UCL DEPARTMENT OF SPACE AND CLIMATE PHYSICS
MULLARD SPACE SCIENCE LABORATORY

A Highly Polarised Jet in XTE J1748-288

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The BH X-ray Transient XTE J1748-288

The 1998 outburst of XTE J1748-288

- X-ray outburst started 3-4 June 1998, detected by RXTE/ASM and CGRO/BATSE (Smith et al. 1998, Harmon et al. 1998)
- Initially hard but beginning to soften at BATSE energies
- Revnivtsev et al. (2000) suggested outburst evolved through very high/soft, high/soft and low/hard spectral states during decay as now known to be typical
- Optically-thin, variable radio source detected 7 June 1998 (Hjellming et al. 1998a)
- Radio source resolved from 14-15 June - 3rd source detected with apparent superluminal motion and 1st to show strong deceleration

ATCA Observations

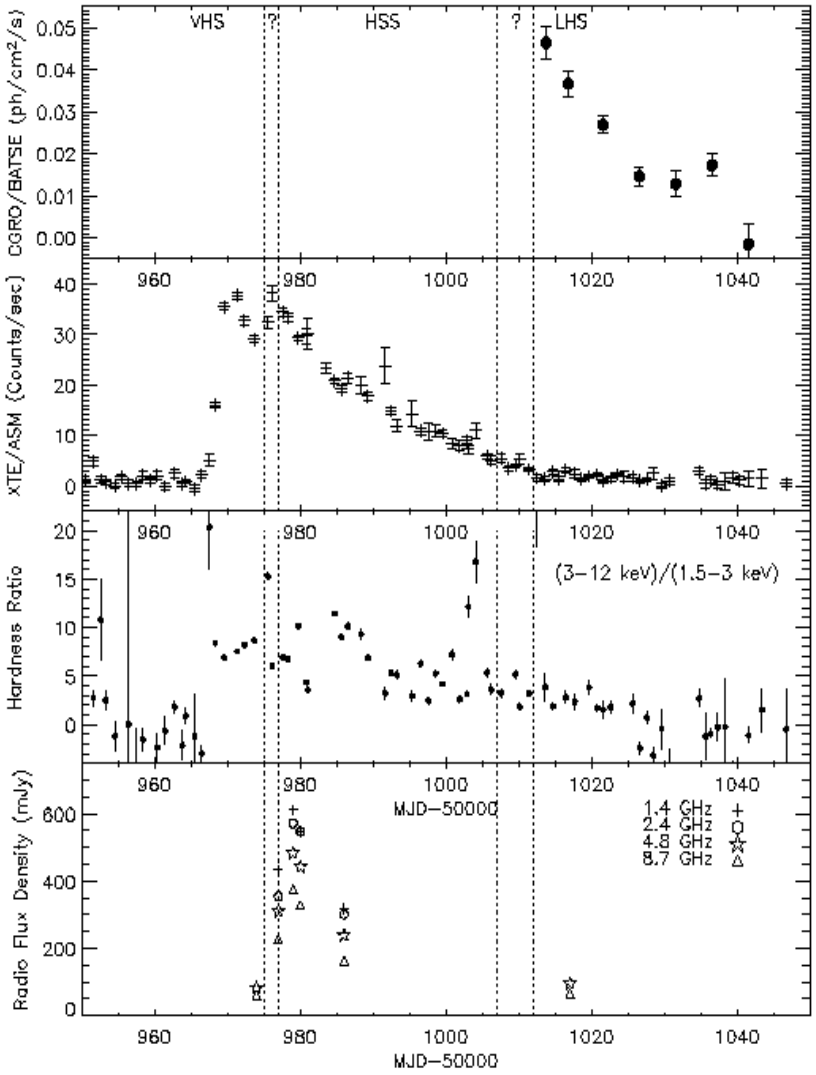
- XTE J1748-288 observed on 7 occasions at 2 or 4 frequencies
- Detected but unresolved at each epoch
- Unusually high radio flux density (>600 mJy)
- Unusually high level of linear polarisation (>20%)

X-ray and Radio Lightcurves

Brocksopp et al. (MNRAS in press)

