BK LYNCIS

The Novalike Variable that turned into a Dwarf Nova

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THIS TALK IS BASED ON:

BK Lyncis: The Oldest Old Nova... and a Bellwether for Cataclysmic Variable Evolution

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Observations by the CBA community

CENTER FOR BACKYARD ASTROPHYSICS CBA:

Globally distributed telescopes operated by amateur astronomers

~20 locations

BK Lyn: 20 yrs/2200 hrs of time-resolved photometry

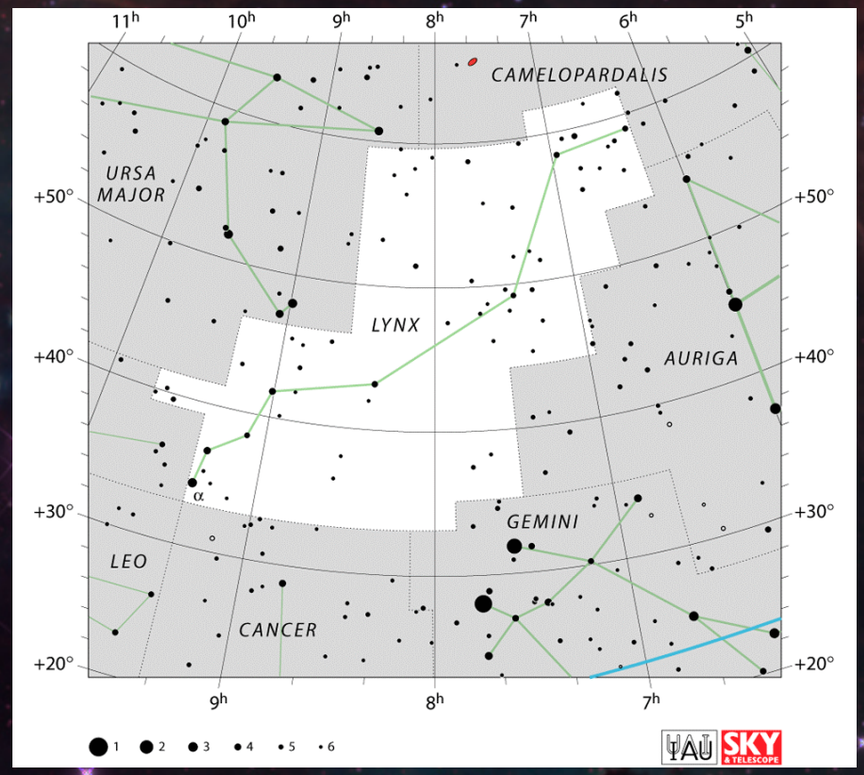
Chinese records: small "guest star"
- Nova on 31 December 101 A.D. -

Remnant: BK Lyn (dist. 30' from alpha Lynx)

Long P_{orb} CVs have the same brightness before and after eruption

HOW LONG DOES A SHORT P_{ORB} NOVA STAY BRIGHT?

BK LYN



- Palomar-Green survey (UV excess)
- Short P_{orb} (1.8 hr)
- The ONLY novalike below the gap!
- Turned into a dwarf nova 2002-2005

BEFORE 2011 - NOVALIKE

- No eruptions (stable @ V~14.6)
- High acc. rate and T (than expected for its short P_{orb})
- Non-magnetic
- Superhumps
- Harvard plates over ~100 yrs show stability @ B~14.3 (until 2005)

