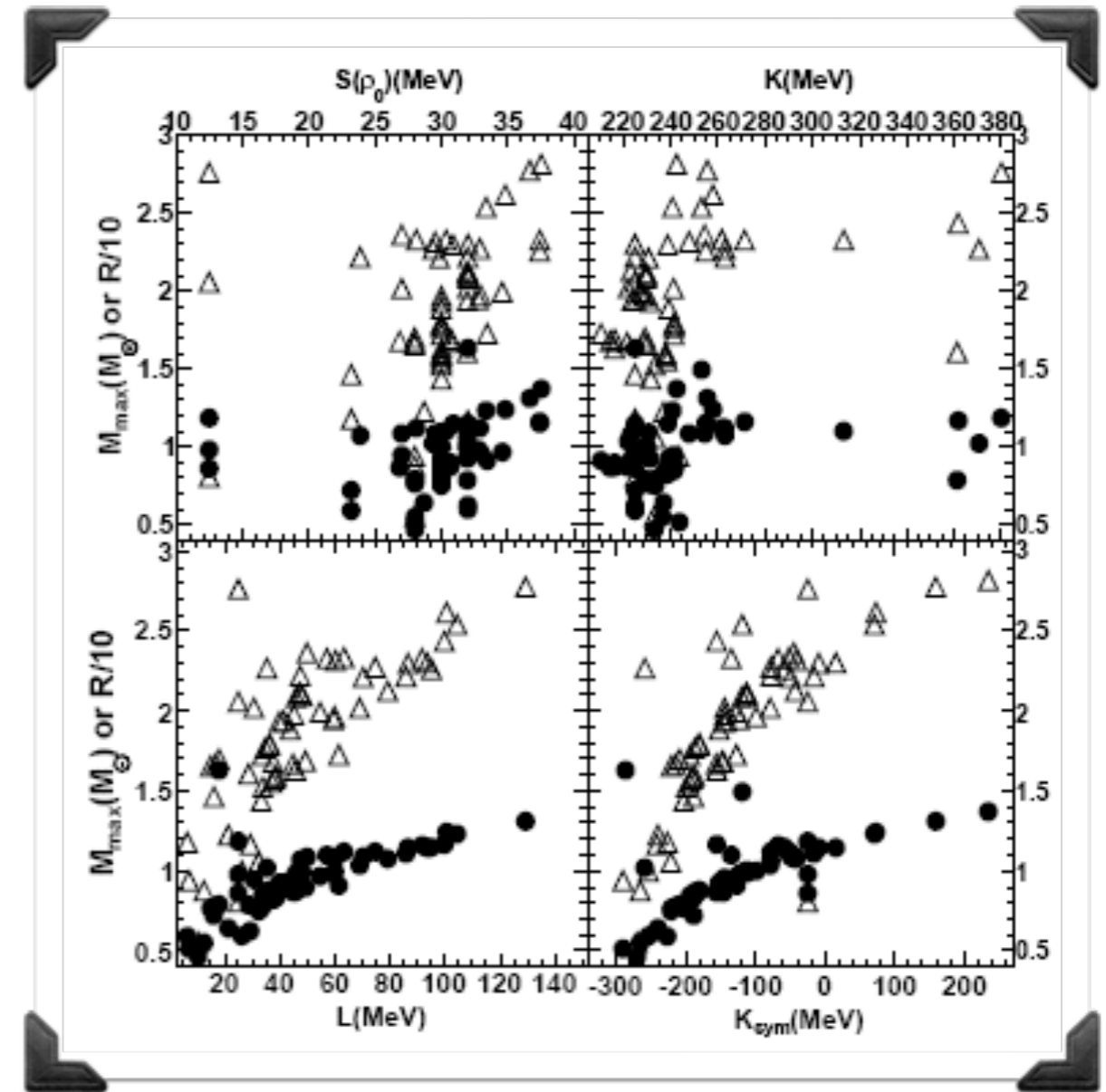
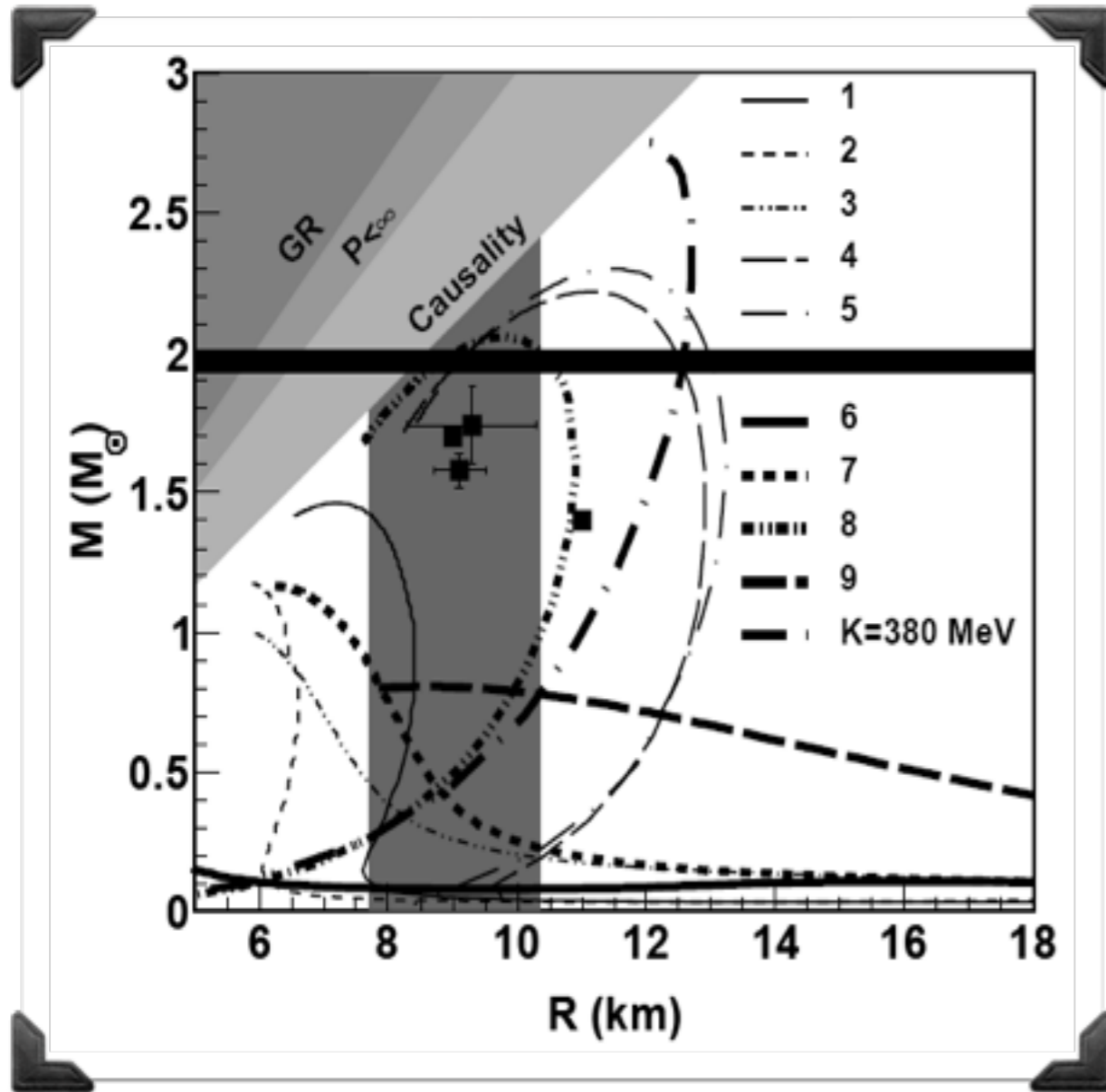


