

# G2 and Sgr A\*: A cosmic fizzle at the Galactic Center

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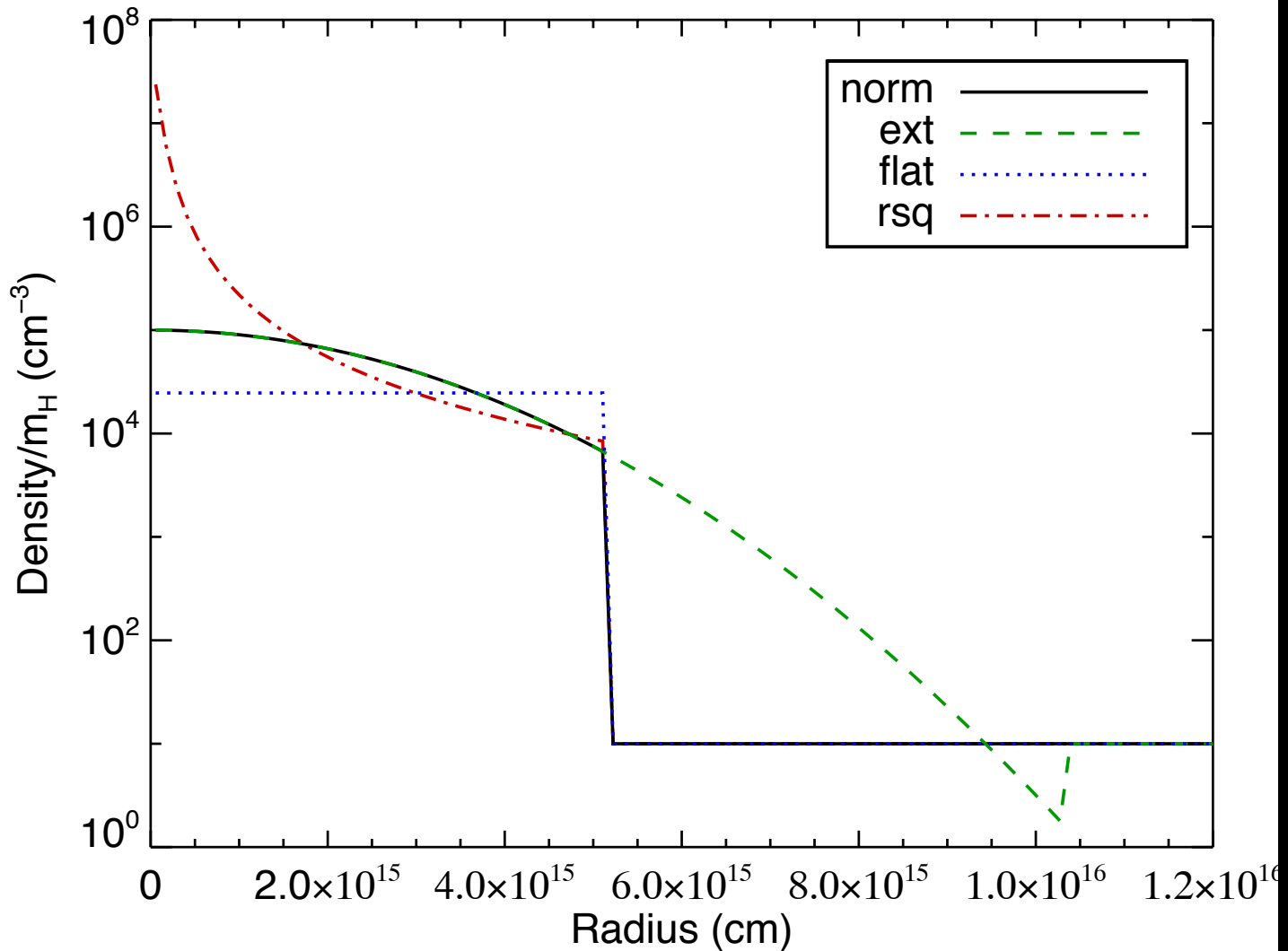
# Questions

- Why didn't we see anything spectacular from G2?
- What is G2?
- Simulate different cloud structures
- Morsony et al. submitted, arXiv:1508.00384

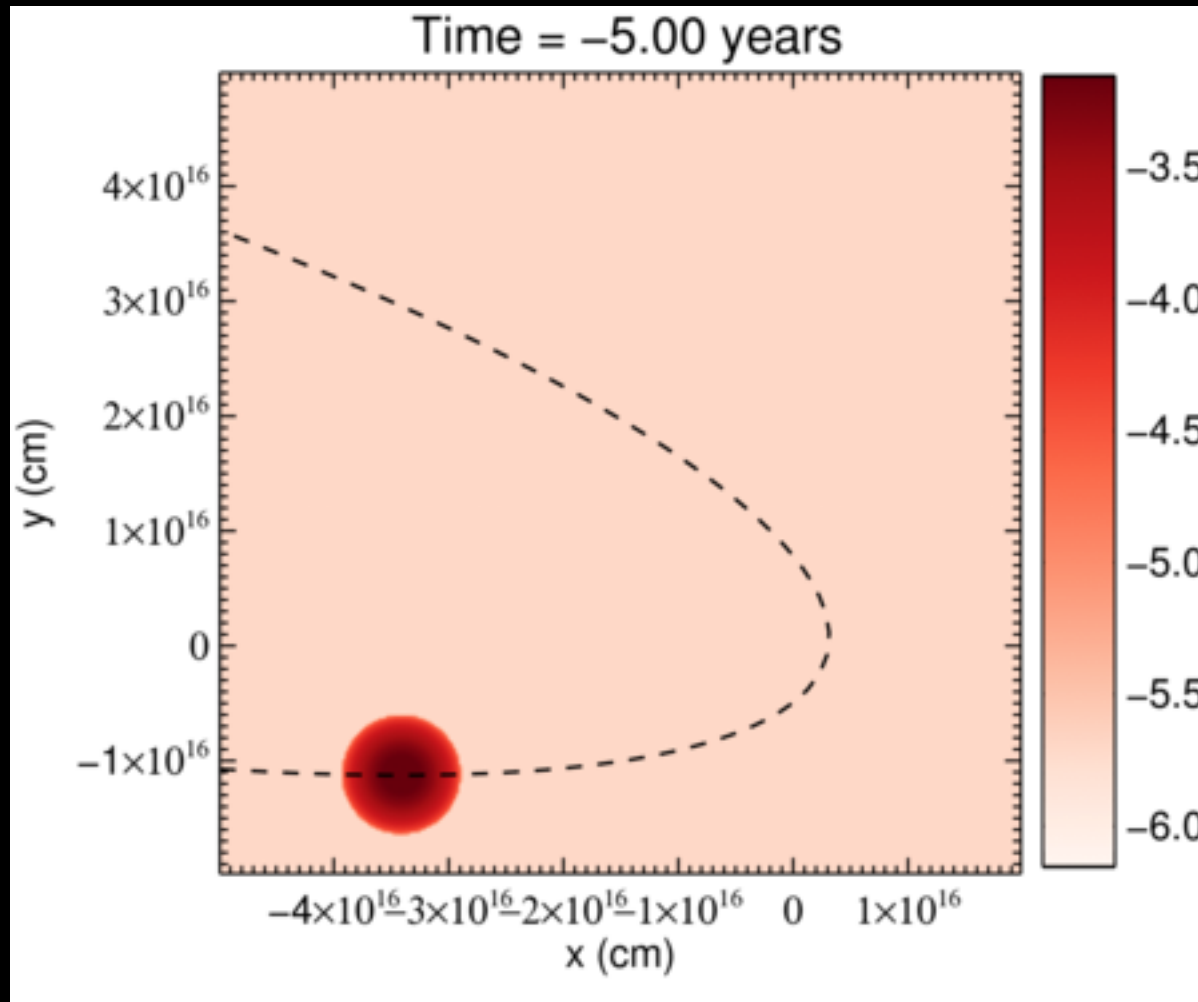
# Simulations Setups

- Start with a cloud 5 years before periapsis
- Orbit from Gillessen et al. 2013
- Gravity from Sgr A\* only
- Background co-moving with cloud
- Include cooling
- Resolution of  $1.2 \times 10^{14}$  cm  $\sim$  1 mas  $\sim$  8 AU
- Accretion radius of 1 pixel

