# The puzzling precession in LSI +61°303

L. Zimmermann und M. Massi

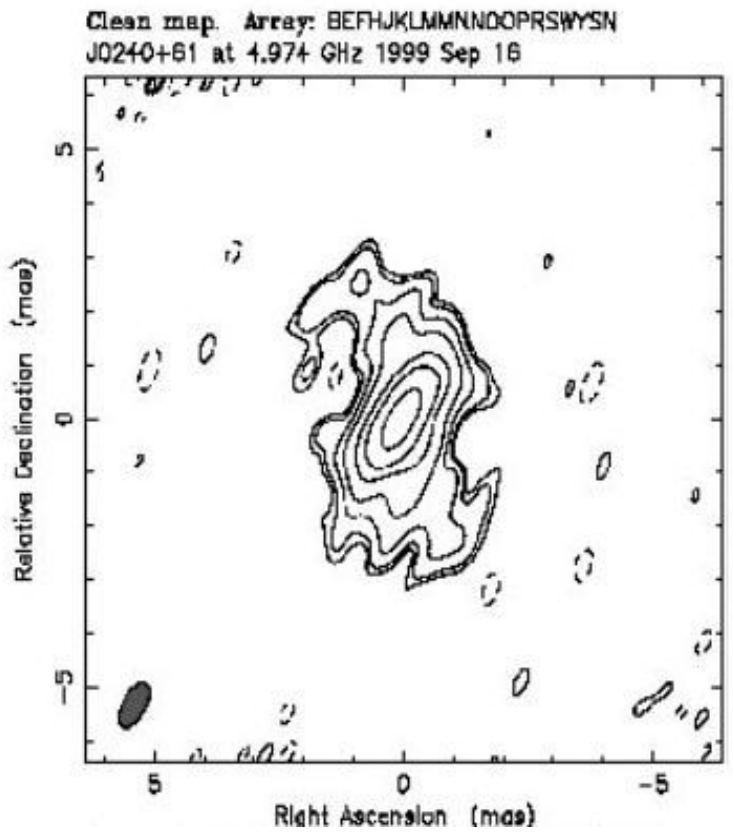
Max-Planck-Institut für Radioastronomie, Bonn

# LSI +61 °303

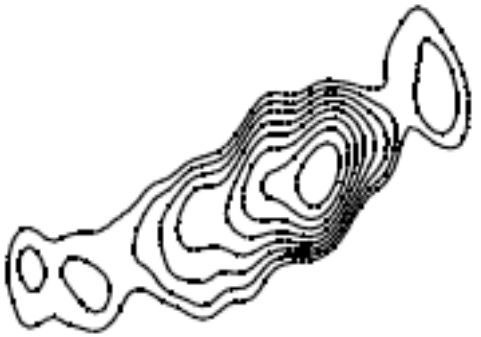
- High mass X-ray binary system
- Compact object: 2-3.5 M⊙
- Companion: Be star (5-15 M⊙)
- Orbital period: 26.5 d
- Highly eccentric orbit

**Spectral index analysis and high energy observations confirm the two peak accretion microquasar model for LSI +61°303.**