# Can we constrain the EOS from NS observations?

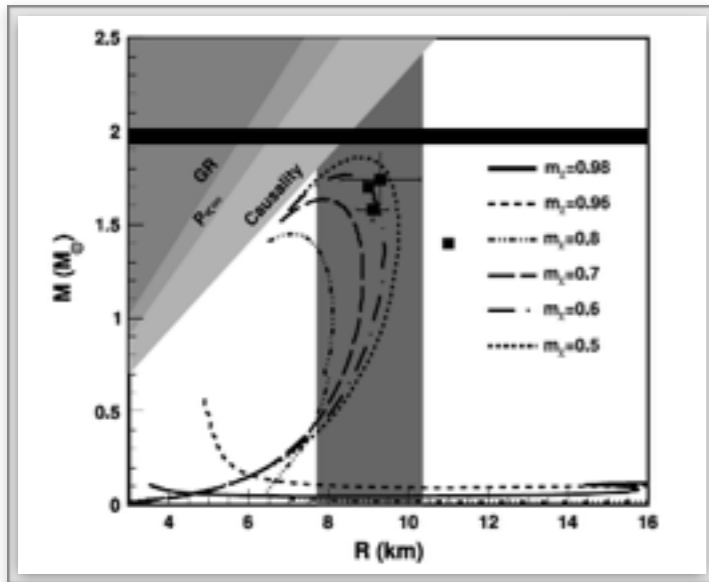
H. Zheng and A. Bonasera



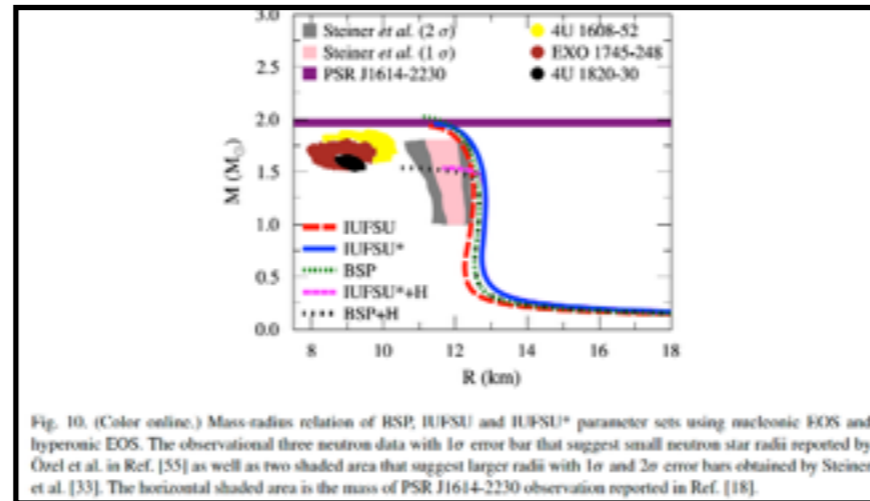
Using the 2 sun mass to  
constrain EoS, Pure NM