State transitions from Revnivtsev et al. (2000)

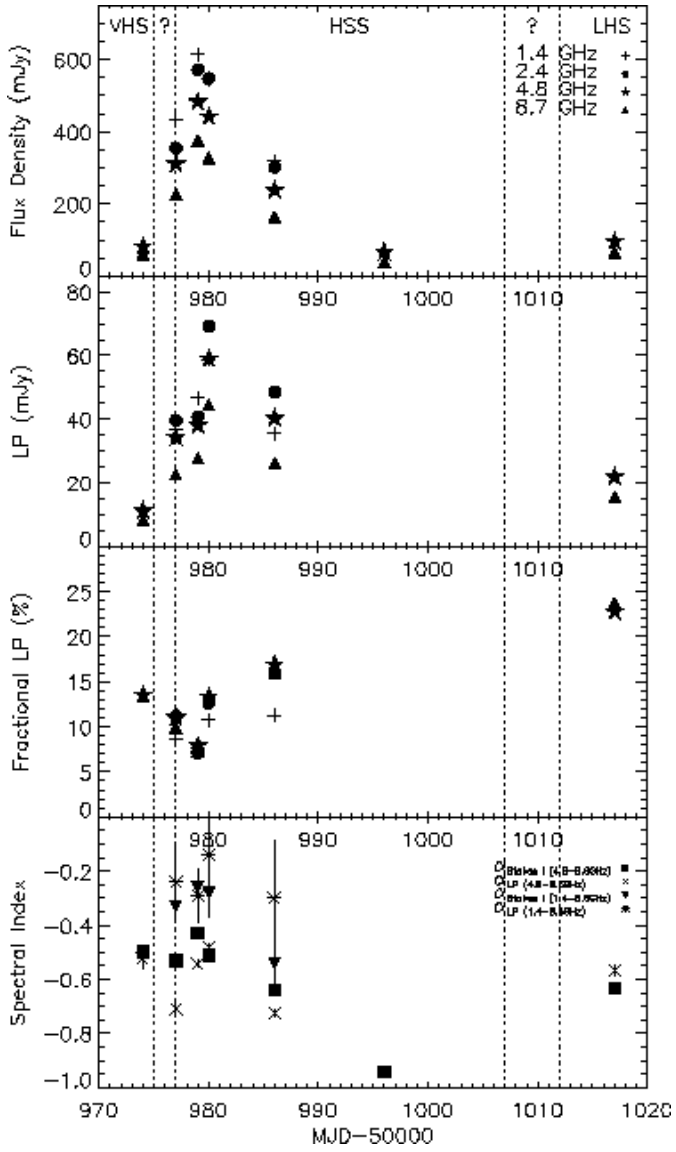
Peculiarly high radio flux during LHS



Radio Lightcurves

- Stokes I and LP flux well-correlated
- Stokes I and fractional LP anti-correlated
- Spectral index shows emission

  optically-thin throughout



What causes the variability in polarisation?

Optically thin synchrotron emission has FP < 70 %

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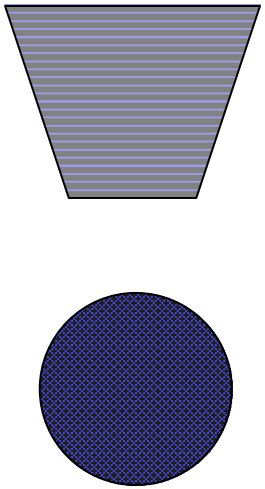

Two competing components ?

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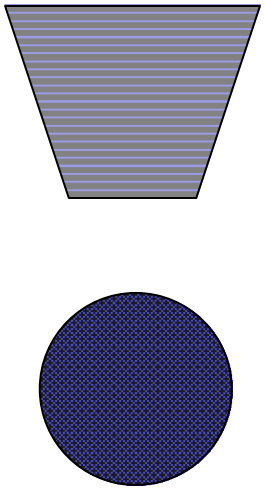