# Short-term variability and strong morphologial changes in LSI +61°303

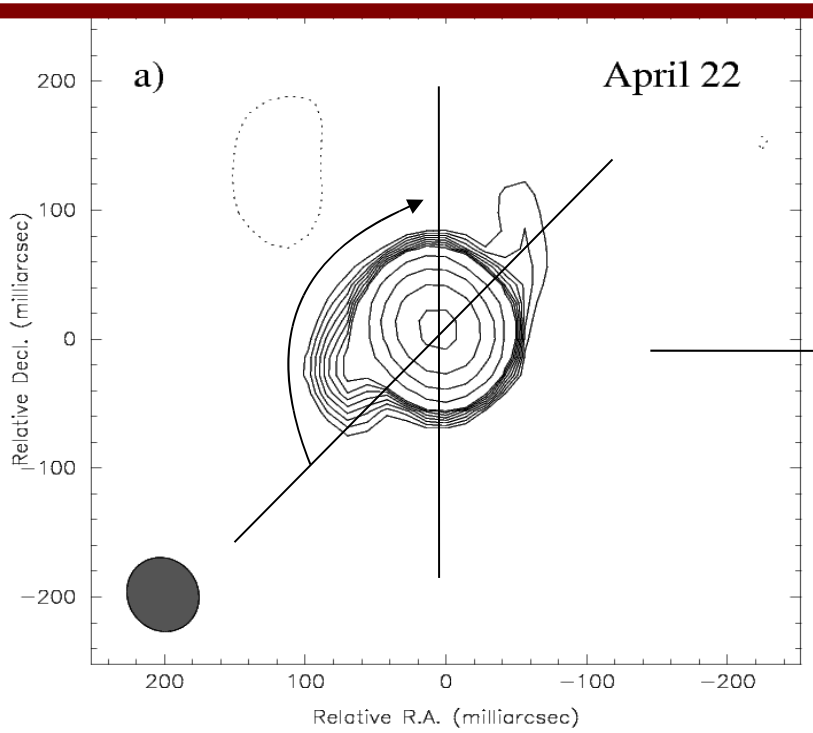


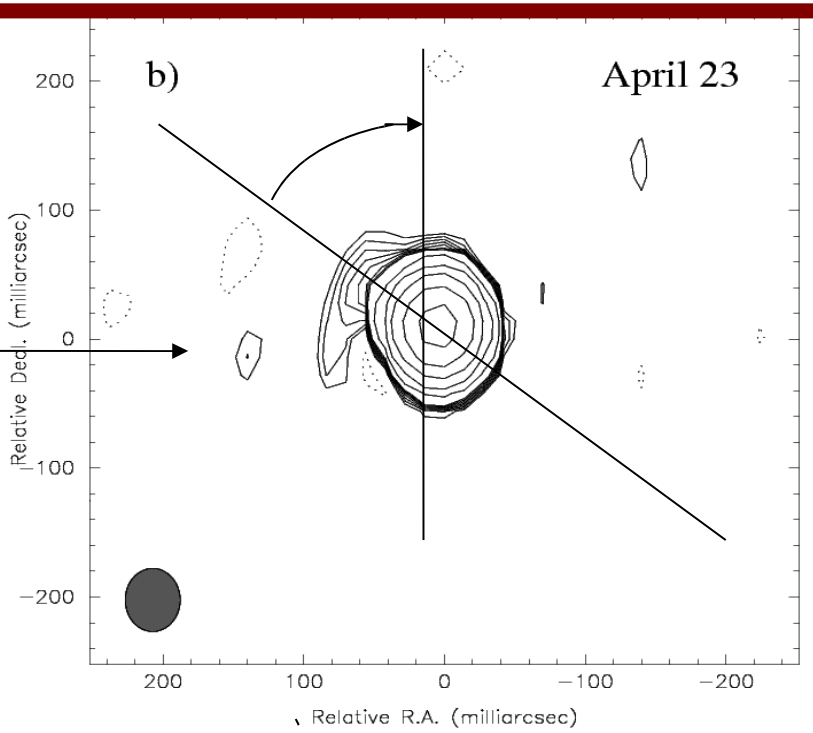

Taylor et al. 2000



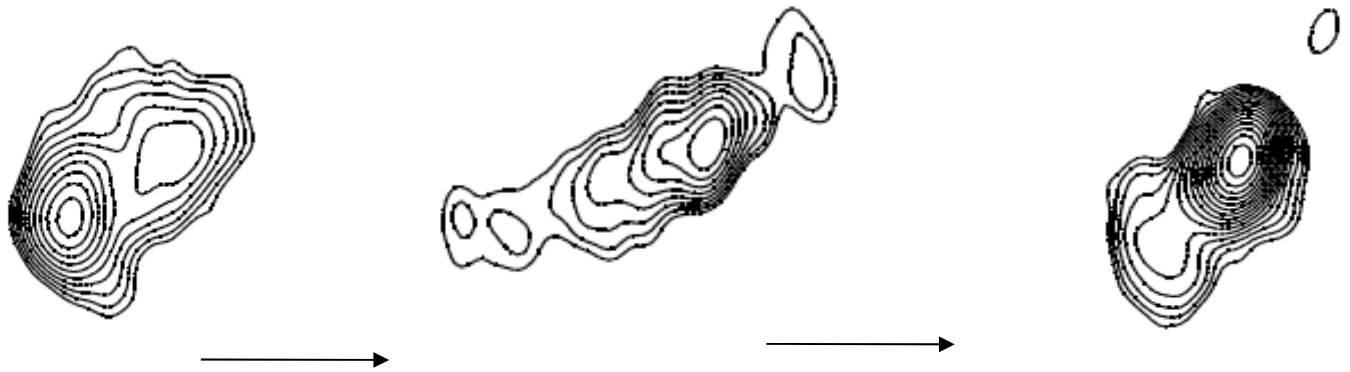
Dhawan et al. 2006

→ Different epochs




Massi et al. 2004



Dhawan et al. 2006

- Change in position angle of 60° per day observed by MERLIN in 2004
- Confirmed by consecutive VLBA images in 2006

# In the context of a microquasar model:

- A **precessing jet** with a period of only a few days