This is not the whole story!

# Neutron Star(NS)



Fraction of proton affects M-R



Hyperon affects M-R

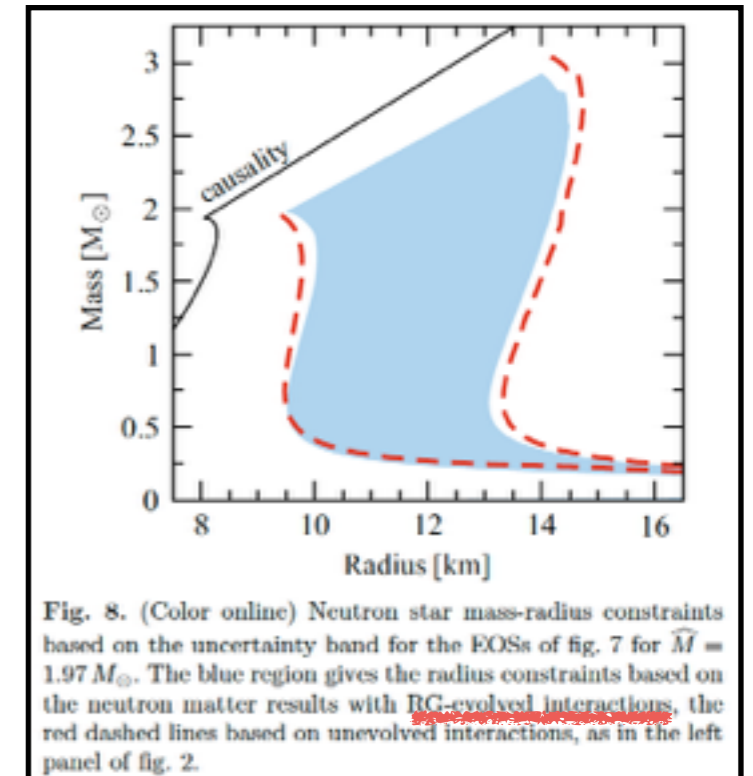
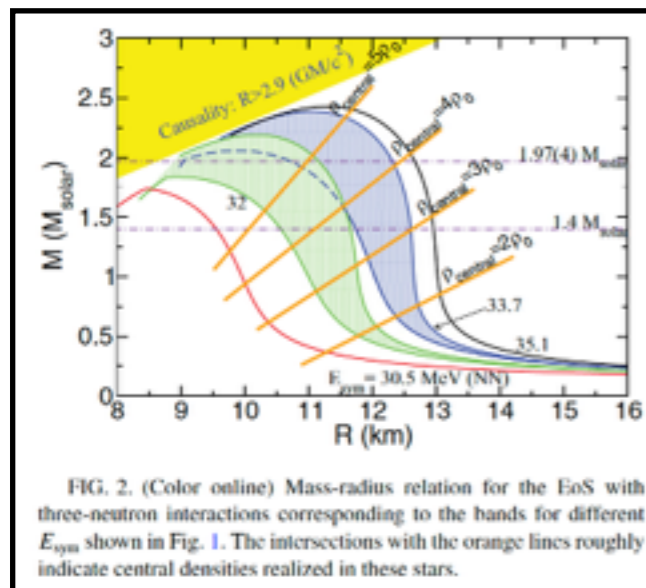
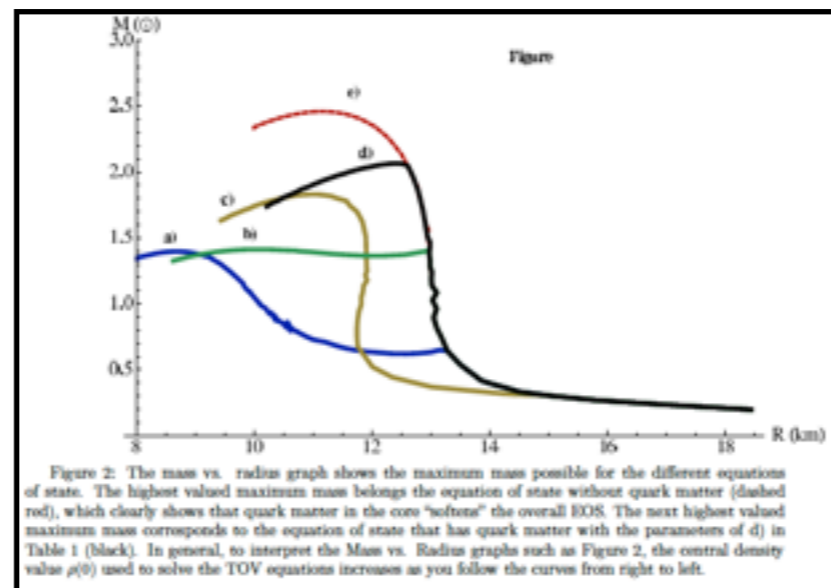


