The vertical structure of the accretion disc in LMXBs

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Low Mass X-ray Binary
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$M_1$: BH or NS

$M_2 < 1 \, M_\odot$
Low Mass X-ray Binary

$M_1$: BH or NS

$M_2 < 1 \, M_☉$
Persistents

Transients

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Persistents

Transients

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K₂

* Casares and Charles 1994

* Steeghs and Casares 2002
$K_2$

$K_{\text{emission}}$
\[ \frac{K_{em}}{K_2} = K_c (\alpha, M_2/M_1) \]

Muñoz-Darias et al. (2005)
$K_{\text{correction}}$ \quad \quad K_{\text{em}} / K_2 = K_c (\alpha, M_2/M_1)$
K correction
Aquila X-1
Aquila X-1

- Neutron star transient
- Outburst ~ 2 years
- GTC 10.4m (2011, 2013 and 2016)
\[ K_{\text{em}} = 102 \pm 6 \text{ km s}^{-1} \]
Aquila X-1

Mata Sánchez et al. 2017 (VLT-nIR)

\[ K_2 = 136 \pm 4 \text{ km s}^{-1} \]

\[ \frac{M_2}{M_1} = 0.41 \pm 0.08 \]
Aquila X-1

Mata Sánchez et al. 2017 (VLT-nIR)

\[ K_2 = 136 \pm 4 \text{ km s}^{-1} \]

\[ M_2 / M_1 = 0.41 \pm 0.08 \]
Opening angle

\[ K_c (\alpha, M_2/M_1) = \frac{K_{em}}{K_2} \]
Opening angle

\[ K_C (\alpha, \frac{M_2}{M_1}) = \frac{K_{em}}{K_2} \]

- \( K_{em} \)
- \( K_2 \)
- \( \frac{M_2}{M_1} \)
Opening angle

\[ \alpha = 15.5^\circ + 2.5^\circ - 5^\circ \]

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Opening angle

\[ \alpha = 15.5^\circ \pm 2.5 \]

Meyer & Meyer-Hofmeister 1982

+ No X-ray heating \( \alpha \sim 6 \text{ deg} \)
+ X-ray heating \( \alpha \sim 18 \text{–} 22 \text{ deg} \)
Conclusions

We measured opening angle of the accretion disc from empirical methods for the very first time.

Monte Carlo technique allow us to give a robust estimate of the error.

Our result consistent with an irradiation-driven thick disc.
Thanks for the attention!