

# Neutron star radiation pressure leading to jet formation in LMXBs

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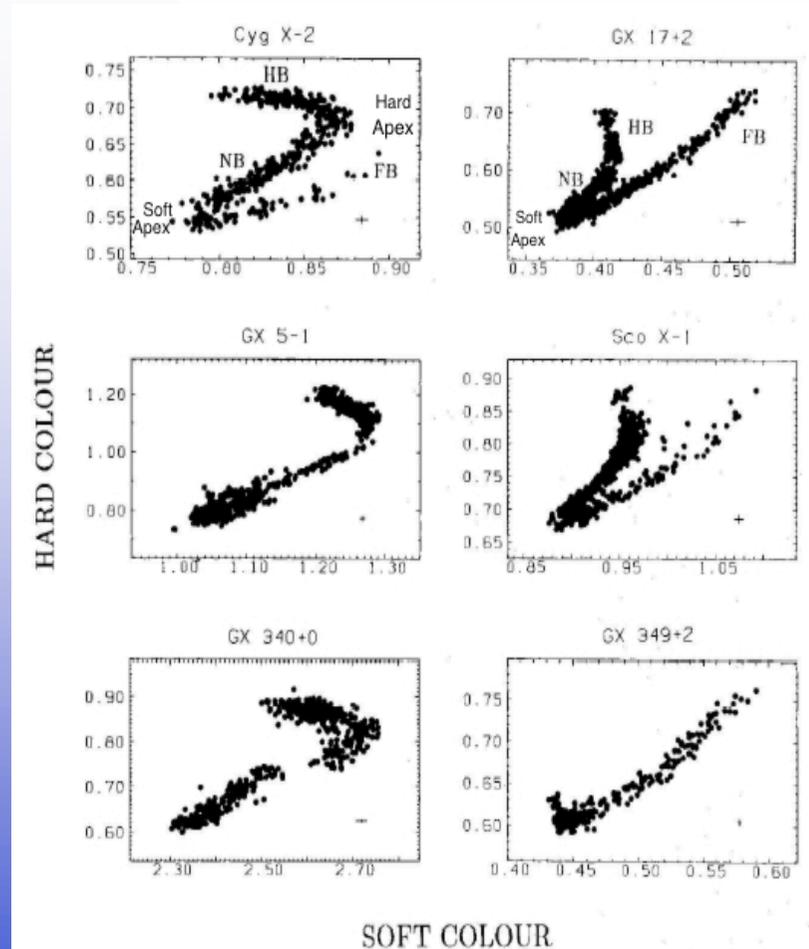
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# The Z-track sources



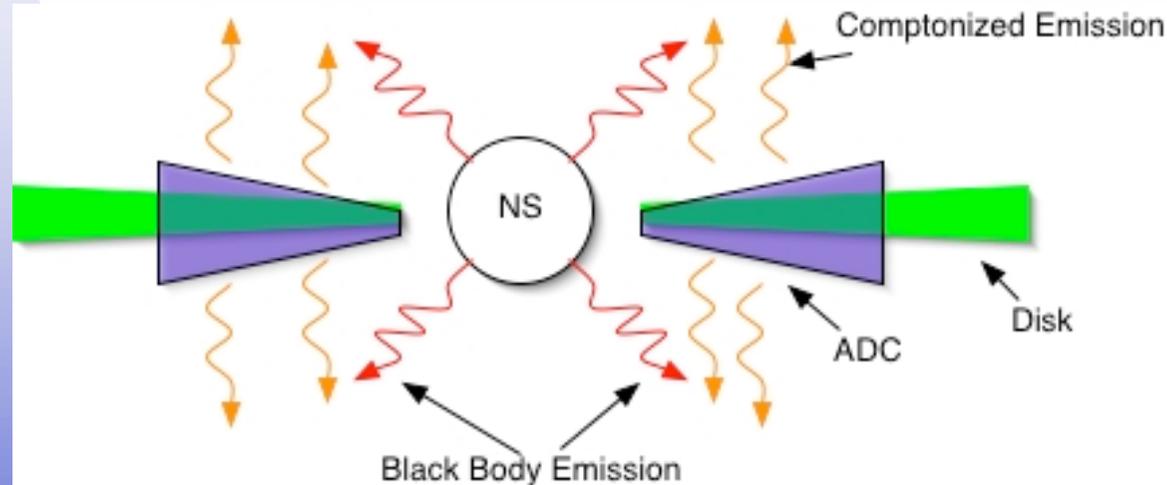
- Brightest LMXBs
  - $L \sim L_{\text{edd}}$
- Radio jets seen at Hard Apex
- QPOs vary **strongly** around Z
  