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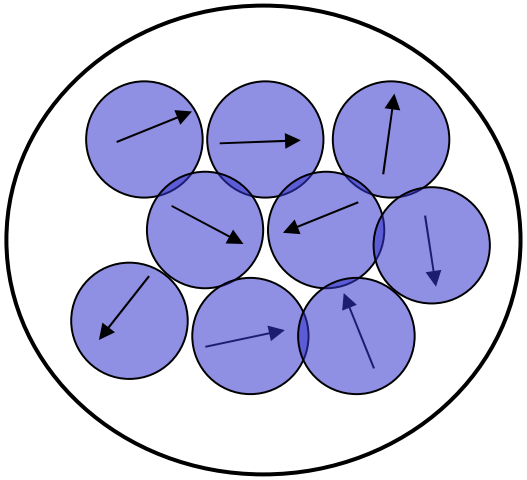

Multiple “packets” ?

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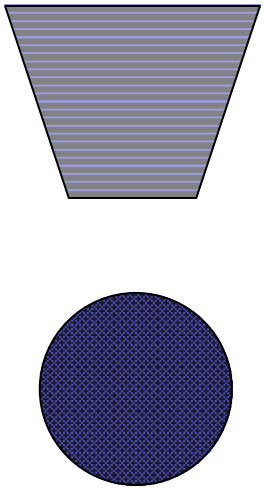

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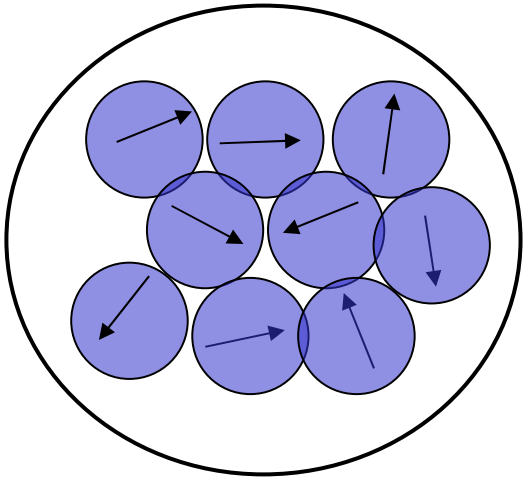


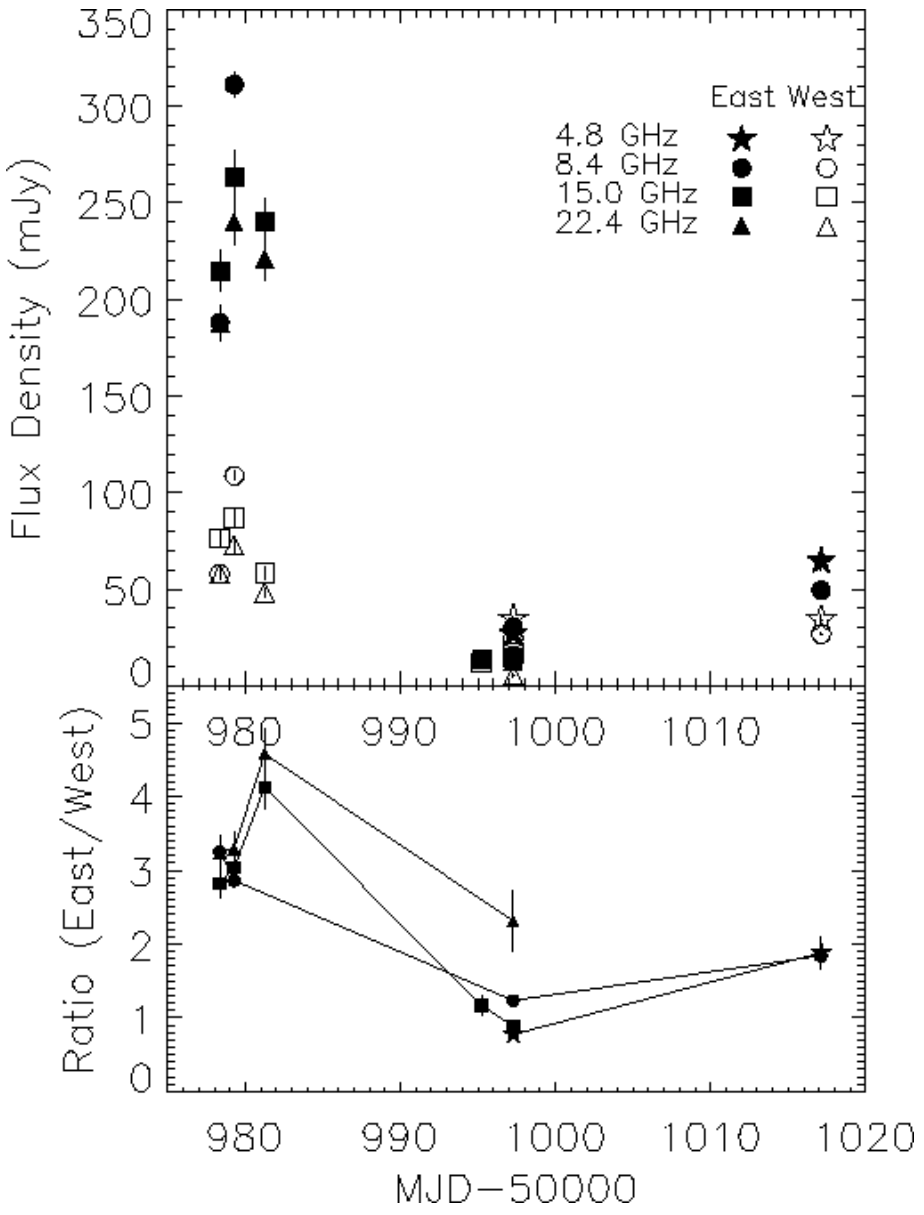
Multiple “packets” ?