# 4 Cloud Profiles



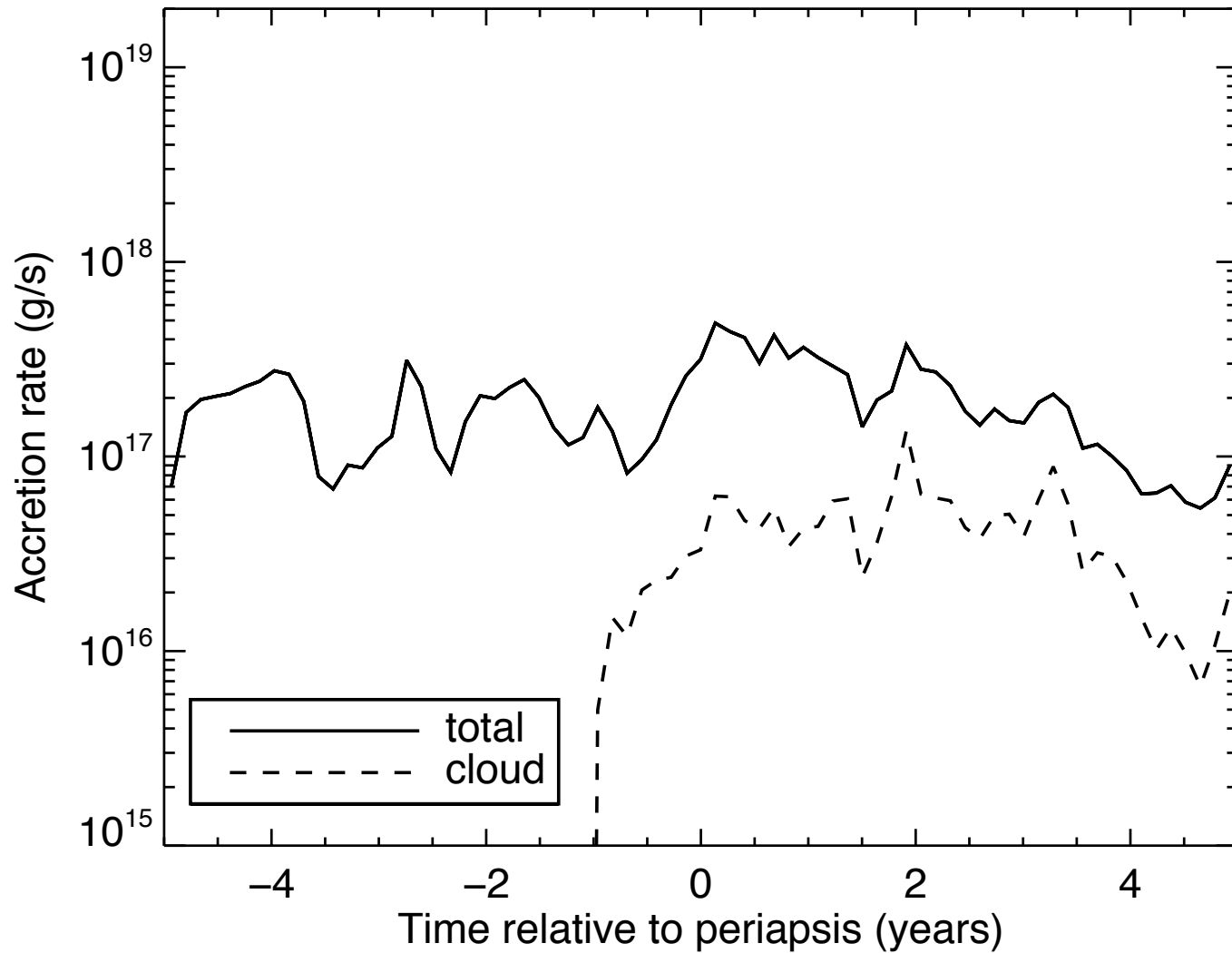
# Norm Density



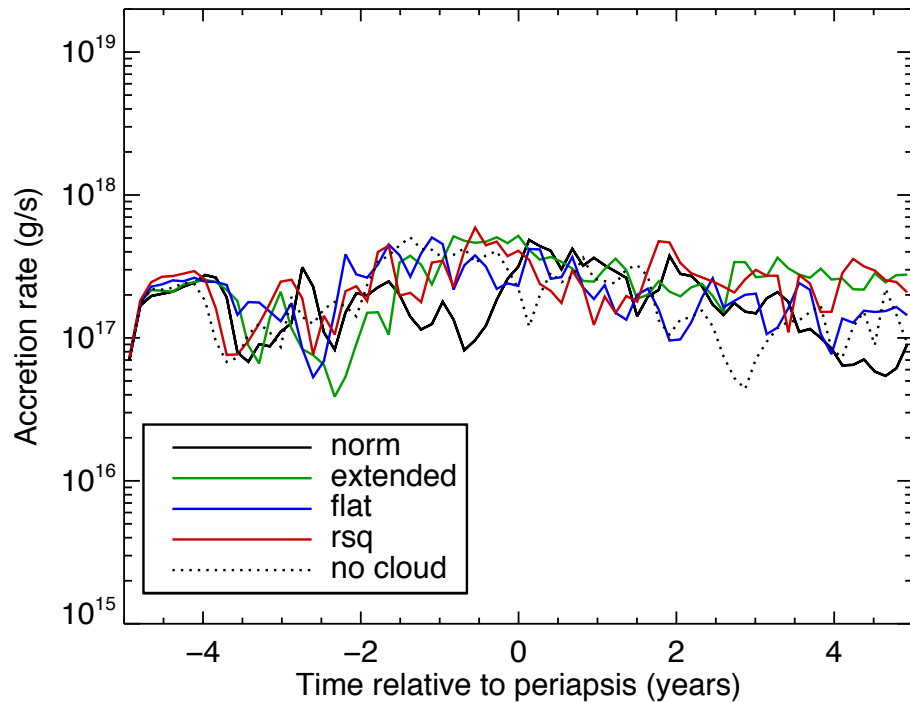
# Why didn't we see anything spectacular?