- Conventional view:  $\dot{M}$  increases around Z HB → NB → FB
  - Spectral fitting with “Eastern model” does **not** give physically understandable results

# The “Extended ADC” model

- Over ten years of research on the Dipping sources
- The technique “Dip ingress timing” shows extended nature of ADC
  - $r_{\text{ADC}} \approx 50\,000$  km
- It was shown that a CPL is a good representation of ADC behaviour 0.01 - 50 keV

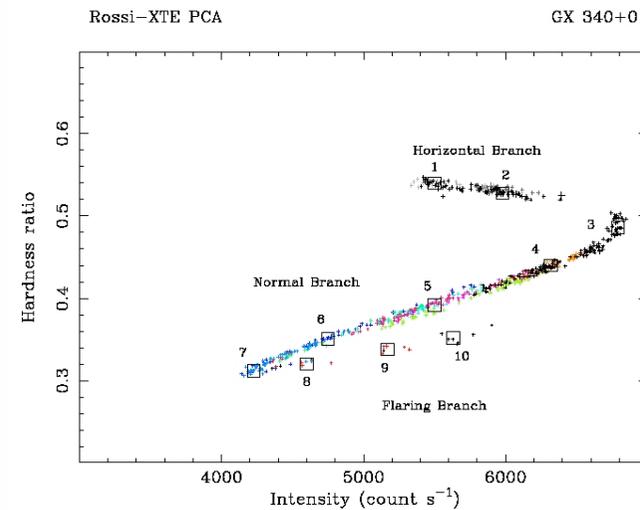
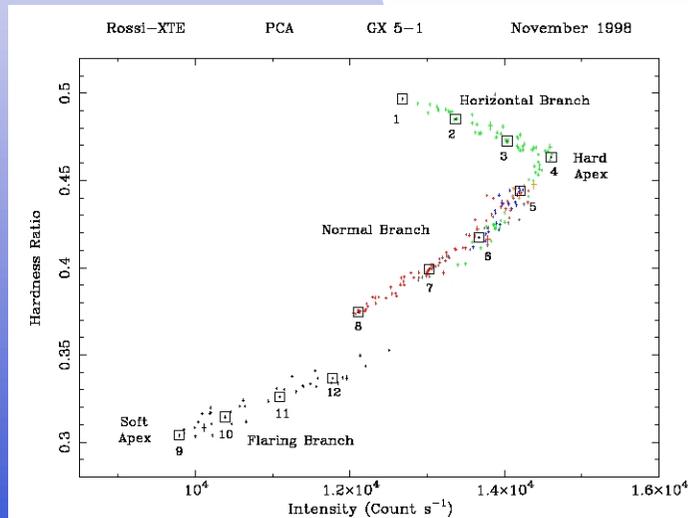
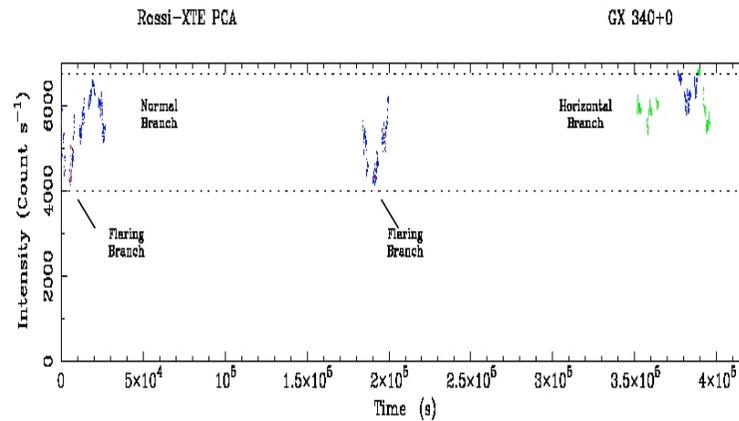
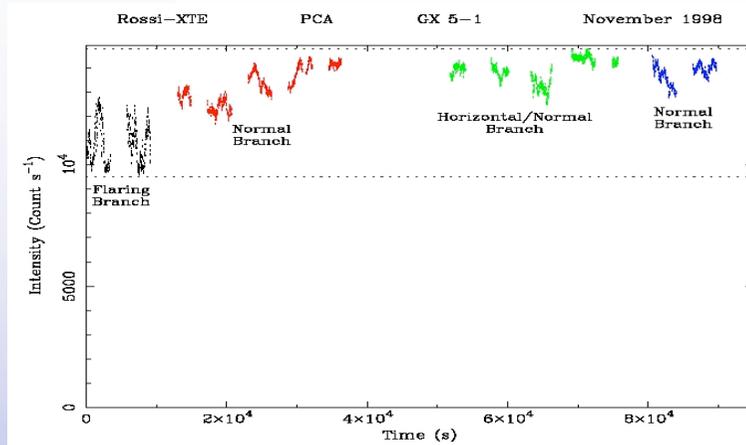
# New approach of the present work

