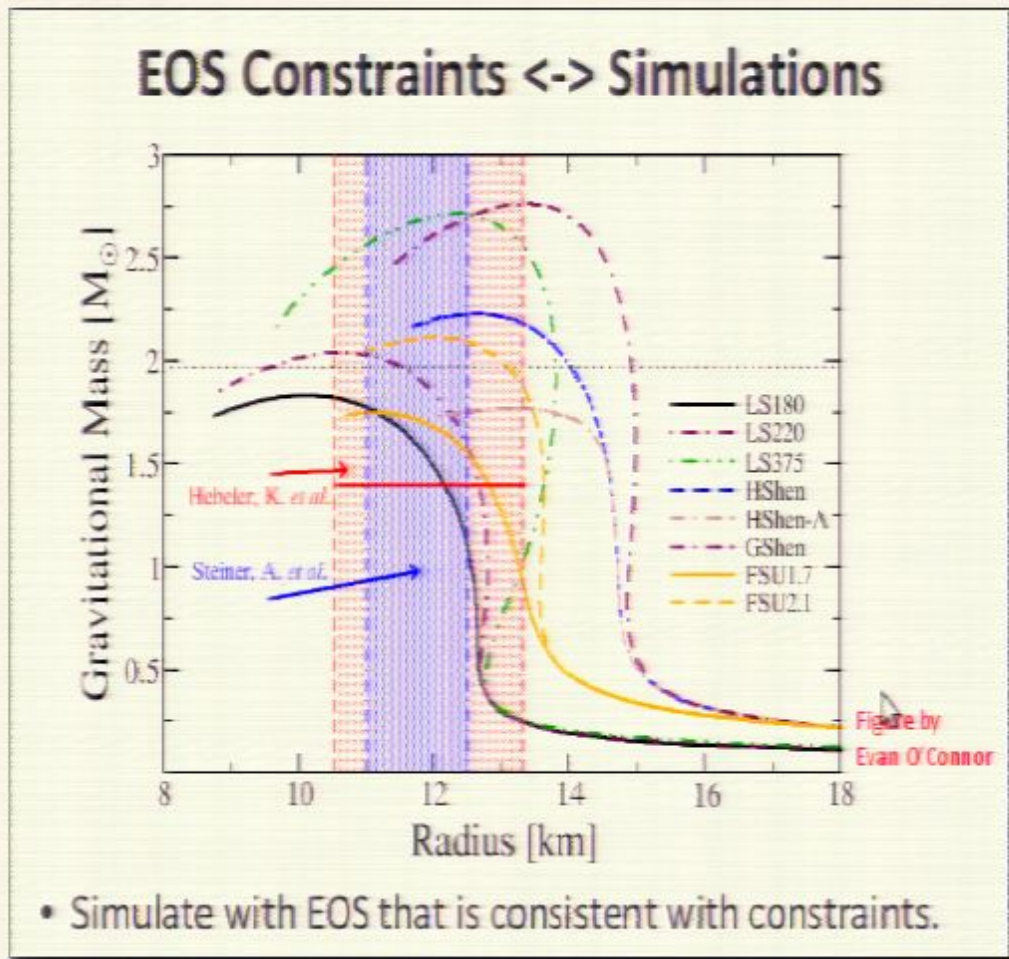
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• Simulate with EOS that is consistent with constraints.