- Accretion rates

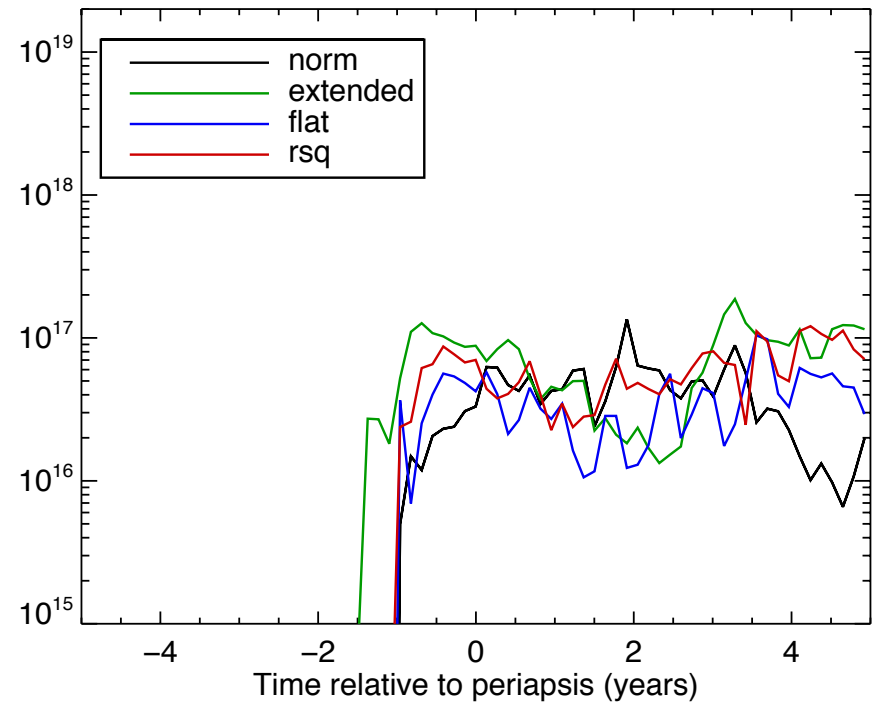
# Sgr A\* accretion rate - Norm



# Sgr A\* accretion rate



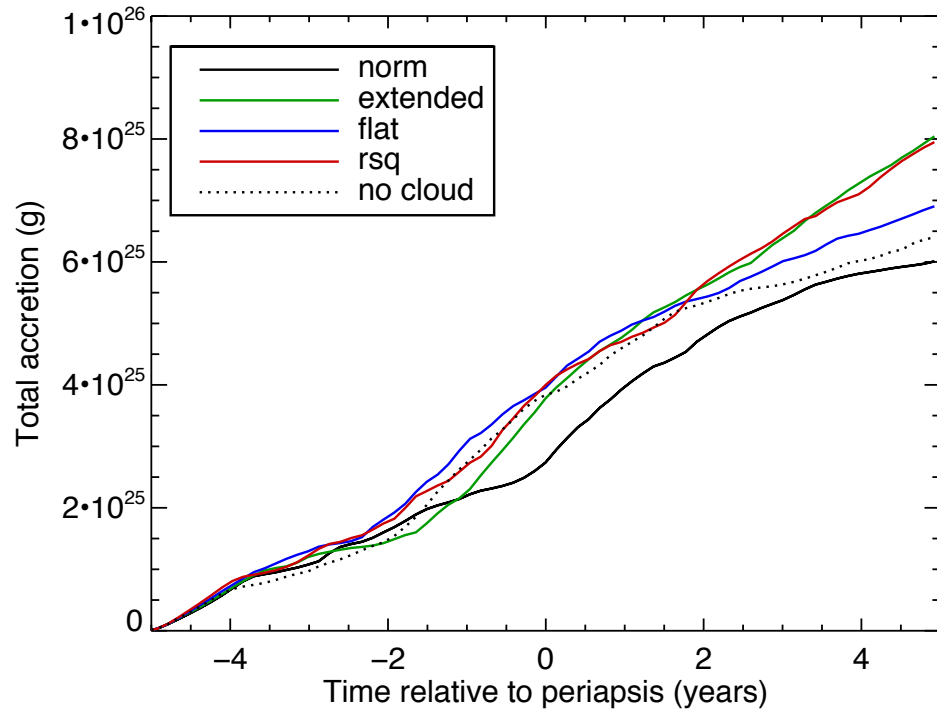
Total



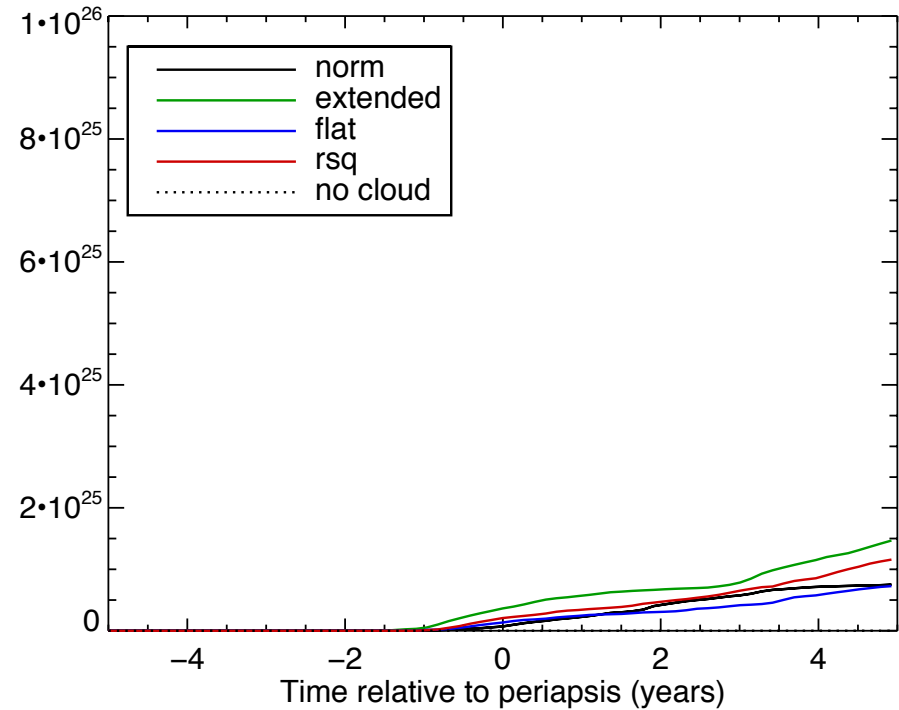
Cloud only



# Sgr A\* cumulative accretion



Total



Cloud only

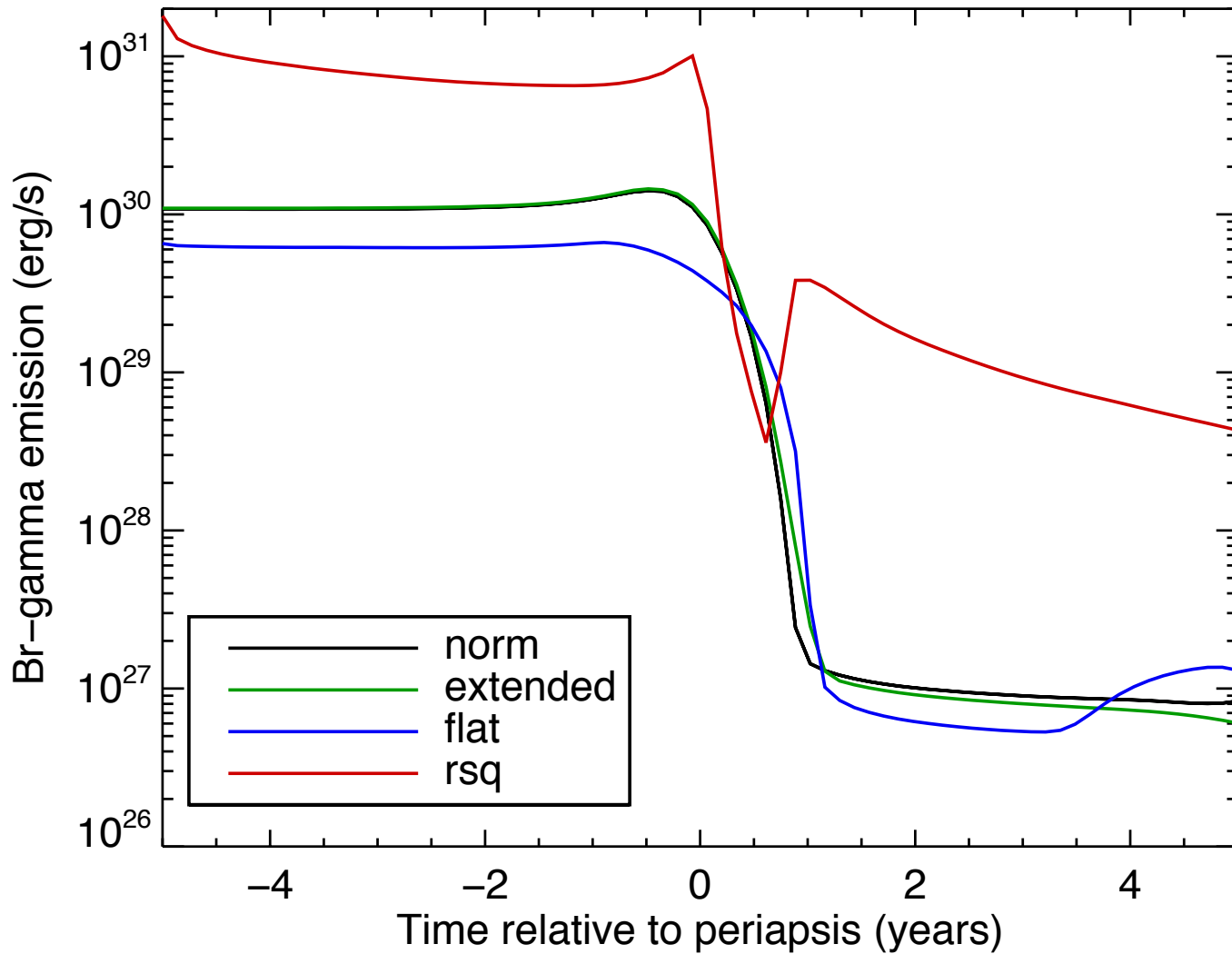
# Why didn't we see anything spectacular?