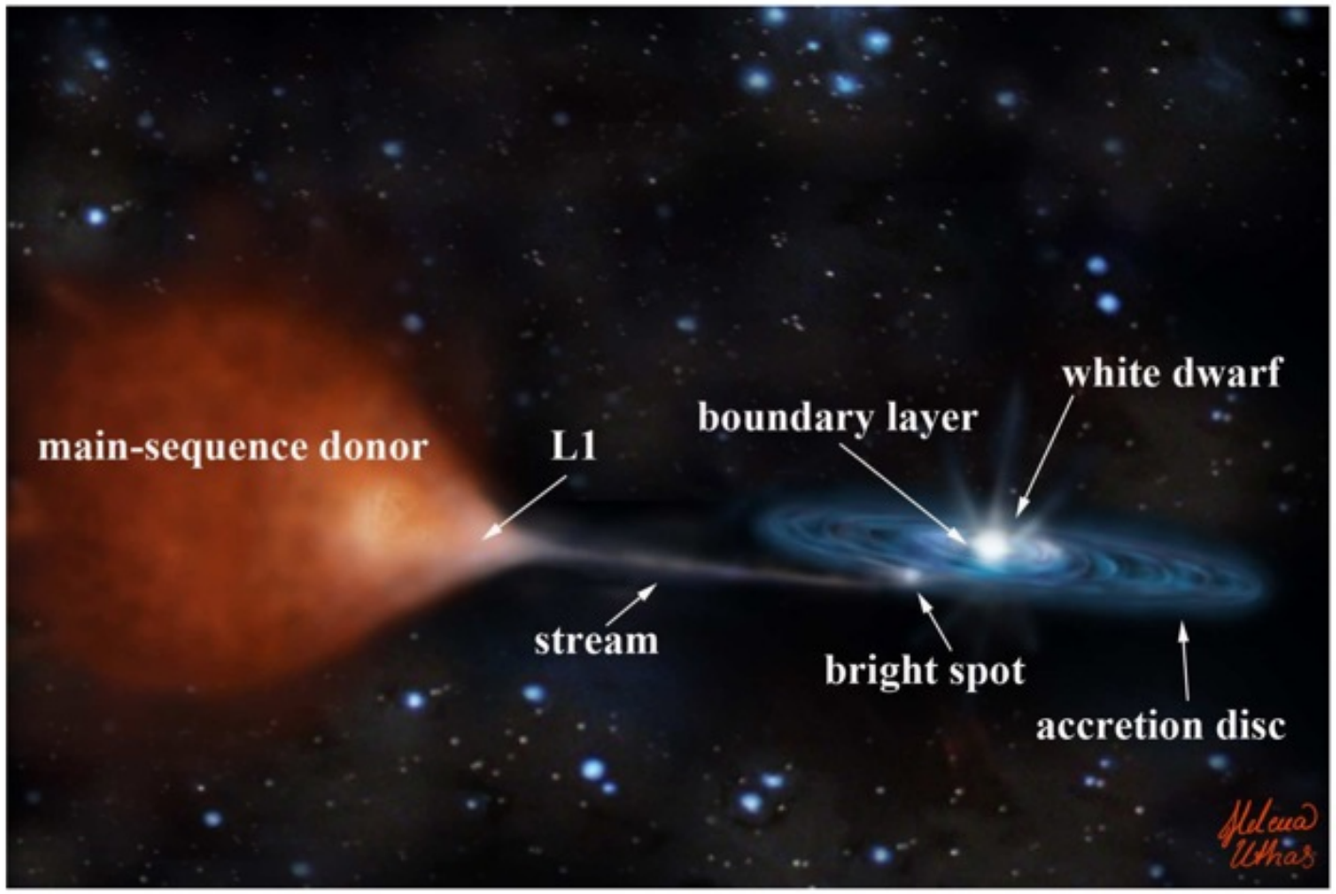
AFTER 2011 - DWARF NOVA

- CRTS indicate transition to DN already 2005
- ER UMa type
- High and Low state (V:14-16)
- Positive superhumps (during superoutbursts)
- Negative superhumps (dominant in quiescence)

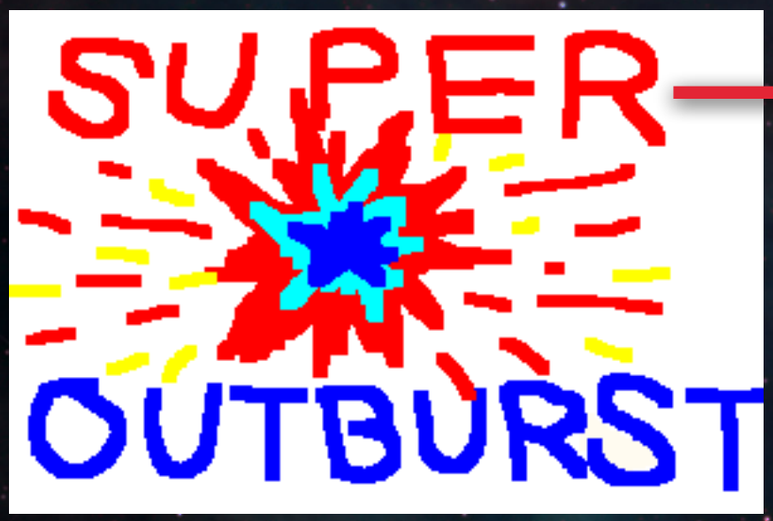
SUPERHUMPS

Thermal-tidal instability - disc precession - positive (apsidal) superhumps @ a few % longer than P_{orb}
elliptical disc, 3:1 resonance