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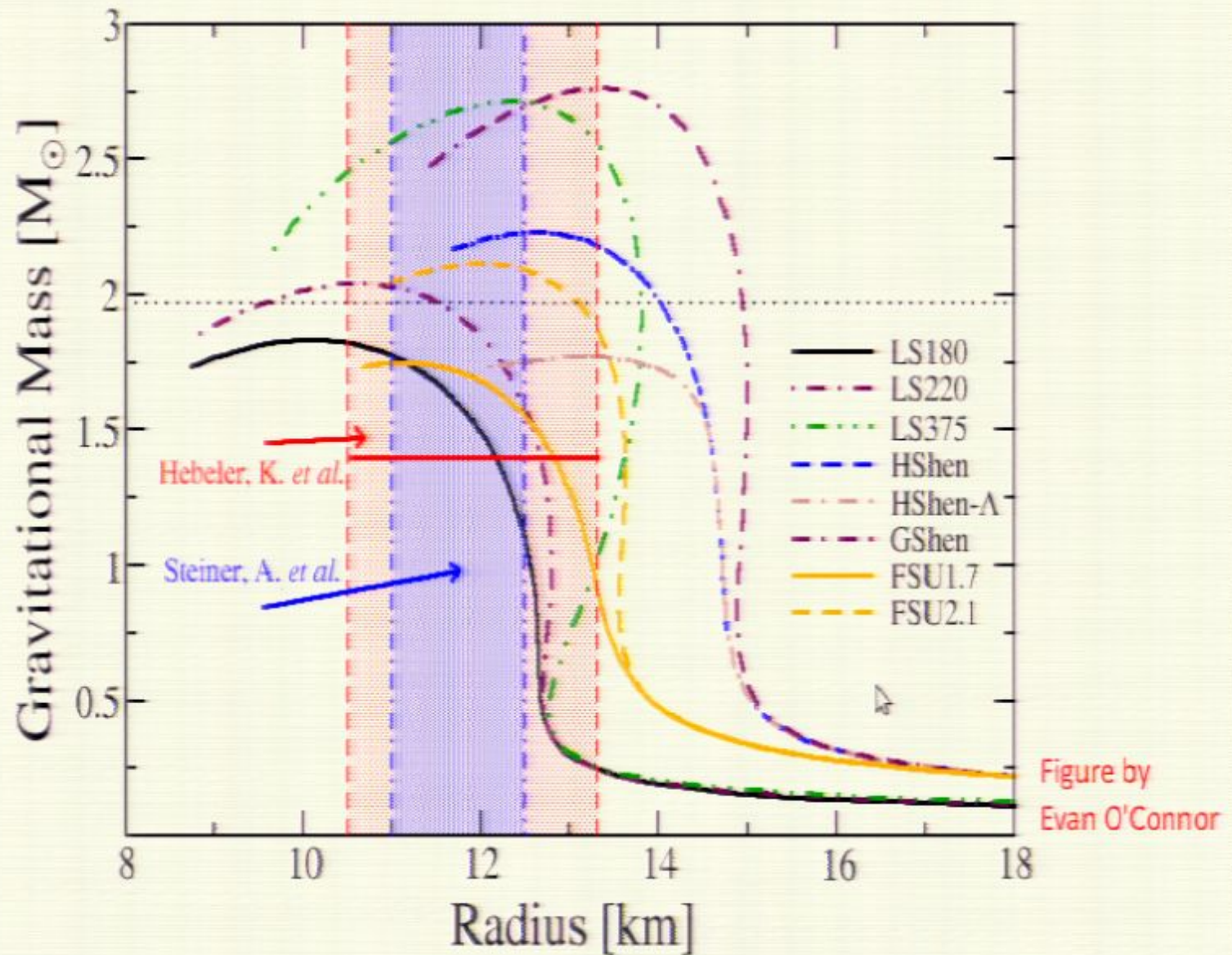
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# EOS