- Not much change in accretion rate
- True for different background density/velocity, accretion radius, cooling
- Cloud accounts for  $\sim 20\%$  of material accreted after periapsis
- More extended cloud leads to more accretion, but still a small change overall

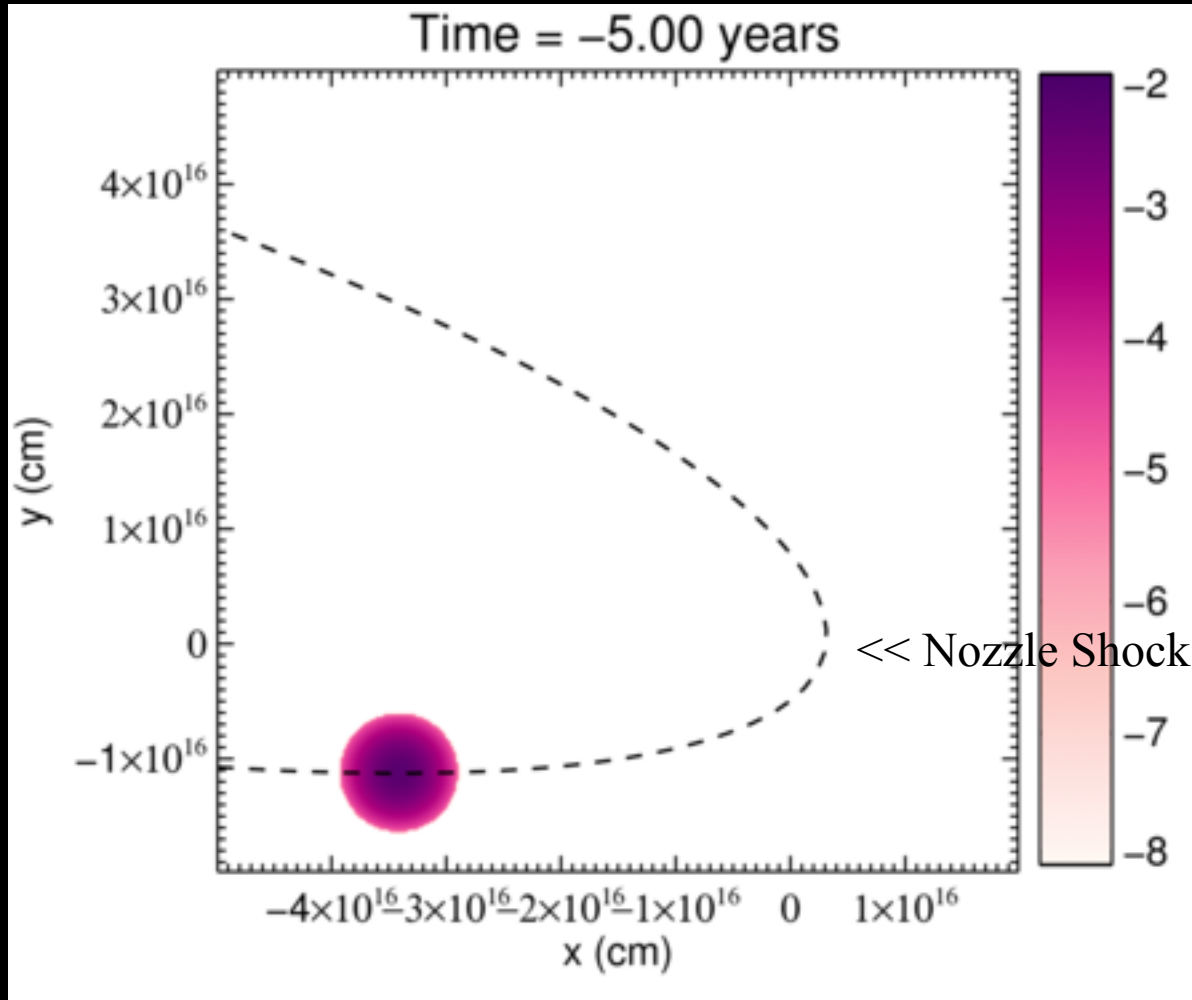
# What is G2?

