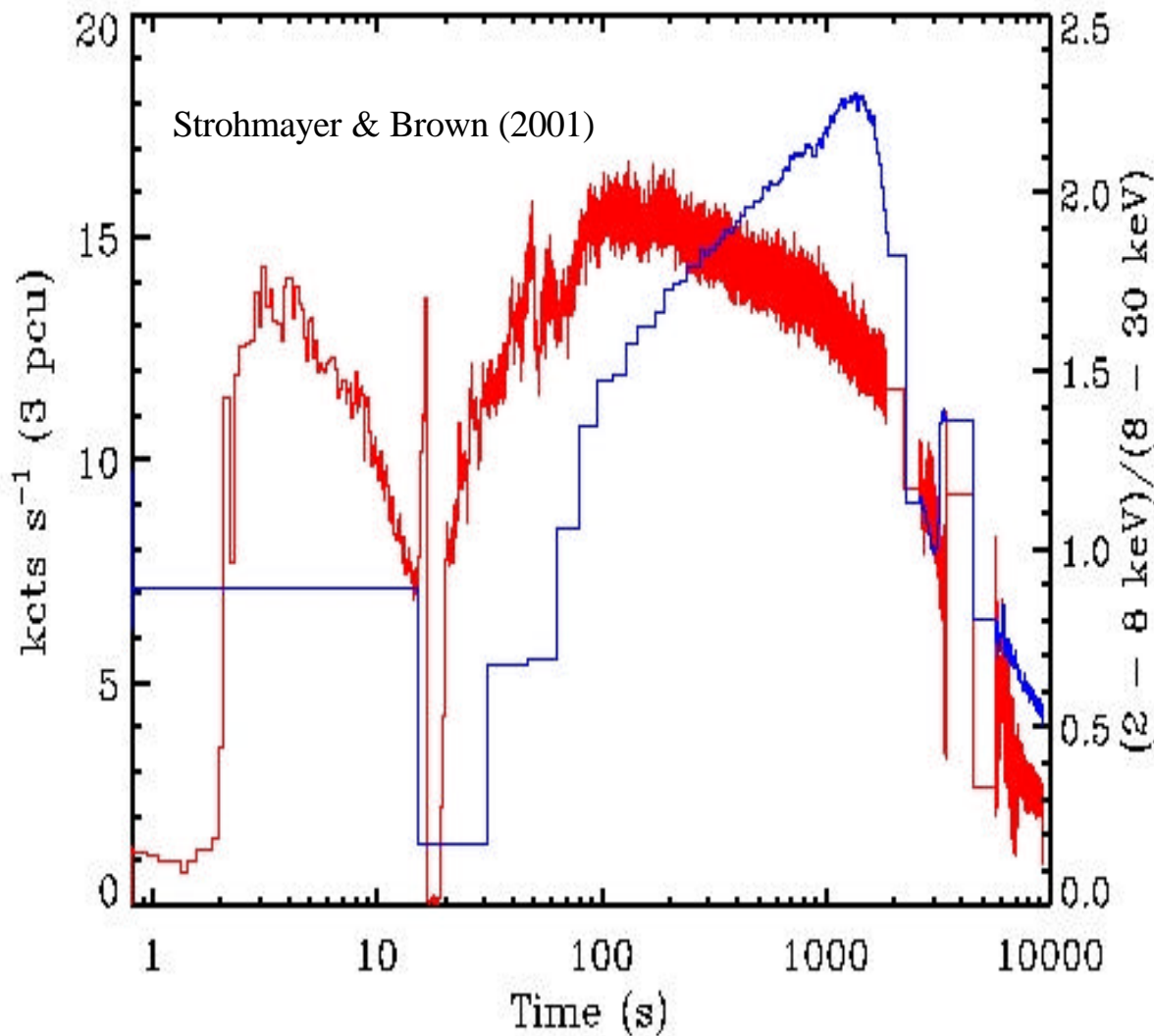
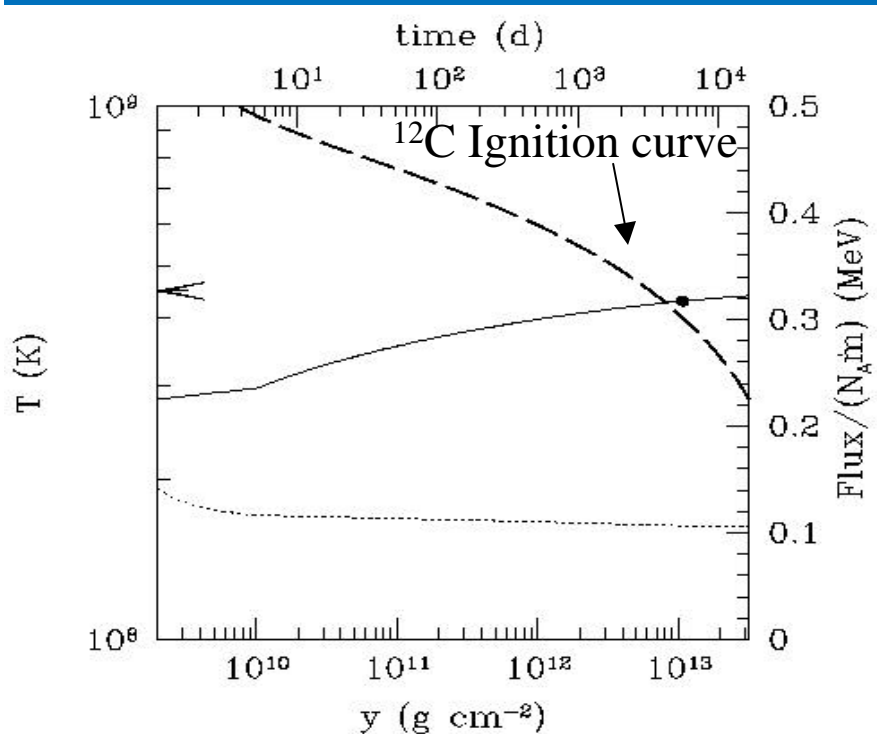