- Induces **variable Doppler boosting** and **variations in the position angle**

- Most likely cause: the **compact object is tilted**
- Accretion disk is either:
    - coplanar with compact object and tilted with respect to the binary orbital plane

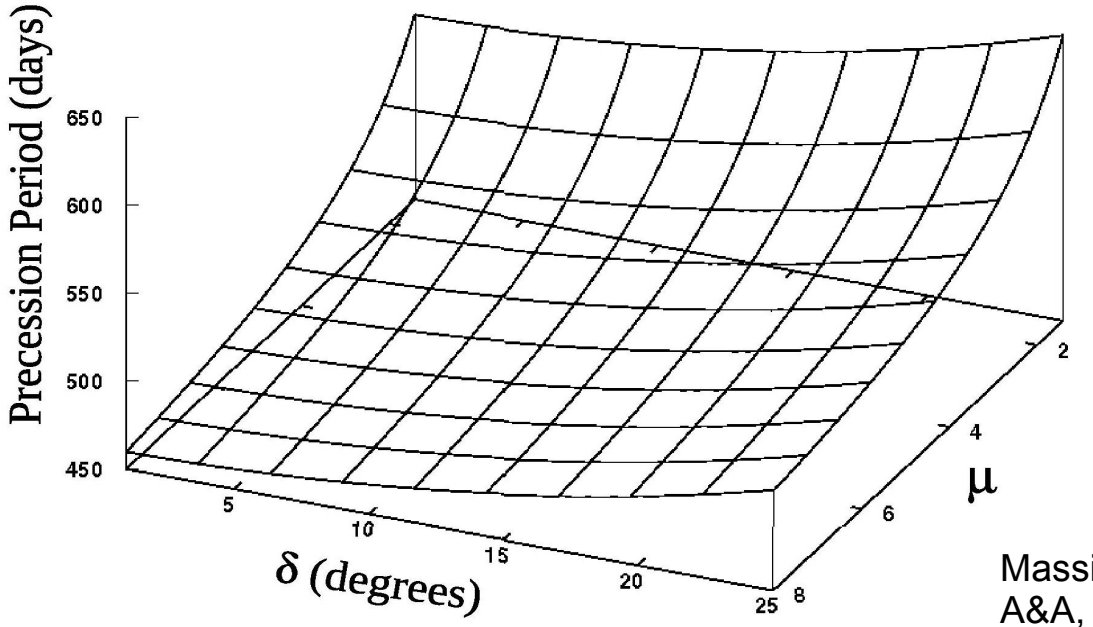
      → Be star induces a **gravitational torque**

    - coplanar with the binary orbital plane and tilted with respect to the compact object