- Model emission from our simulations

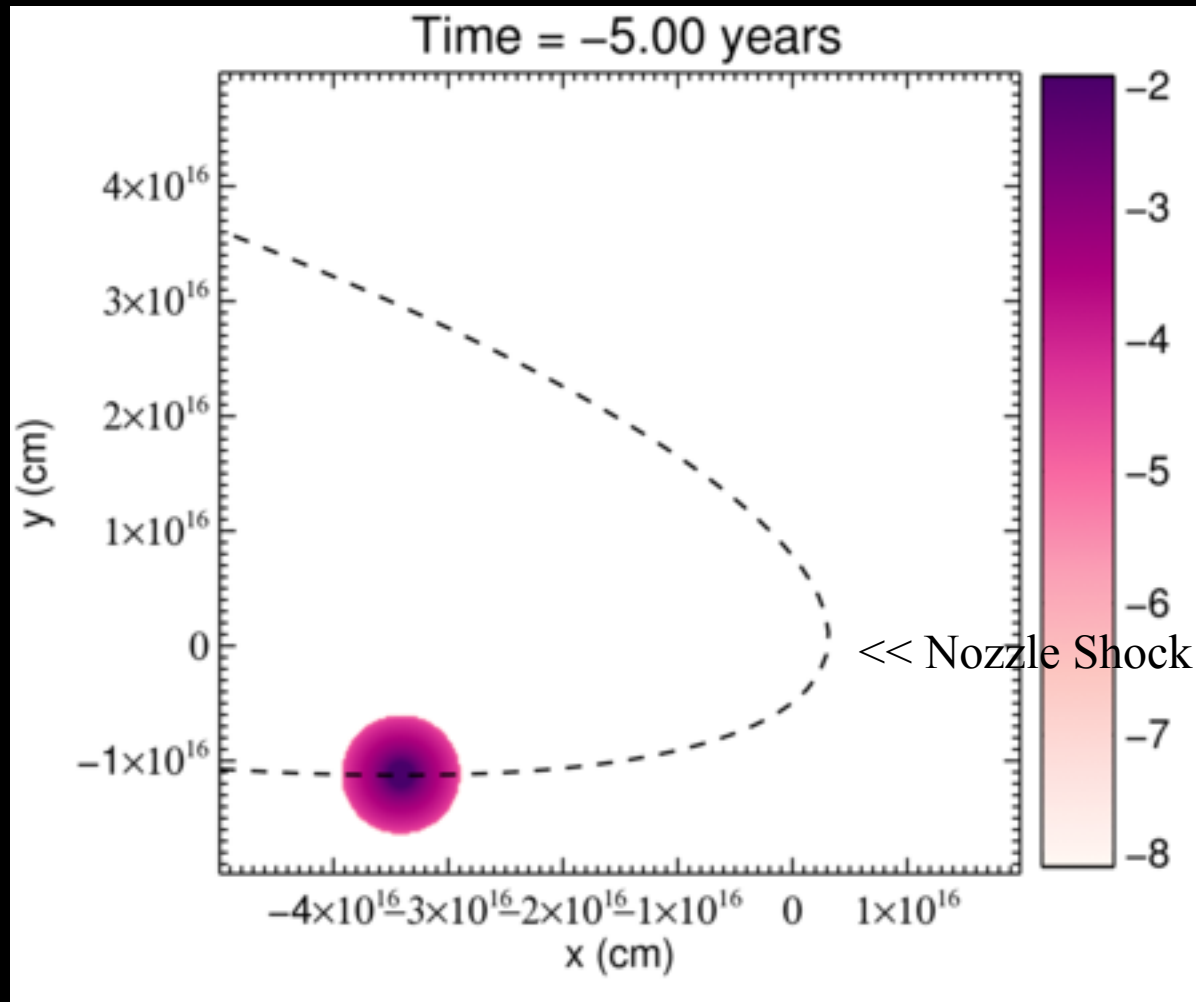
# Cloud Br-Gamma



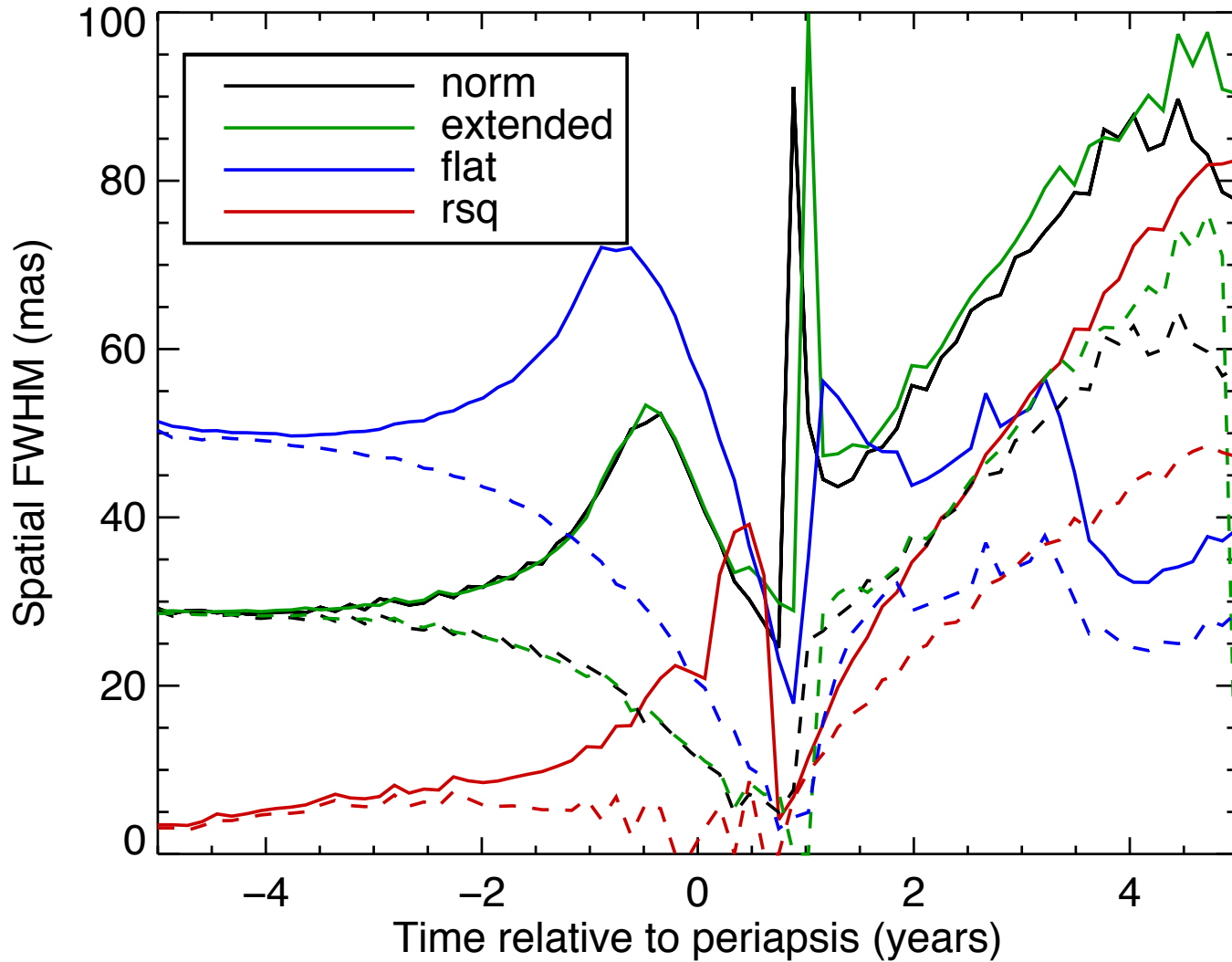
# Norm Br-Gamma



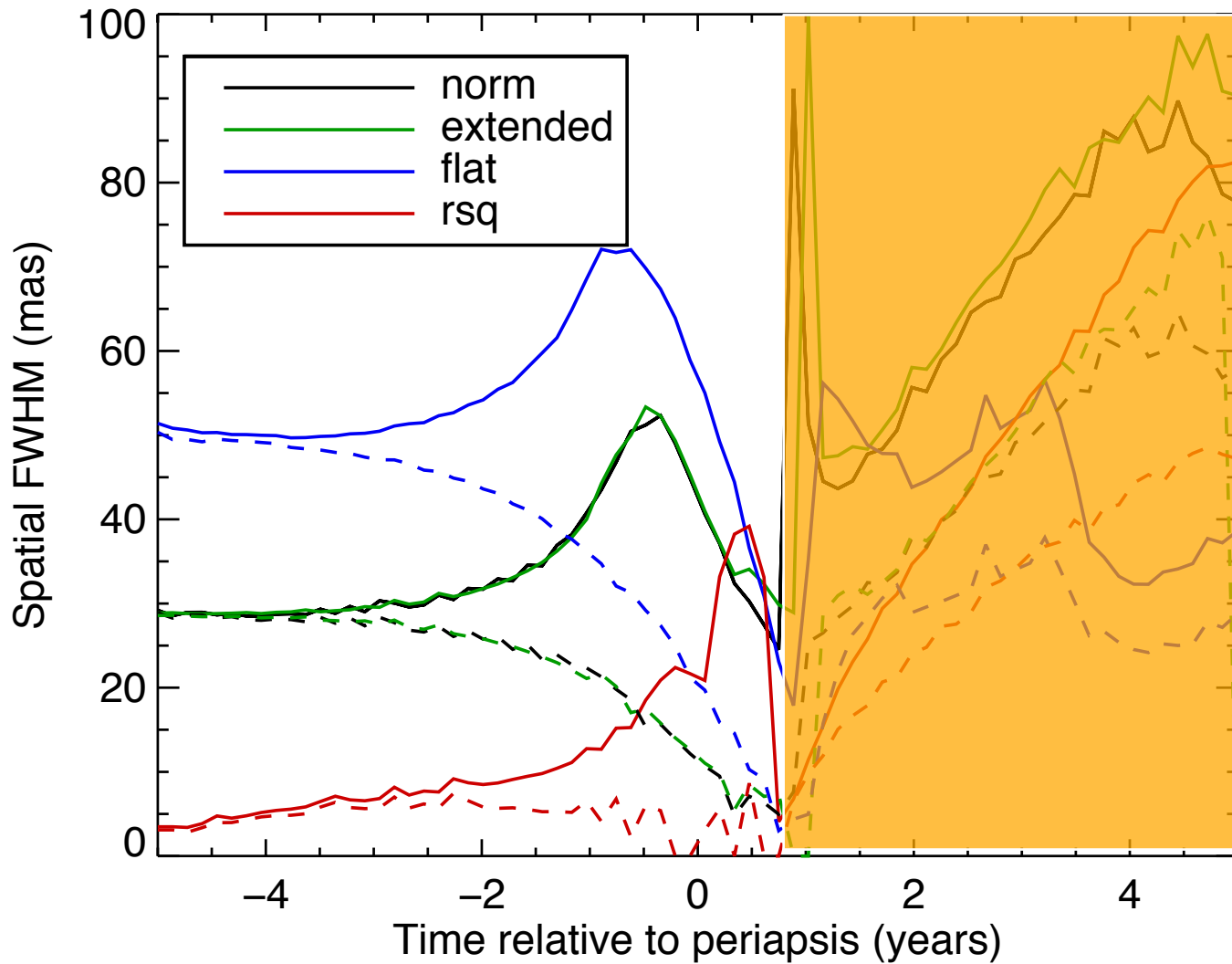