# Transient Gravitational Radiation from Neutron Stars: Thermonuclear Bursts

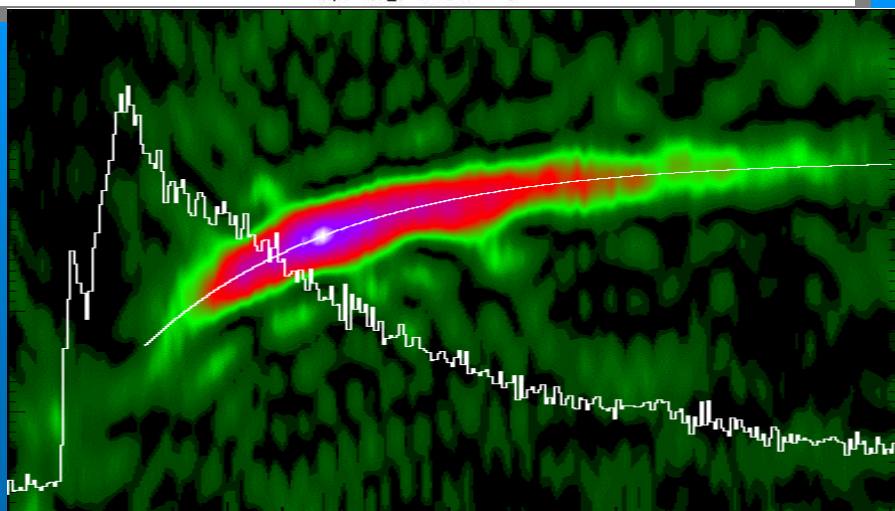


- X-ray bursts generate mass motions and also temperature gradients.
- These can generate quadrupole moments and thus gravitational waves.
- recently discovered “Super Bursts” yield  $\sim 10^{43-44}$  ergs over hours.
- $\Delta m \sim 10^{26-27}$  ~ upper limit on  $h_c \sim 10^{-25}$  at the Galactic center.

# Super Bursts: Carbon “bombs” on a Neutron Star



- Super bursts known from 6 sources, all NS LMXBs.
- Likely origin in unstable Carbon burning. Ignites at  $10^{13}$  g cm $^{-2}$ . Total energy is  $\sim 10$ - $20$  times greater than X-ray fluence.
- GW signal uncertain, but likely will have transient signal near burst onset and then perhaps a weaker CW signal.
- Spin periods known in some sources from burst oscillations, could do coherent search.
- Likely rate is  $\sim$  a few super bursts per year in X-ray.



# Possible LIGO Data Studies

- Do triggered searches on Super bursts for initial transient signals. Use all relevant information on the known source, spin, position, distance, etc.
- Do coherent searches for hours to days after super burst, as heat from burst diffuses out (and some into the core).
- Normal thermonuclear bursts are much weaker, but they are frequent. For sources with known spin periods could try incoherent stacking searches from many bursts.
- Need X-ray monitoring capabilities. The Galactic Center would be particularly interesting. WFC on SAX could provide some of this, RXTE /ASM as well. SWIFT should see some of these.

# Other Possible Triggers?

- Soft Gamma Repeaters (SGRs): Giant Flares.  $\sim 10^{44-45}$  ergs. Spin periods known in several cases, pulse timing might be possible for coherent search. Infrequent, only two in  $\sim 20$  years! SGR outbursts are more frequent, but not all show a giant flare event.
- Type II X-ray bursts (GRO J1744-28 and Rapid Burster)??
- Giant glitches in radio pulsars, (Vela pulsar for example).
- ??