Constraints <-> Simulations





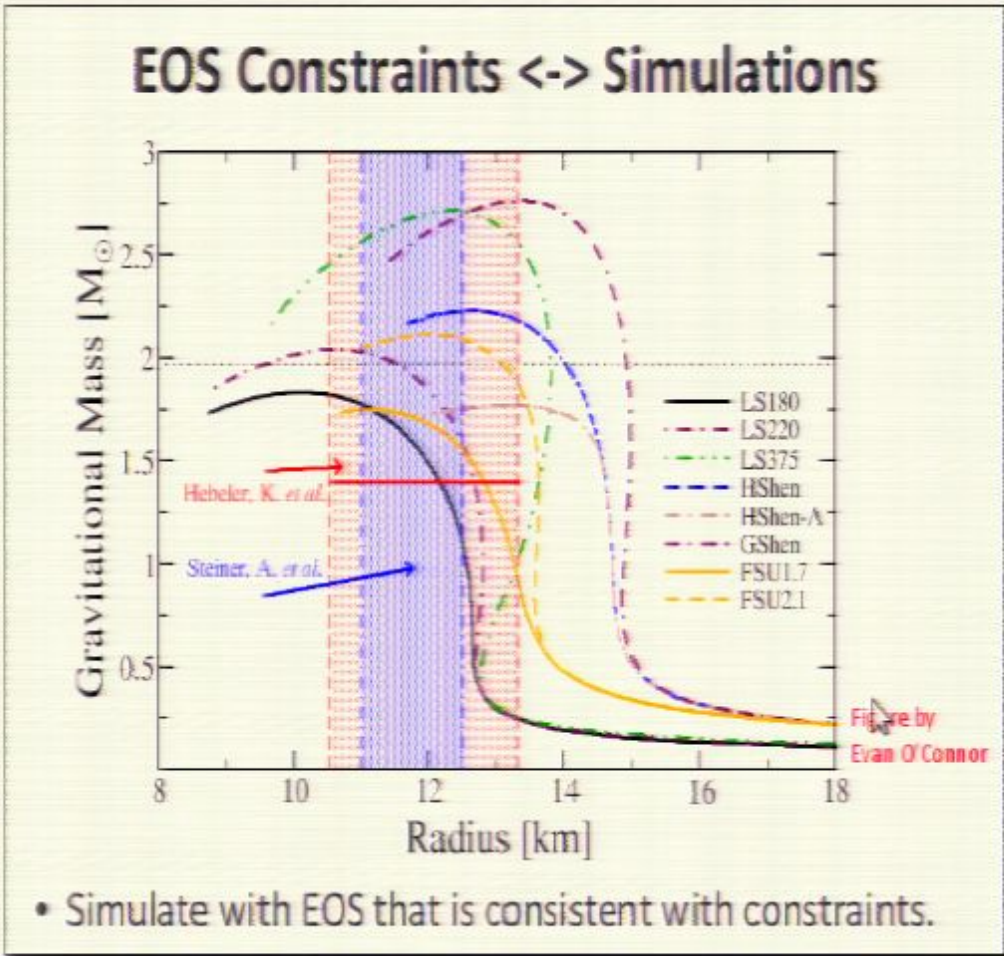
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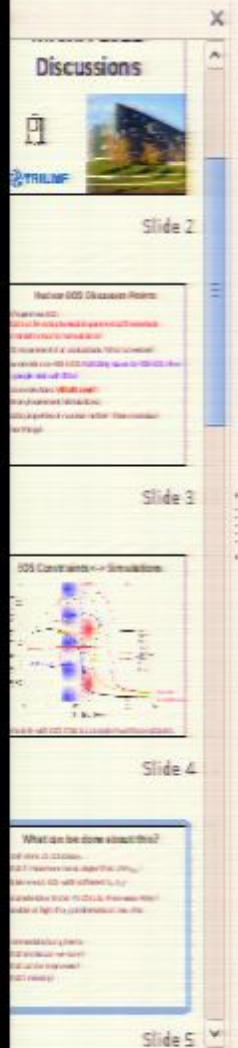