      → **Lense-Thirring** precession, if compact object rotates

# Tidal Forces

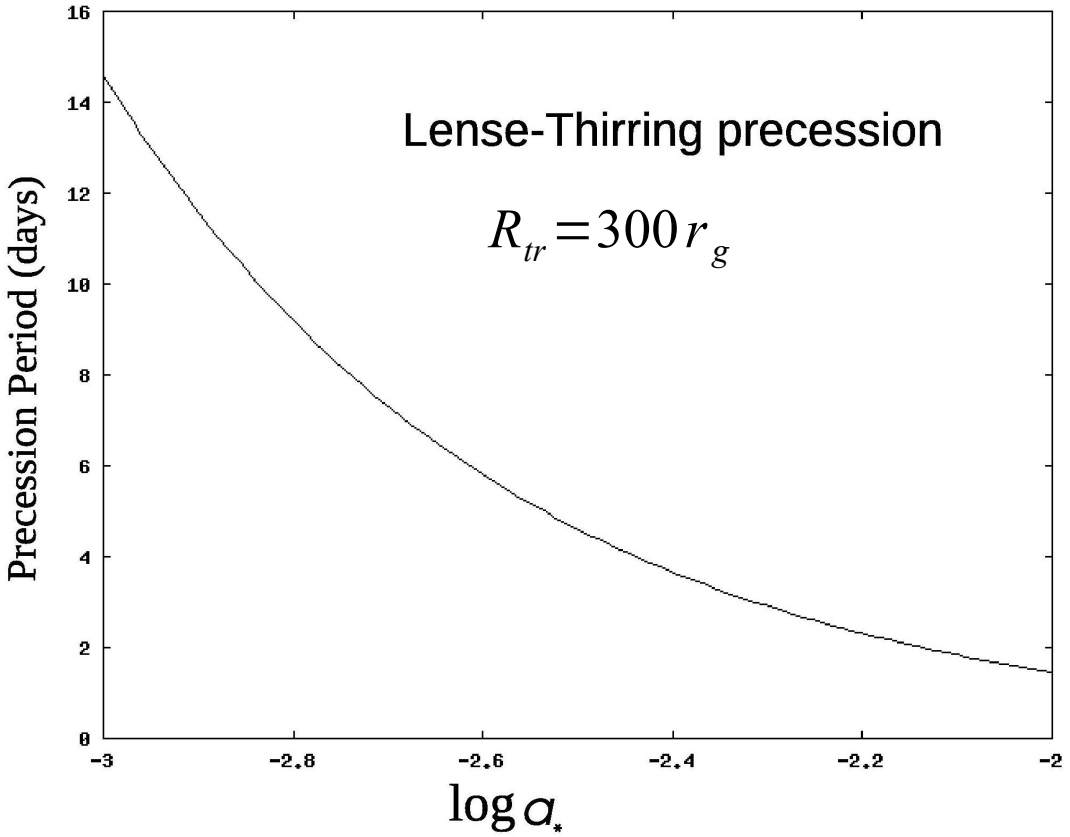
Tidally forced precession for assumed disk size