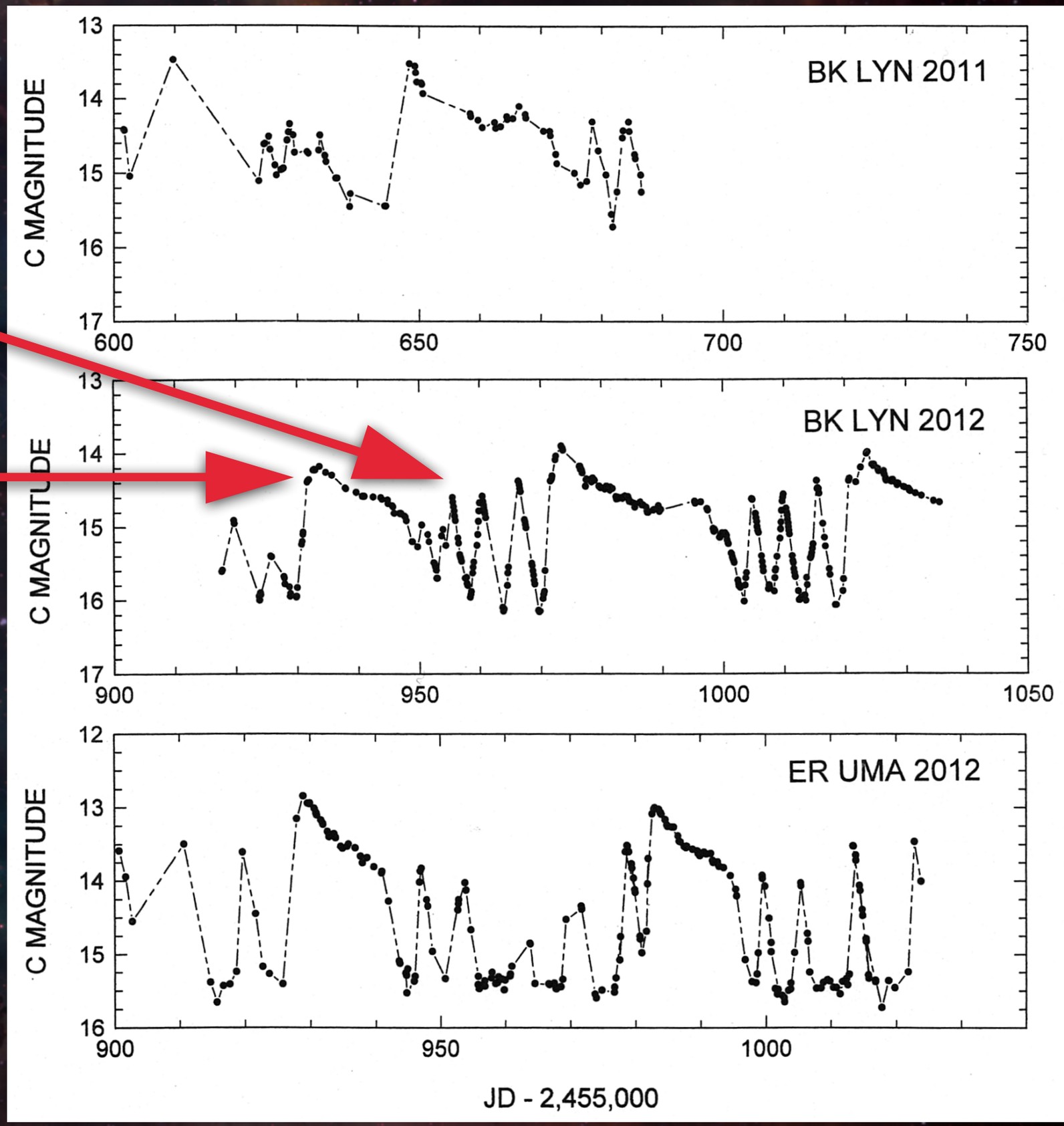
Tilt of the disc - negative (nodal) - retrograde precession - superhumps @ at a few % shorter than P_{orb}