…….or perhaps just Faraday rotation along our line of sight?

Testing the core/jet component model

- VLA data resolved into 2 components
- Relative contributions of components vary
- Minimum of FP at time of dominant eastern component

-> eastern component
= depolarised core?

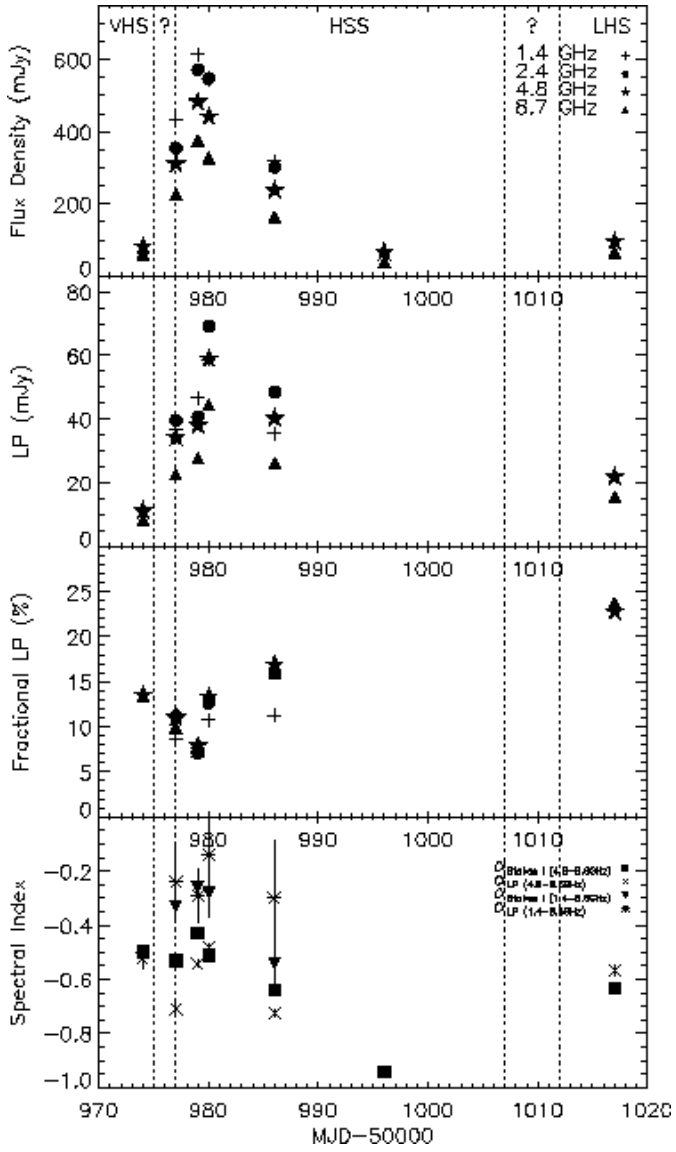


High Radio Flux and Linear Polarisation during the LHS??