# R2 Br-Gamma



# Br-Gamma Size

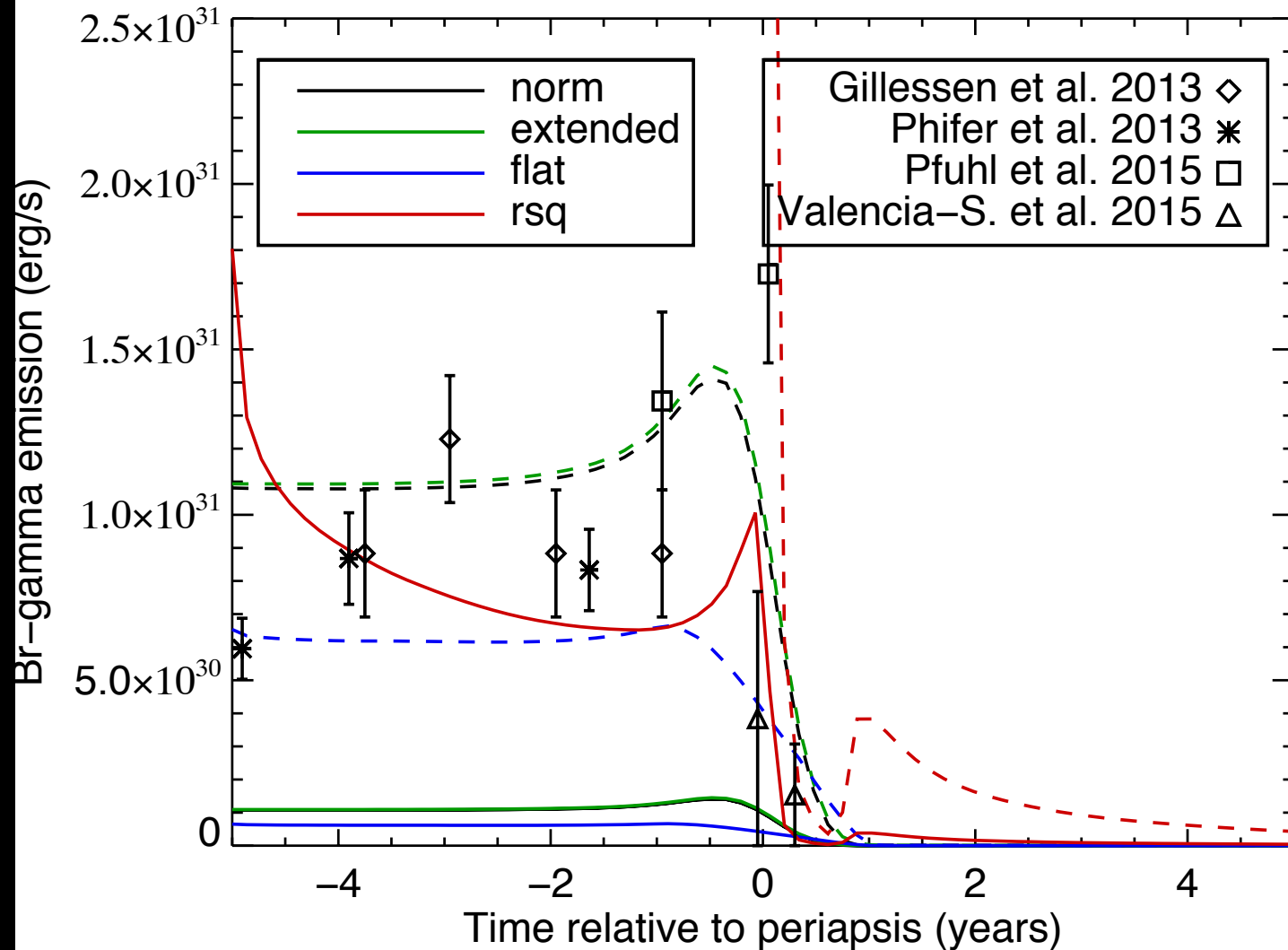


# Br-Gamma Size

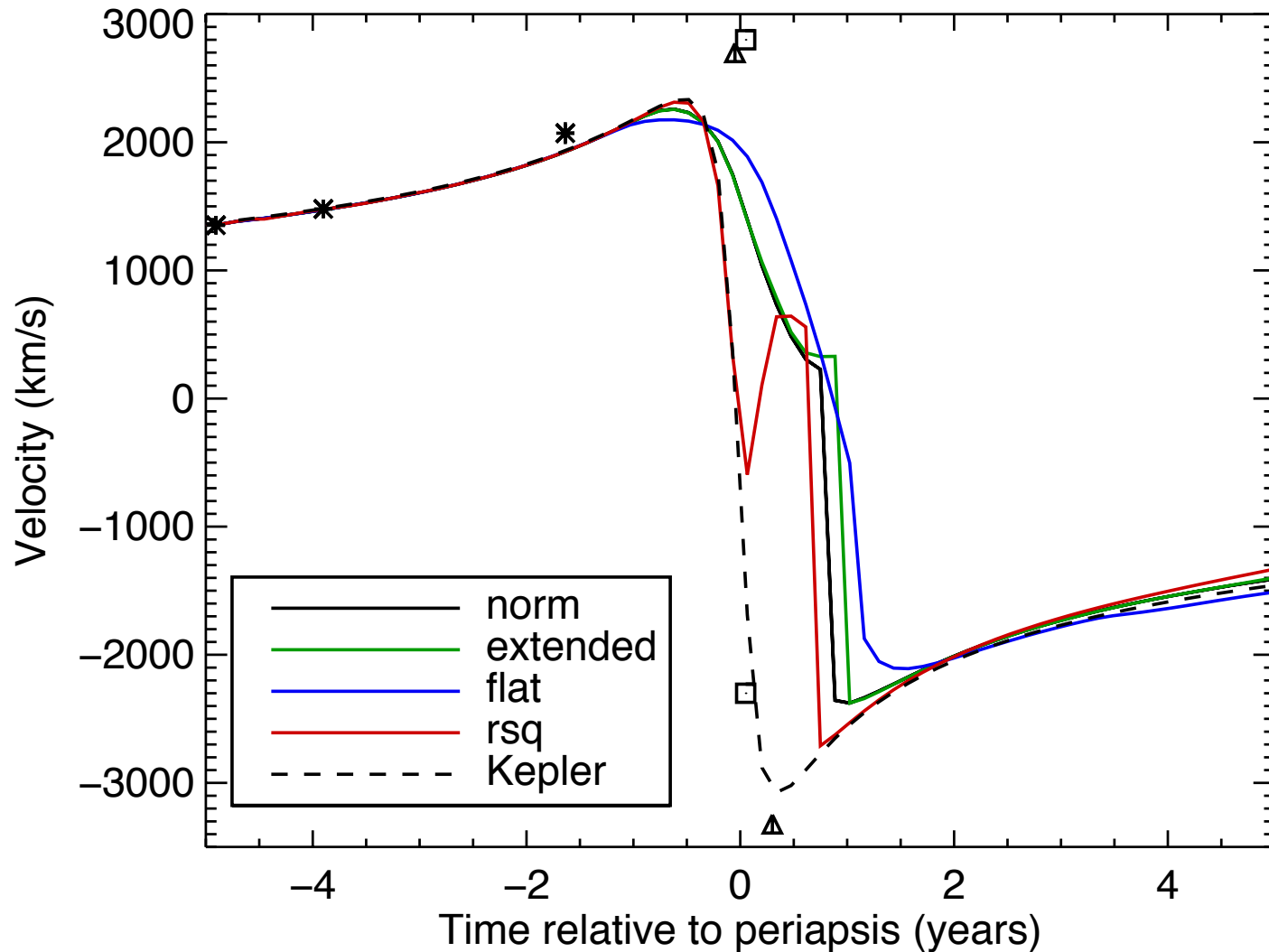




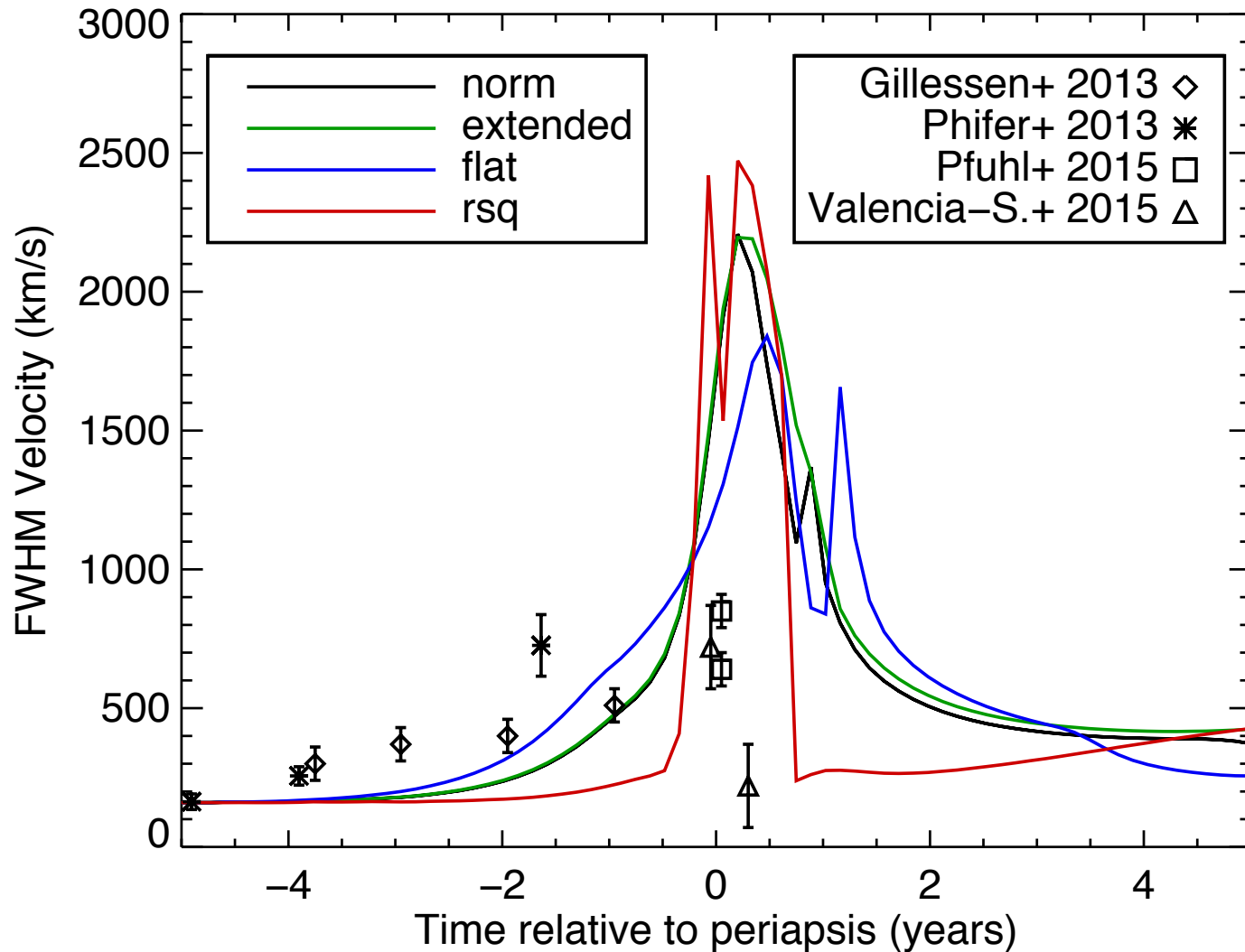
# Cloud Br-Gamma vs. Data



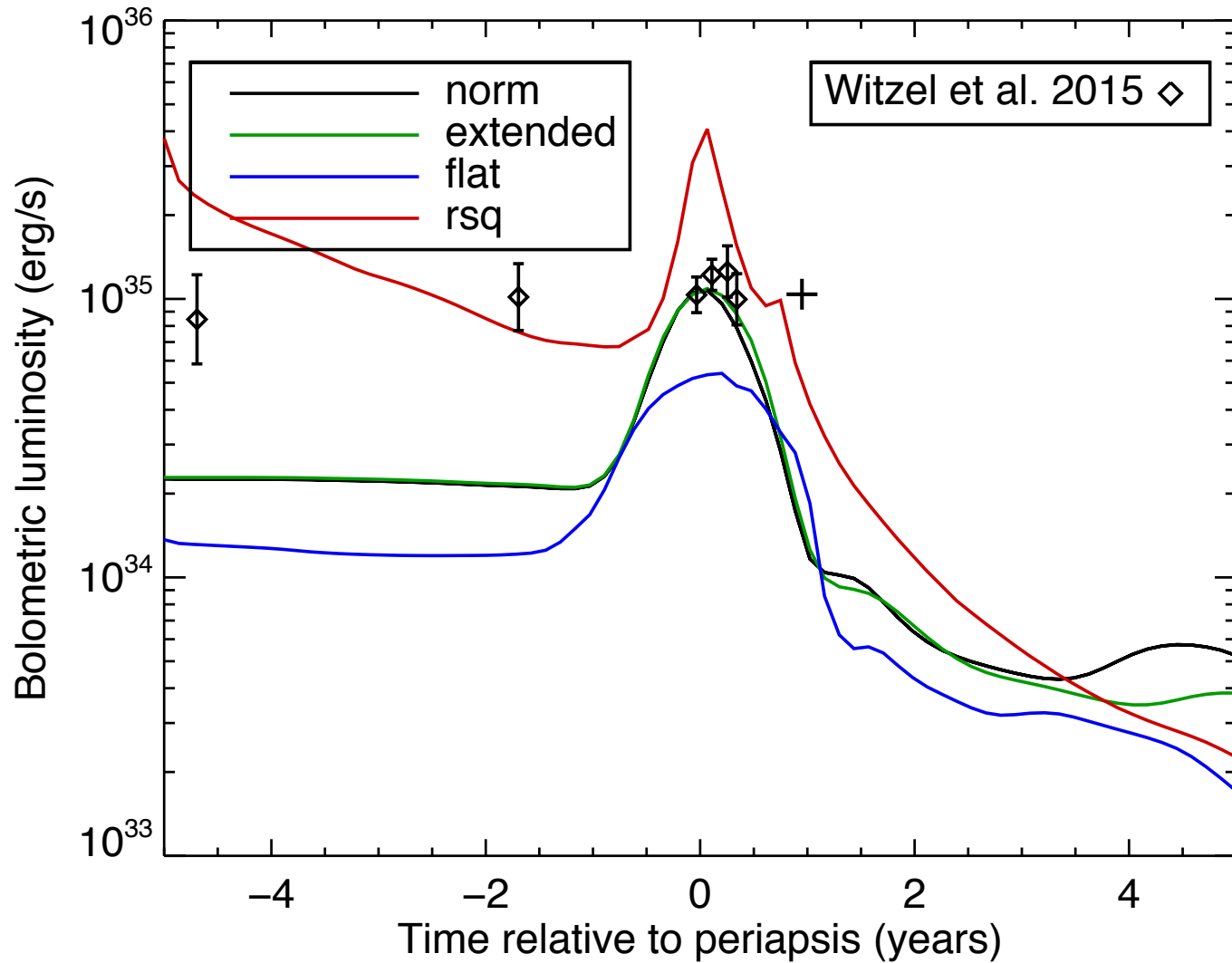