- We will apply a model consisting of blackbody from the NS and Comptonized emission from extended ADC

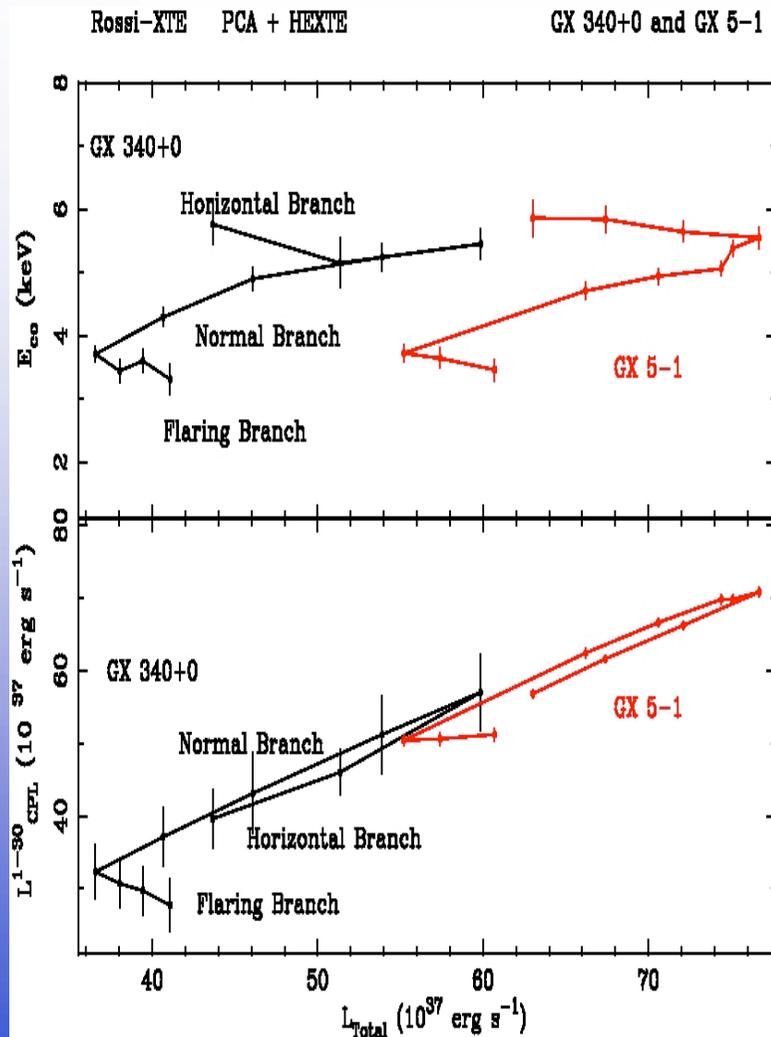


- Extensive testing with the “dipping LMXBs” show validity of this model

# Lightcurves and Z-tracks



# The Accretion Disk Corona



➤  $L_{\text{ADC}}$  increases strongly on NB and decreases again on HB