"Normal" outbursts
~ 4-5 days

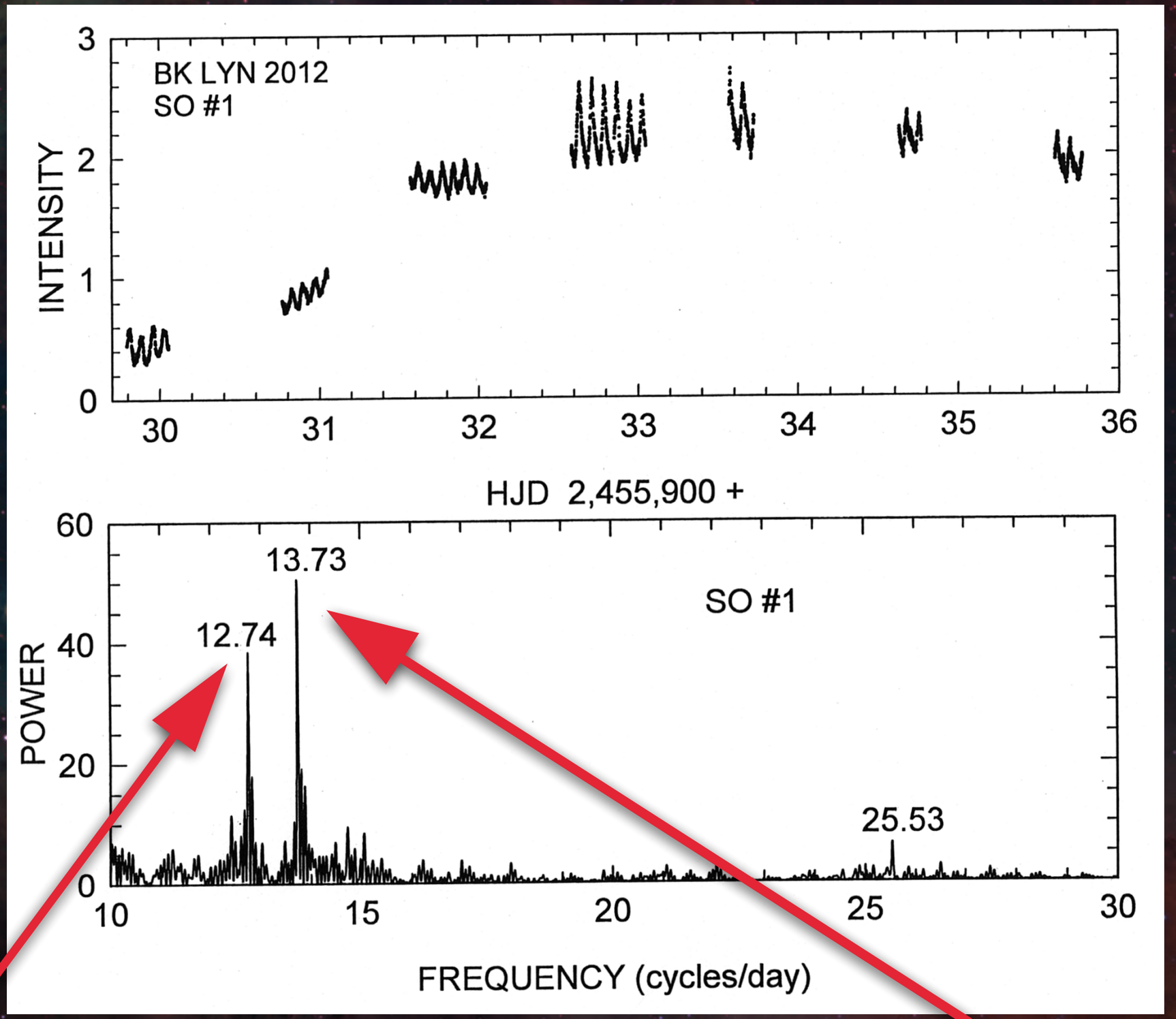


~45 days



Simultaneous monitoring