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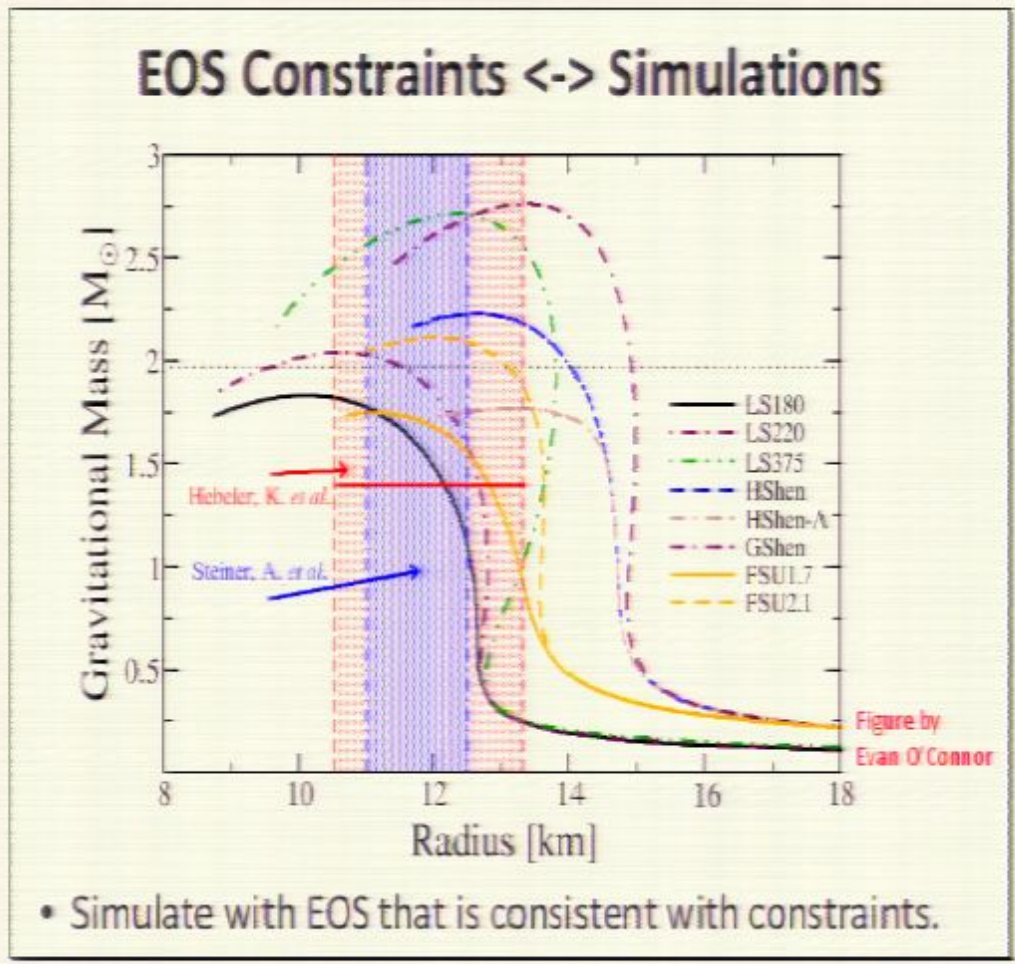
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