➔  $\dot{M}$  increases along NB from soft apex to hard apex

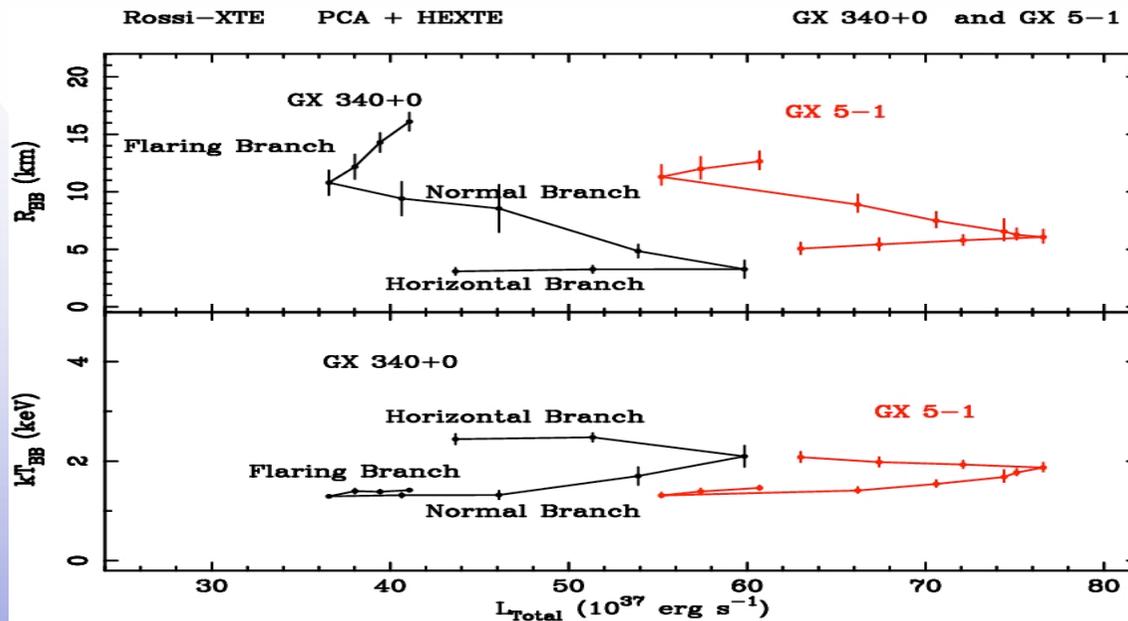
➤  $L_{\text{ADC}} = \text{constant on FB}$

∴  $\dot{M} = \text{constant on FB}$

➔ Resolution of controversy - is flaring  $\dot{M}$  change or nuclear?

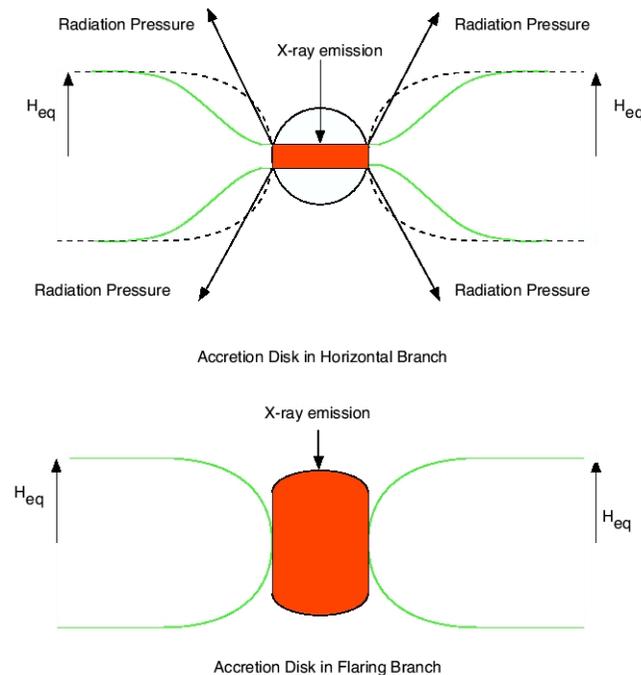
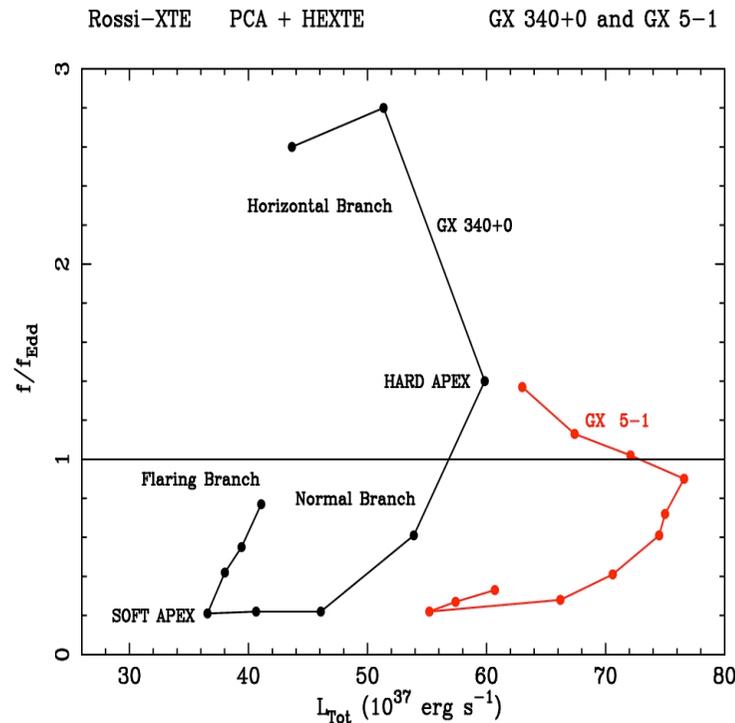
➔ Flaring is thermonuclear burning

