



*Swift*

# The Extraordinary Naked-Eye Gamma-ray Burst GRB 080319B

Judith Racusin

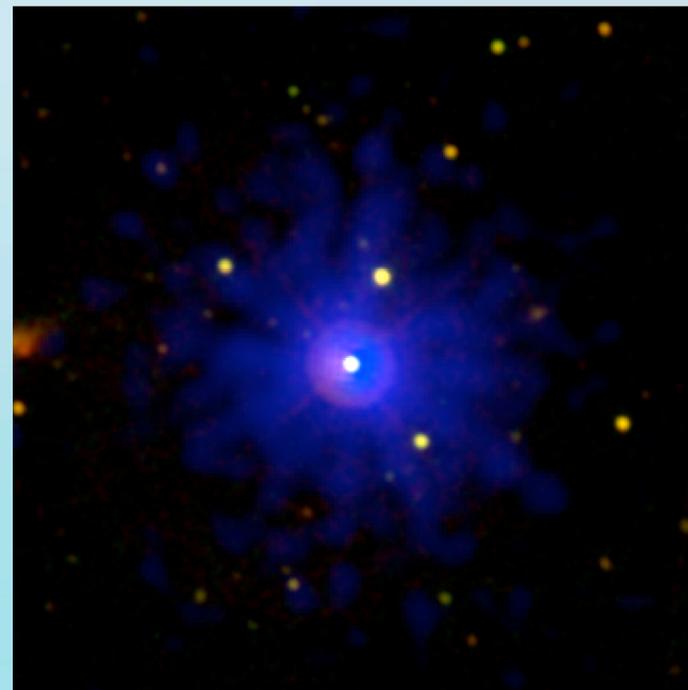
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Presenting results from “Broadband Observations of the naked-eye  $\gamma$ -ray burst GRB 080319B”, Racusin et al., to appear in *Nature* on September 11, 2008

# Gamma-Ray Burst (GRB) 080319B

- One of the brightest GRBs ever observed
- The brightest optical and X-ray flash associated with a GRB
- Peaked at visual magnitude of 5.3 (naked-eye)
- Located at a redshift of  $z=0.937$  or distance of 7.5 billion light years
- Best broadband observations of a GRB ever collected