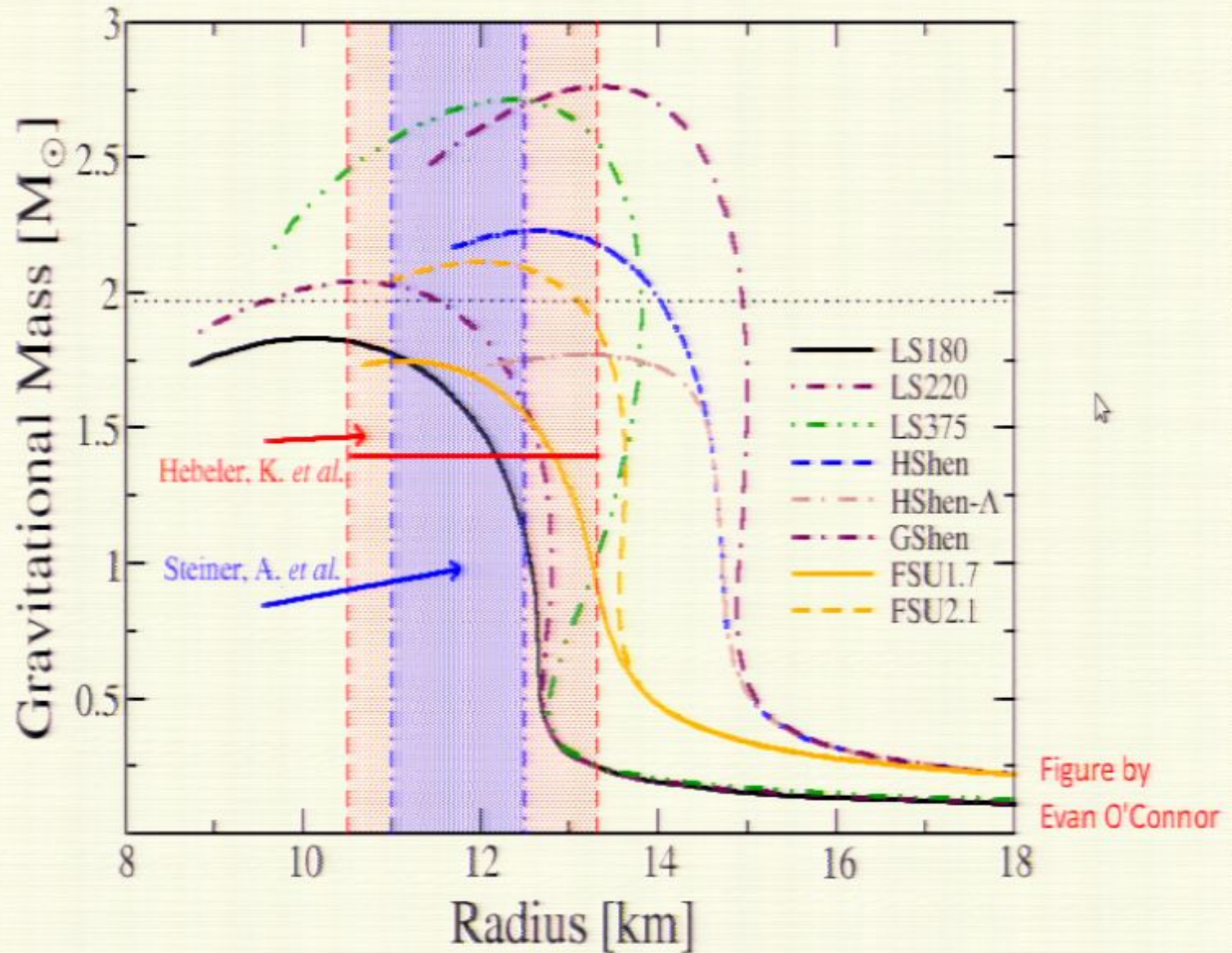
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# EOS Constraints <-> Simulations