Radio flux density ~100 mJy

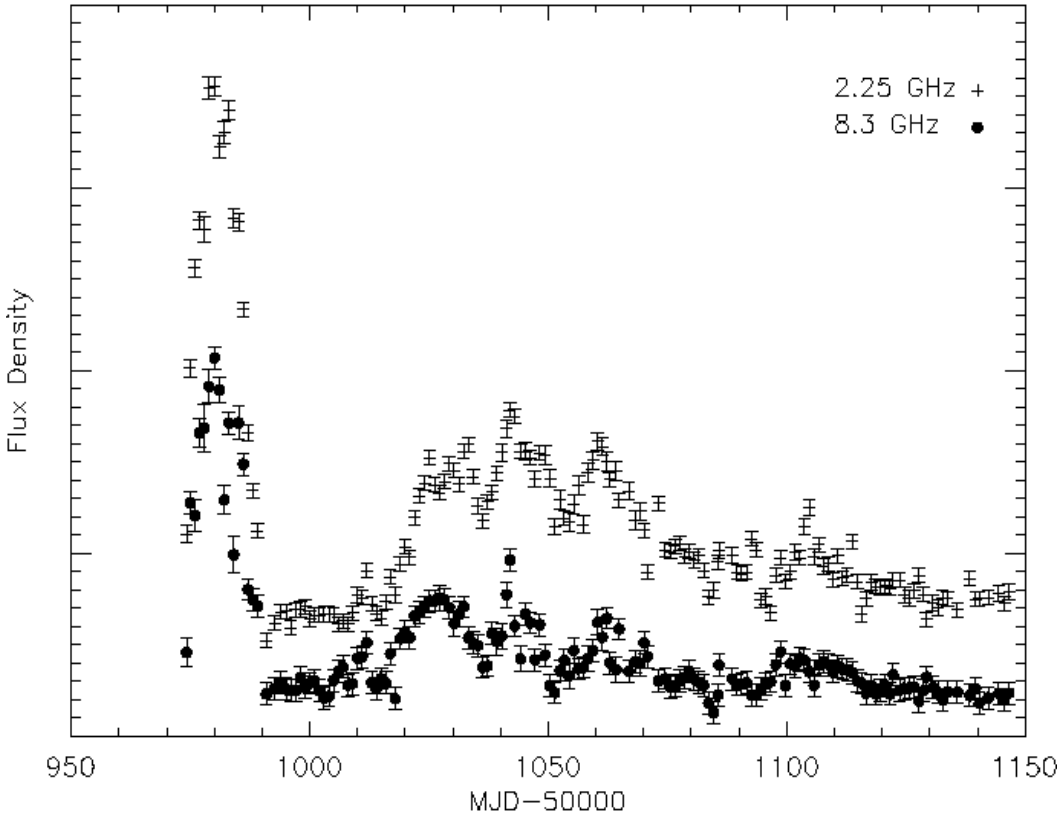
Optically thick synchrotron emission has FP < 15 %

……not 23%



High Radio Flux and Linear Polarisation during the LHS??

- New jet ejections at transition to LHS?
- Collision between jet and ISM?



Why we could have done a much better job with LOFAR

- Patchy coverage of observations, often miss the interesting parts of the outburst

- S/N ok for XTE J1748-288 but typical BH transients have lower radio fluxes

- Difficult to analyse polarisation variability when so few sources to compare with. Increased sensitivity will change this

- Difficult to analyse unprecedented high radio flux in LHS. Continual monitoring after decay of X-ray outburst may find more cases

- Resolution not high enough to resolve source properly and track the components (yet undetected by VLBI), particularly with simultaneous polarisation information

- Dependent on using different telescopes for different contributions to data-set. But not always consistent with each other!