# The Neutron Star



- $kT$  increases by x2
- $R_{\text{bb}}$  decreases
- ➔ **Radiation pressure increases by  $\sim 10$**

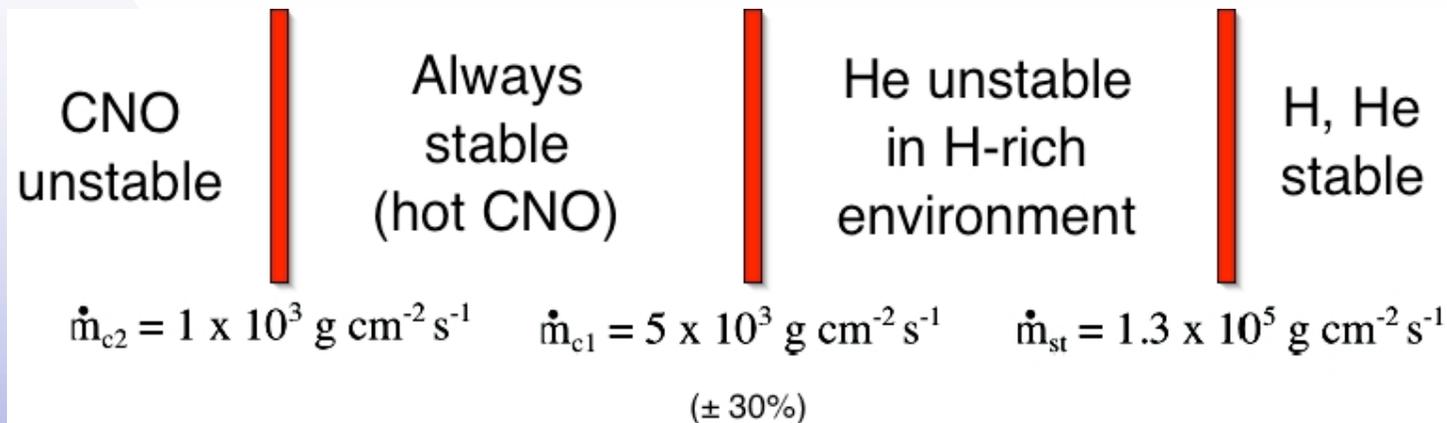
# Jet Formation



- $P_{rad}$  very strong at HA and along HB
  - Same location as occurrence of radio jets
- ➔ Radiation pressure causes jet formation

# Flaring

## ➤ Bildsten model of nuclear regimes



- At Soft Apex  $\dot{m} = 1.5 \times 10^5 \text{ g cm}^{-2} \text{ s}^{-1}$ 
  - Here  $\dot{m} \sim \dot{m}_{st} \rightarrow$  unstable nuclear burning begins
- Consistent with flaring always starts at the lowest luminosity

# Conclusions

- $P_{\text{rad}}$  from NS launches jets
- FB is unstable nuclear burning
  - resolving controversy
- Results imply conventional view of  $\dot{M}$  increasing monotonically HB-NB-FB incorrect