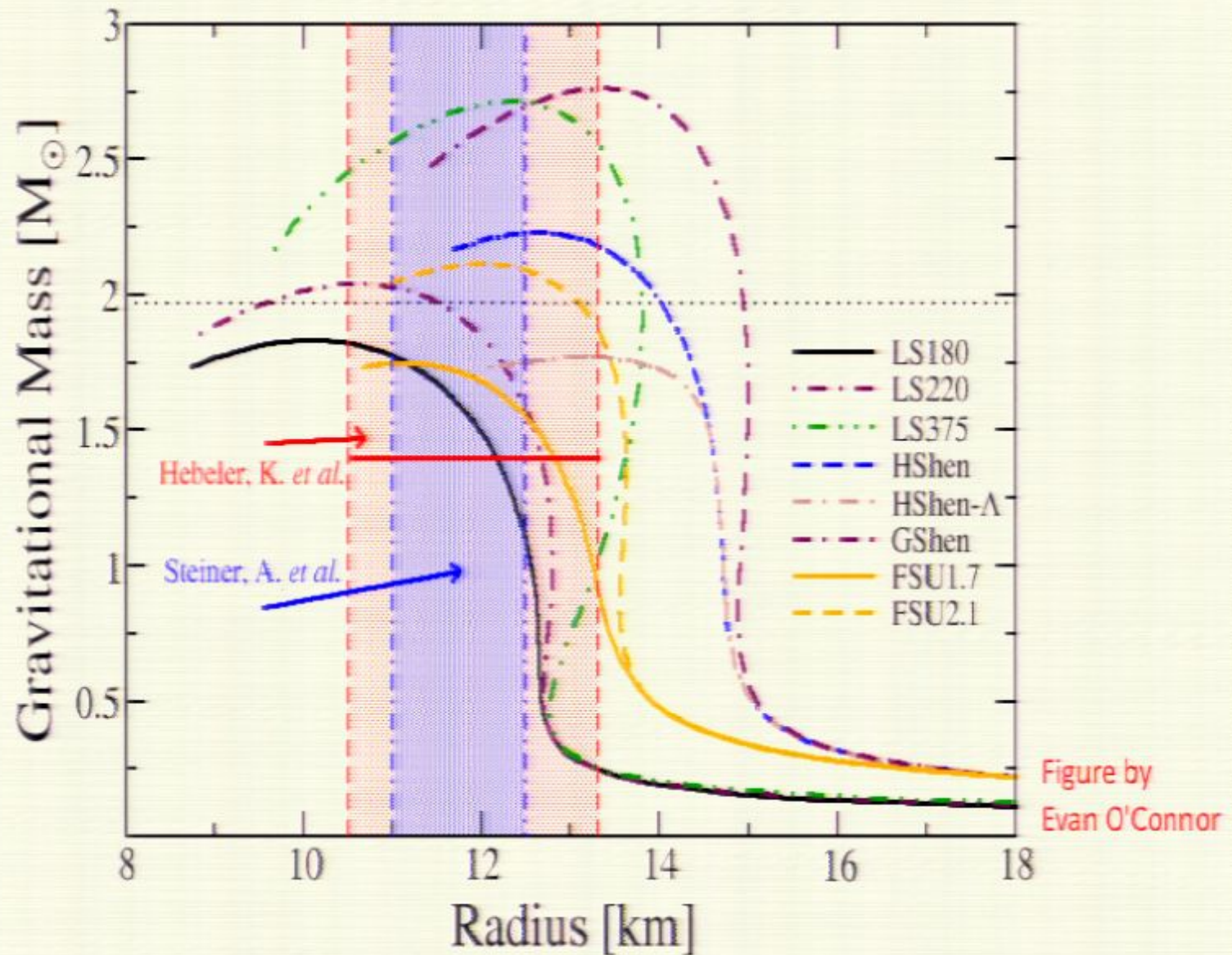


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- Astrophysical constraints consistent with nuclear data?