Fig. 8. (Color online) Neutron star mass-radius constraints based on the uncertainty band for the EOSs of fig. 7 for  $\bar{M} = 1.97 M_{\odot}$ . The blue region gives the radius constraints based on the neutron matter results with RG-evolved interactions, the red dashed lines based on unevolved interactions, as in the left panel of fig. 2.



Three-neutron interactions affect M-R



QGP affects M-R

RG (Renormalization Group) affects M-R

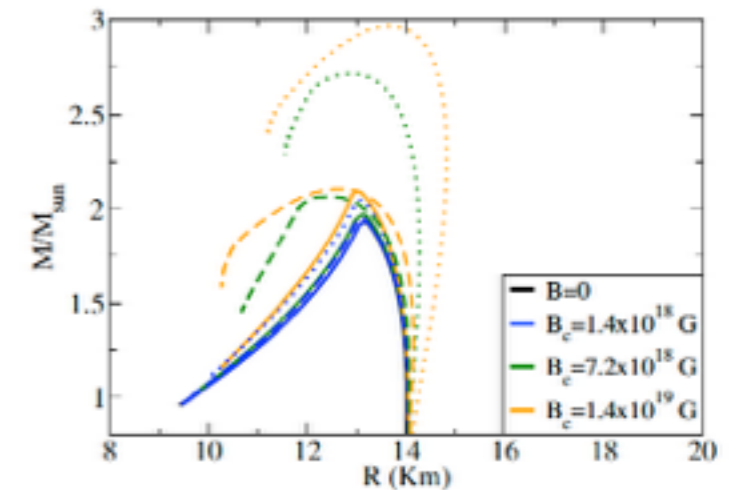


Fig. 8. (Color online) Mass-radius diagram shown for different central magnetic fields including AMM. The dashed and dotted lines have the extra magnetic pressure term of  $B^2/24\pi$  and  $B^2/8\pi$ , respectively, added to the total pressure.

Magnetic field affects M-R

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# New EOS In CoMD

$$\frac{E}{A}(\rho, m_\chi) = (1 + \frac{5}{9}m_\chi^2)\bar{\epsilon}_f\tilde{\rho}^{2/3} + (1 + c_1m_\chi^2)\frac{A_1}{2}\tilde{\rho} + (1 + c_2m_\chi^2)\frac{B_1}{1 + \sigma}\tilde{\rho}^\sigma,$$

- 1) We stop the expansion at second power of  $m_\chi$
- 2) We can change the symmetry energy and the slope of the symmetry energy in CoMD model
- 3) There may be different forms of symmetry energy and density dependence. We need experimental data to constrain it.

BE/A of 12 neutrons Vs L