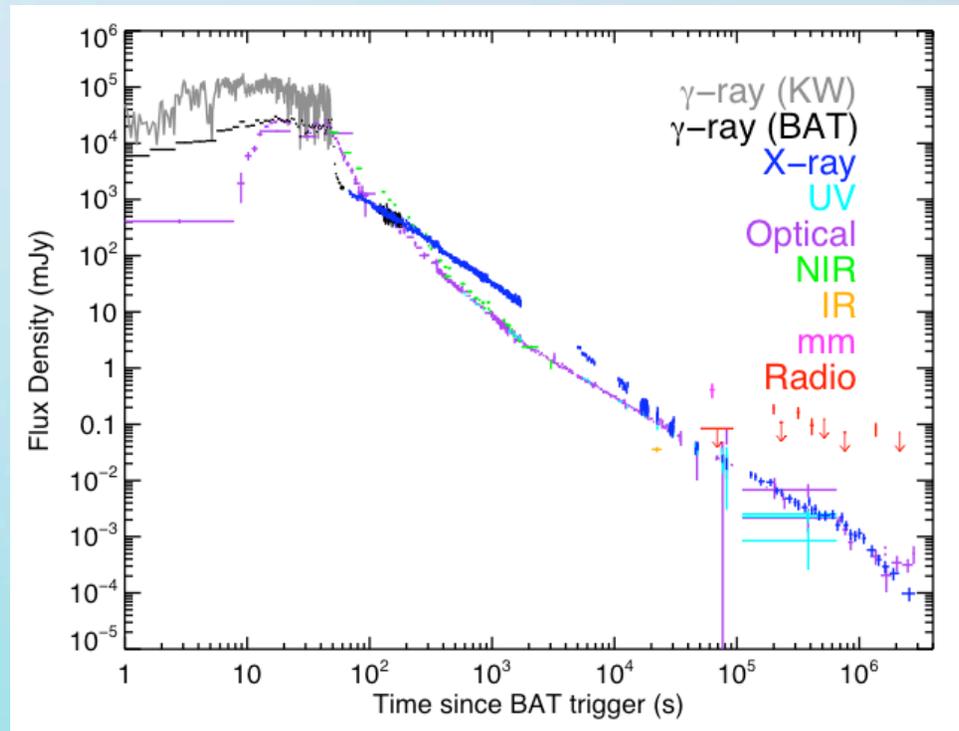


*Animated version available on website*



# Broadband Observations of GRB 080319B

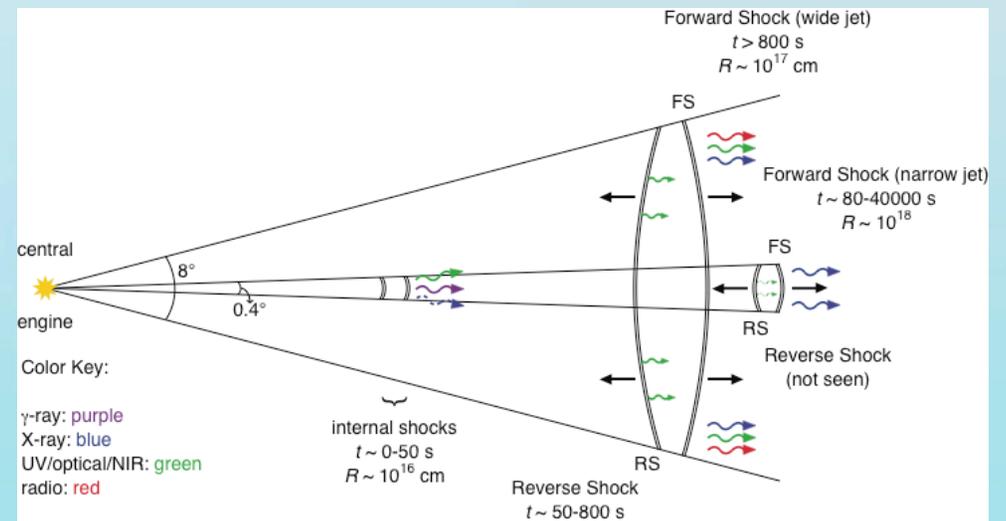
- *Swift* (Burst Alert Telescope, X-ray Telescope, Ultraviolet Optical Telescope)
- Konus-Wind
- Telescopio Ottimizzato per la Ricerca dei Transienti Ottici Rapidi (TORTORA)
- “Pi of the Sky”
- Rapid Eye Mount Telescope (REM)
- Liverpool & Faulkes Telescopes
- Very Large Telescope (VLT)
- Hubble Space Telescope (HST)
- Gemini – North Telescope
- Hobby-Eberly Telescope (HET)
- Westerbork Synthesis Radio Telescope (WSRT)
- Institute de Radioastronomie Millimétrique – Plateau de Bure Interferometer (IRAM)



Racusin et al., *Nature*, 2008

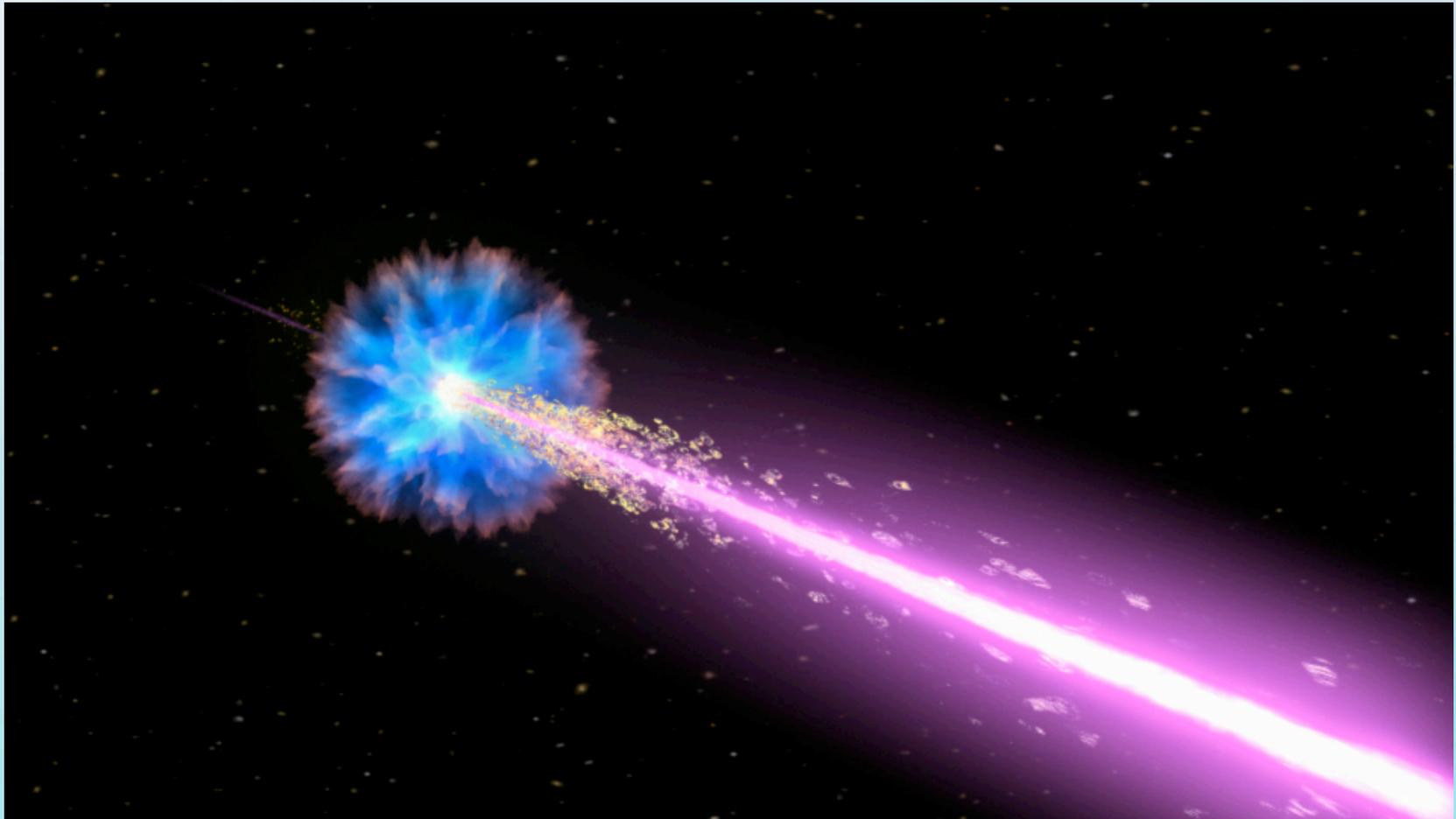
# Interpretation

- Prompt  $\gamma$ -ray and optical flash was caused by two different radiation mechanisms
  - Different than typical interpretation
  - First time data are good enough to distinguish
- Unusual prompt emission and afterglow properties can be explained with a two-component jet
  - Very narrow ultra-relativistic (99.99995% c) inner jet
  - Wider less relativistic outer jet
- Narrow jet must have been pointed precisely at earth



Racusin et al., *Nature*, 2008

# Two-Component Jet



*Animated version available on website*