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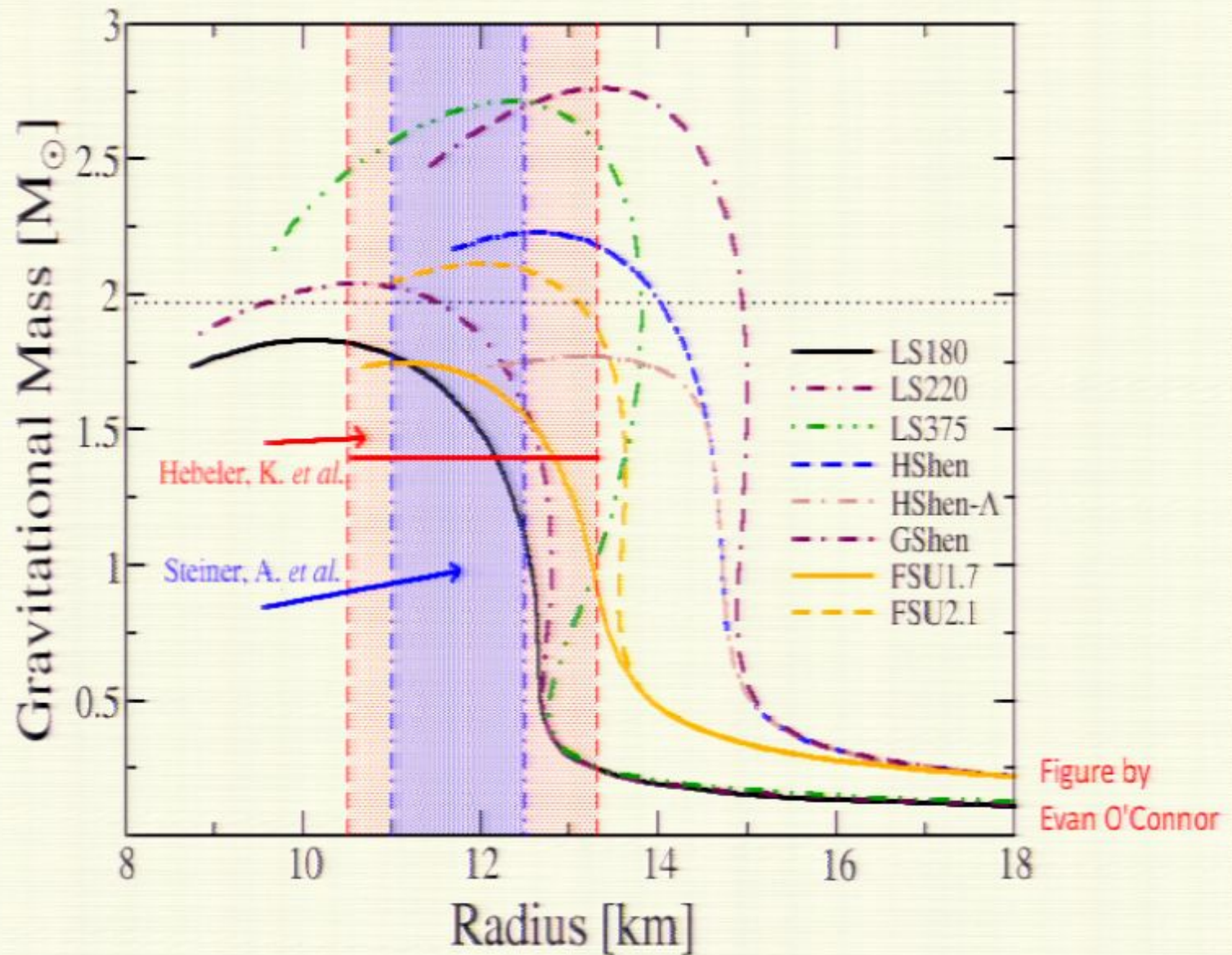
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# EOS Constraints <-> Simulations



# What is needed for Simulations?

- Density:  $10^5$  - few  $\times 10^{15}$  g/ccm  
Temperature: 0 - 100 MeV  
 $Y_e$  range: 0 - 0.6;      **How many data points?**
- How do people handle tables in their codes?
- GR codes need correct internal energy zero.
- Average (A,Z) or multiple nuclei? How many? What difference does it make?
- Ideally: Want a number of EOS exploring parameter space consistent with observations/experiment/theory. What is this parameter space today?
- Other issues?



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  - density regime between  $1e12$  and saturation. below NSE just fine.
- Format for EOS tables (of multi-(A,Z) weak rates)?
- Issues with memory consumption in massively parallel calculations. **I**  
 Why not look at EOS as a fitting function; producing continuous function at any point.
- Other issues?

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