campaign of ER UMa

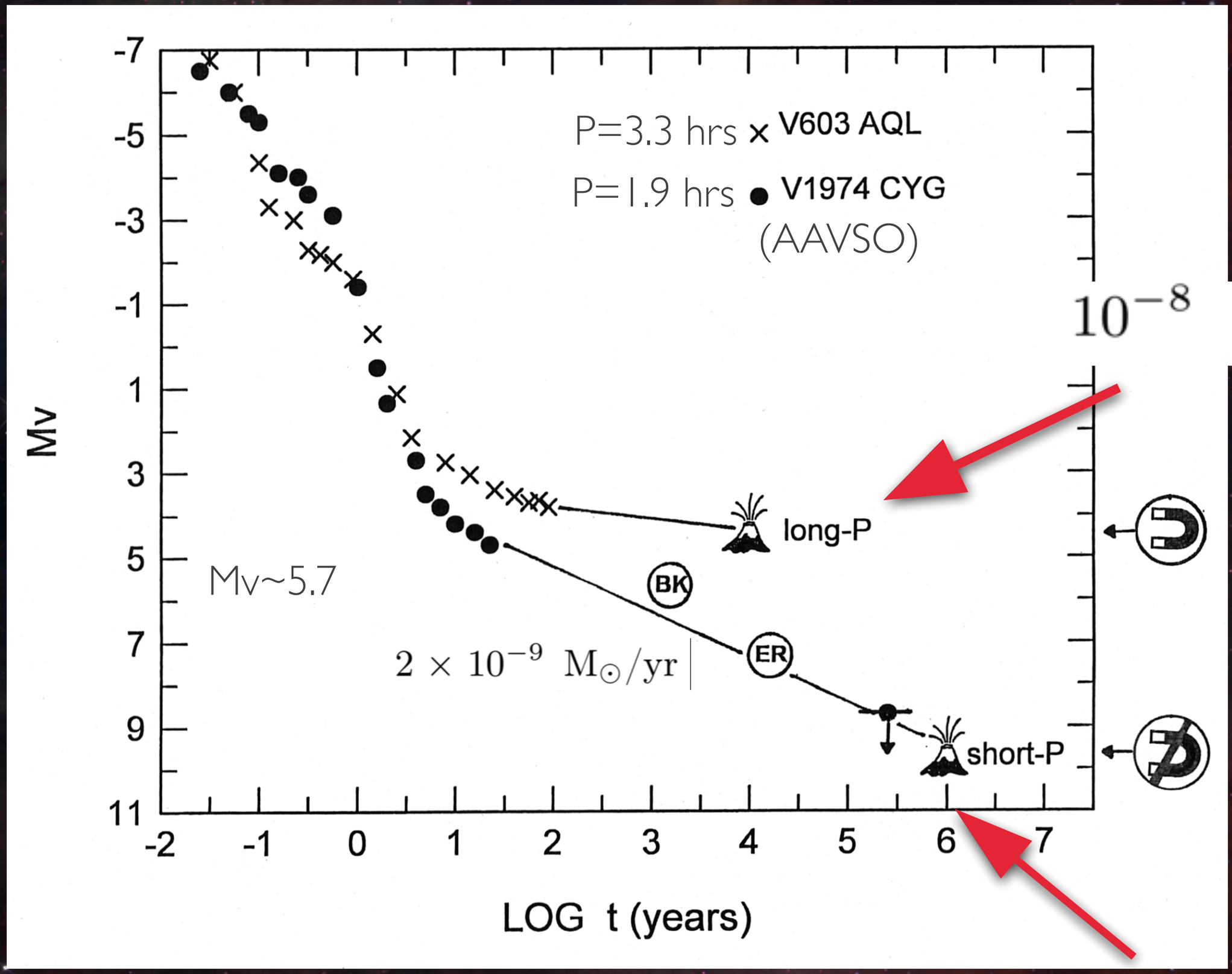
LC of superoutburst built up over ~ 7 days



