X-ray burst

What is type 1 X-ray burst?

- light curve
  - rising time ~10s
  - decay time ~10s - a few min
  - peak luminosity
- spectrum
  - almost blackbody spectrum
    - blackbody temperature ~10^7 K(Swank et al. 1977) --> soft X-ray?
    - How about the time evolution: the dependence of blackbody temperature on time?
- burst source
  - neutron star binary
  - X-ray bursts occur at neutron star surface.
    - Where is 'surface'?

How type 1 X-ray bursts occur?

- It is said that thermonuclear burning makes X-ray burst.
- Accreting matter from companion star lead to ignite thermonuclear burning.
  - What conditions lead to ignite?
    - Maybe, thermodynamical values are involved.
      - temperature
      - density
      - pressure
      - entropy
    - It is said that one of conditions is accretion rate
      - and, said that accretion rate determine stability of burning
      - How the typical accretion rate is?
  - Which has a significant role of 'fuel'?
    - H
    - He
- The most critical parameter determining burst properties was the accretion rate. (Fushiki and Lamb 1987)
  - How strong influence on burst profiles does the accretion rate have?
- It is said that matters falling on NS rapidly spread across the surface by latial pressure gradients
  - How such strong pressure gradients work?
- It is said that lightcurves depend on what is accreting matter(donor composition).
  - pure He
  - H/He mix

Histroy of study on X-ray bursts

1. Nuclear fusion in accreting NS(Rosenbluth et al. 1973)
2. Computing instability of thermonuclear burning on NS (Hansen and van Horn 1975)

3. The first discovery of X-ray burst (Grindlay et al. 1976)
4. Suggestion nuclear burning causes X-ray burst(Maraschi and Cavaliere 1977)
5. Blackbody spectrum fitting (Swank et al. 1977)
6. Reproducing lightcurve (helium shell burning) (Joss 1978)
7. Role of hydrogen shell burning (Fujimoto et al. 1981)
8. rp-process (Wallace and Woosley 1981)
9. Using more realistic nuclear reaction network (Woosley et al. 2004)