Thursday Discussion

- Composition and pasta in the crust
- Cooling and direct Urca
- Cooling of transients
- Radii
- Magnetar flares
- Core-collapse supernovae
- X-ray bursts and deep crustal heating
- Moment of inertia
- Tidal deformation
- r-process nucleosynthesis

Questions

- What kinds of theory / experiments can help us interpret the observations?
- What kinds of observations can help us understand our experiments?
- What are the associated nuclear theory/experiment frontiers?

Notes

- How do magnetar frequencies depend on the pasta?
- Frequencies probe shear modulus which ~ Z^2/a
- Some evidence for enhanced cooling in accreting neutron stars
- Need more cooling data. Will we get it?
- New Carbon star. What happened to the H & He? Stable burning?
- Cooling of accreting NSs without exotic cooling is nearly independent of mass
- Composition and nature of the neutrinosphere is important
- Need more Natowitz-like work on low-density warm matter, Freeze-out conditions need to be looked at closely
- How are these light clusters formed?
- We should do experiments to recreate the neutrinosphere at T=5 MeV at FRIB, with more neutron-rich systems
- Do at ~ 75 MeV/A. How best to analyze the data? Improvements on Joe's analysis? Who can do it?
- "There are words, and then there are words."

Frontiers

Cooling:

- Better cooling rates and superfluid gaps

The crust:

- Better molecular dynamics? How to tackle superfluidity?
- Large(r) scale HF calculations?
- Low-energy effective theories in the crust

Nuclear structure:

- Ab-initio methods and their connection to S and L
- How might the shell model tell us about S?

EOS:

- Matching mean-field to virial?
- Can lattice help us with the hyperons?

r-process:

- More nuclear data and better analysis of uncertainties

Misc:

- Open-source technology foundations for EOSs, reaction networks, stellar models, structure, and reaction rates?
  (My NS Monte Carlo stuff is online if you're brave)

Transient cooling

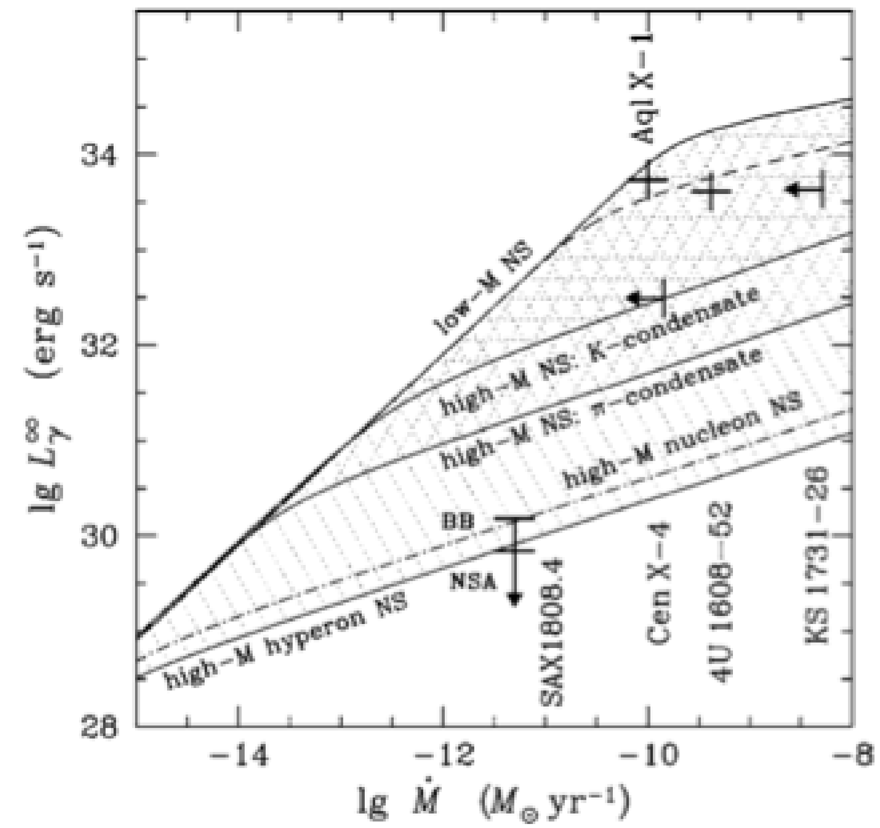

Figure 12 Quiescent thermal luminosity of several neutron stars (NSs) in SXRTs versus mass accretion rate compared with theoretical curves. Three ranges of L_γ^∞ (*single, double, and triple hatching*) correspond to the three types of fast neutrino emission. Each range is limited by the upper heating curve of a low-mass star and a lower curve of a high-mass star. See the text for details.