Positive superhump

Negative superhump

ROADMAP FOR DECLINING OF FAST CLASSICAL NOVAE



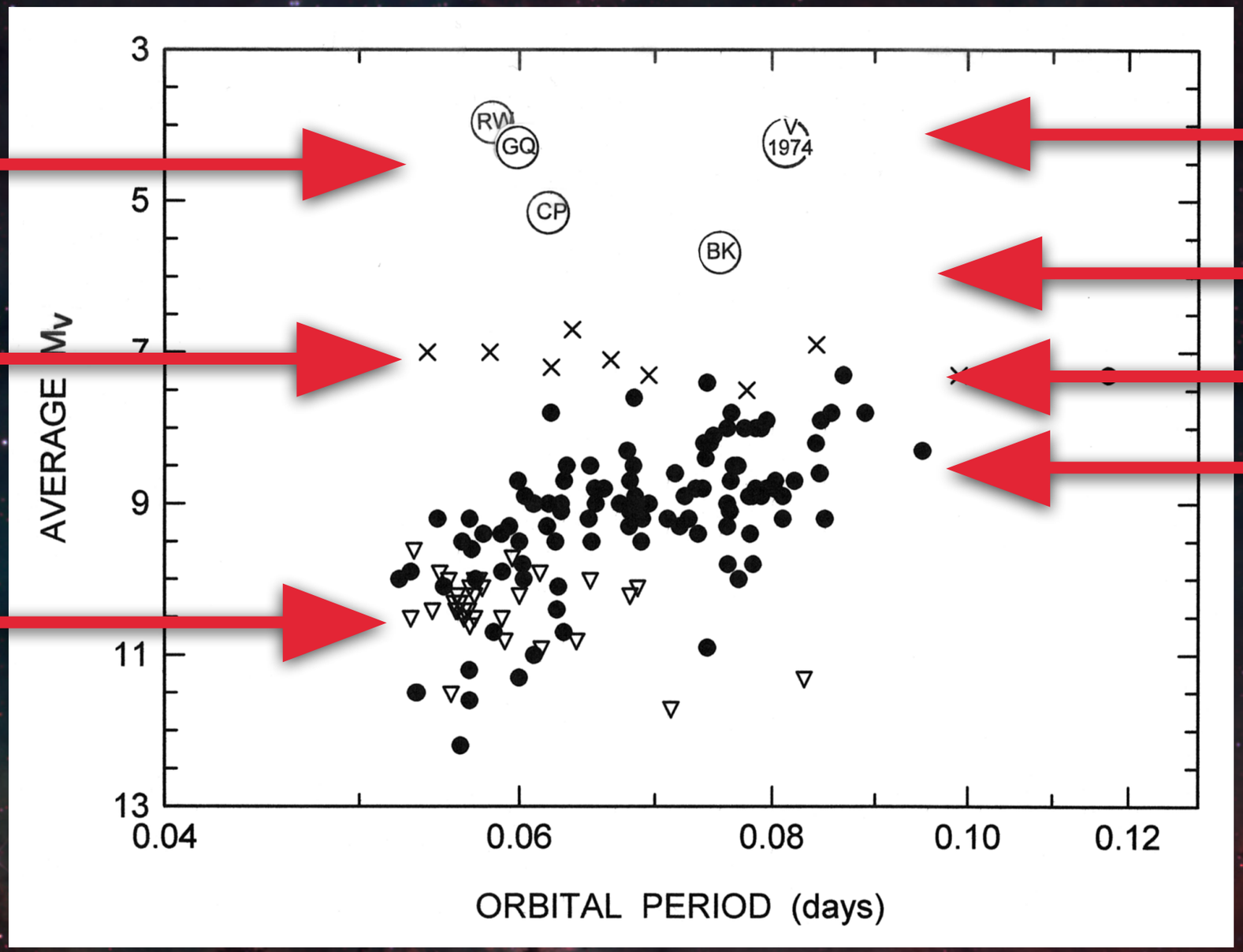
BK Lyn era: 2000 yrs, ER UMa: 15 000 yrs,
quiescence: 500 000 yrs

Nova max: Mv ~ -6

Historic novae

ER UMa

Upper limit



40 yrs

2000 yrs

15000 yrs

100000 yrs

Time-averaged over P_{orb}

SUMMARY

- BK Lyn is probably the remnant of nova Lyn 101
- 2000 yrs later, it's still cooling
- It went from being a novalike to a dwarf nova 2002-2005
- ER UMa class - transient phase in CV evolution
- This could explain large spread of Mv, unusual high acc. rate and T (UV - 35000 K) - which can't be explained by GR
- Proposed decline rate $$dM_V/d(\log t) = 1.0$$
- Benchmark for CV evolution of the cooling of novae

THANK YOU!