Massi & Zimmermann 2010, A&A, in press

Precessional period above 460 days

# Lense Thirring




Massi & Zimmermann 2010

PLT results in a few days for 0.001< a*<0.01

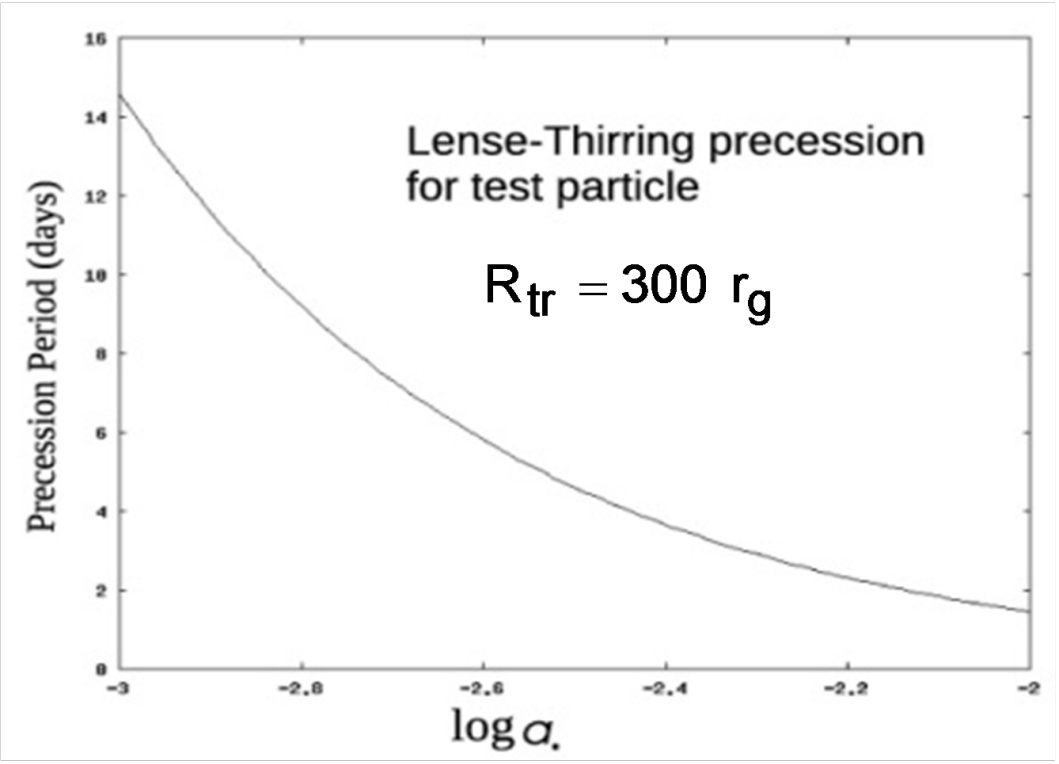
# Conclusions

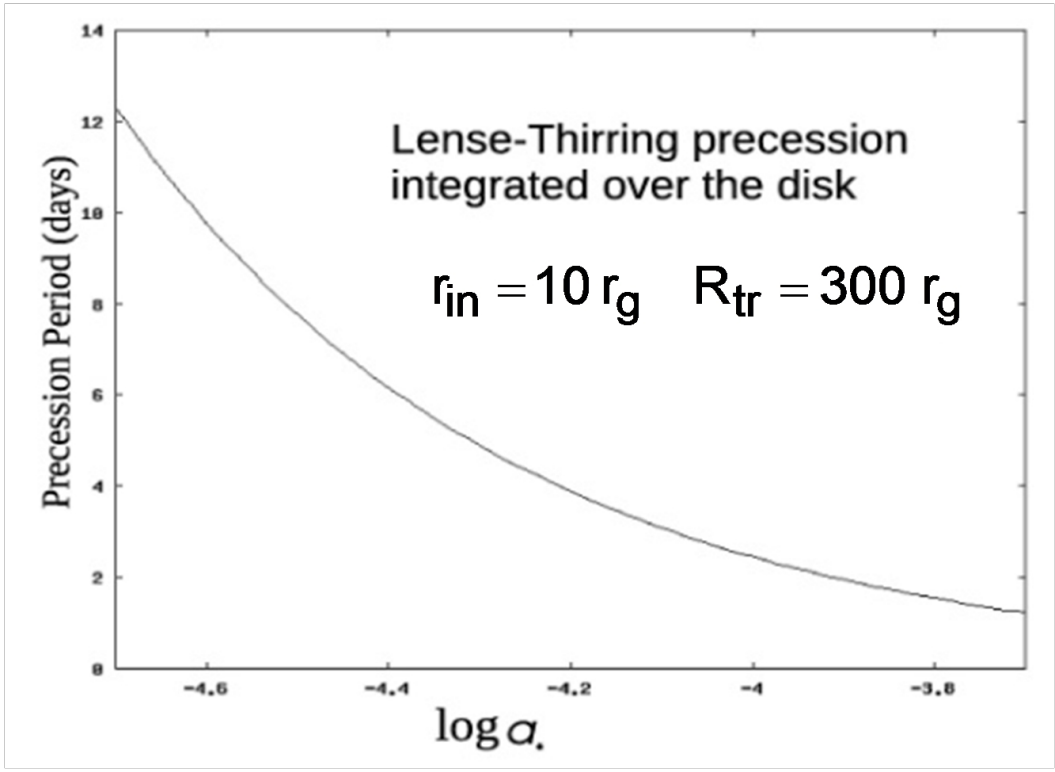
**Daily variations in the position angle** observed by MERLIN in 2004 and confirmed by consecutive VLBA images in 2006:

- **cannot be** explained by **tidal forces**: produces too long a precessional period
- **can be** explained by **Lense-Thirring**: produces the observed precessional period

Thank you for your attention!

# Lense Thirring




Massi & Zimmermann 2010

For a test particle: $P_{LT}$ results in a few days for $0.001 < a^* < 0.01$

Integrated over the disk: $P_{LT}$ becomes even shorter