# Br-Gamma Velocity vs. Data



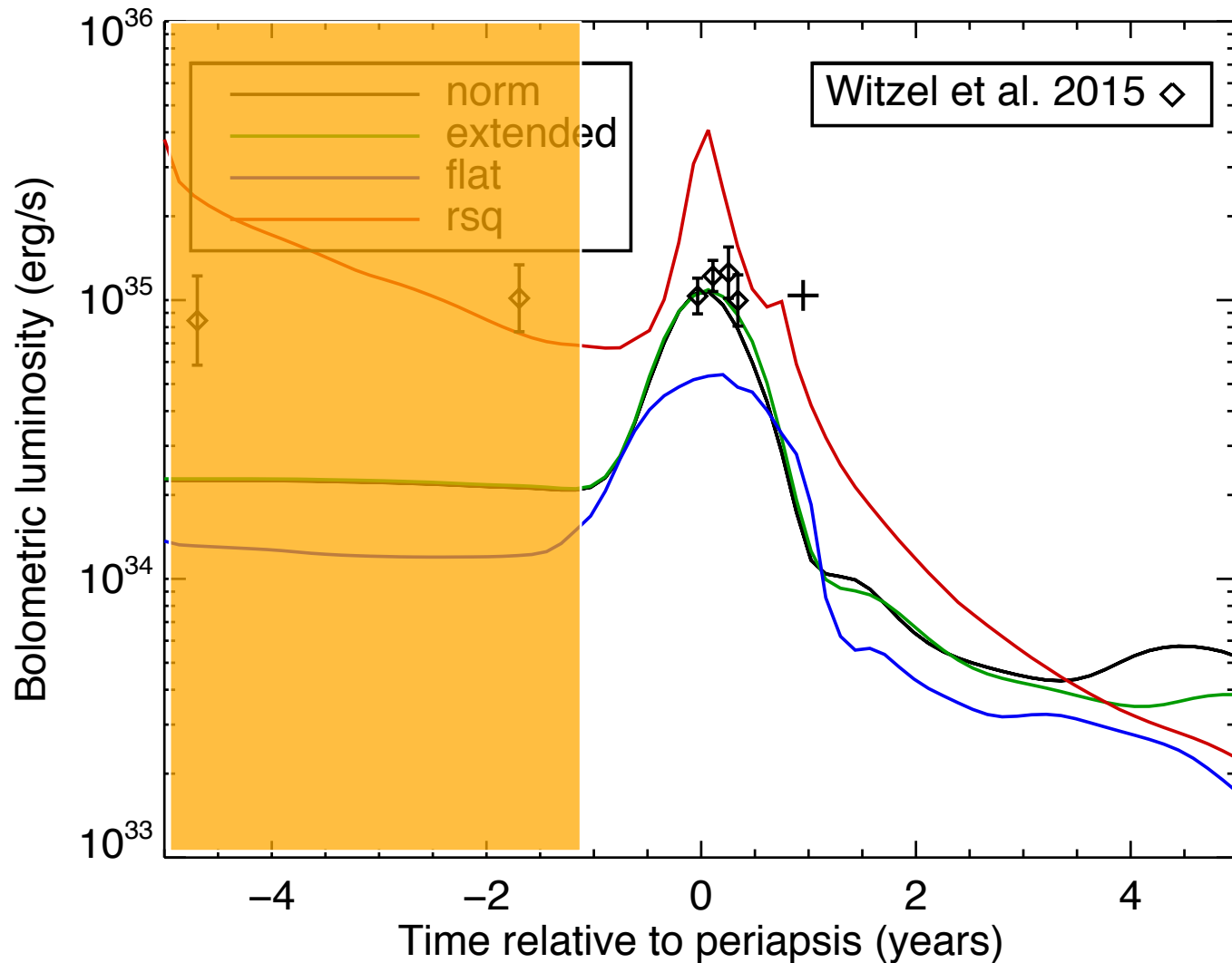
# Br-Gamma FWHM vs. Data



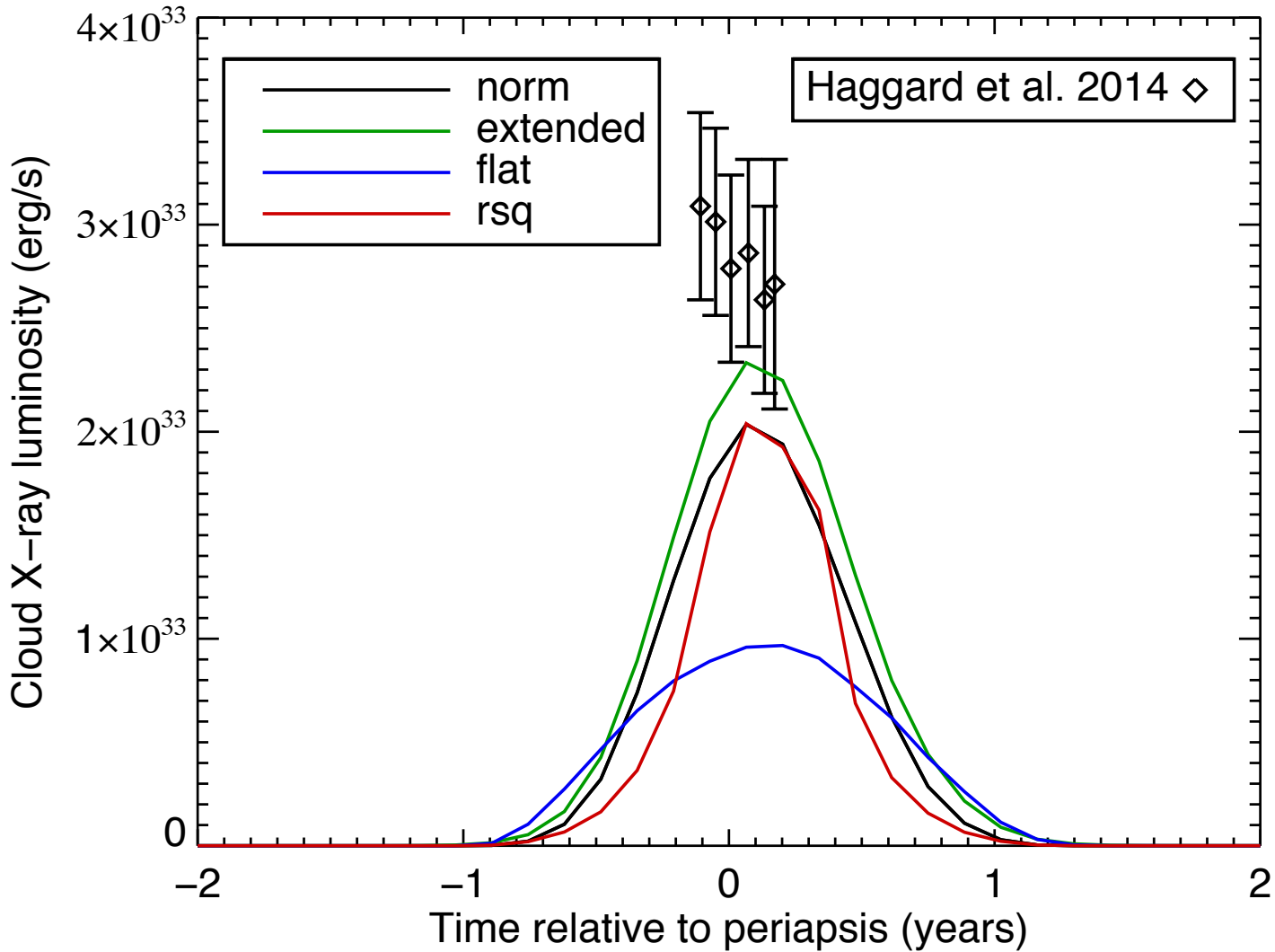
# Cloud Bolometric vs. Data



# Cloud Bolometric vs. Data



# Cloud X-ray vs. Data



# What is G2?

- Can't explain all observations with one simple model
- Need extended gas for Br-gamma FWHM increase, spatial extent
- Need compact source for narrow post-periapsis emission, constant L' band luminosity
- Can be dense core, DSO, star

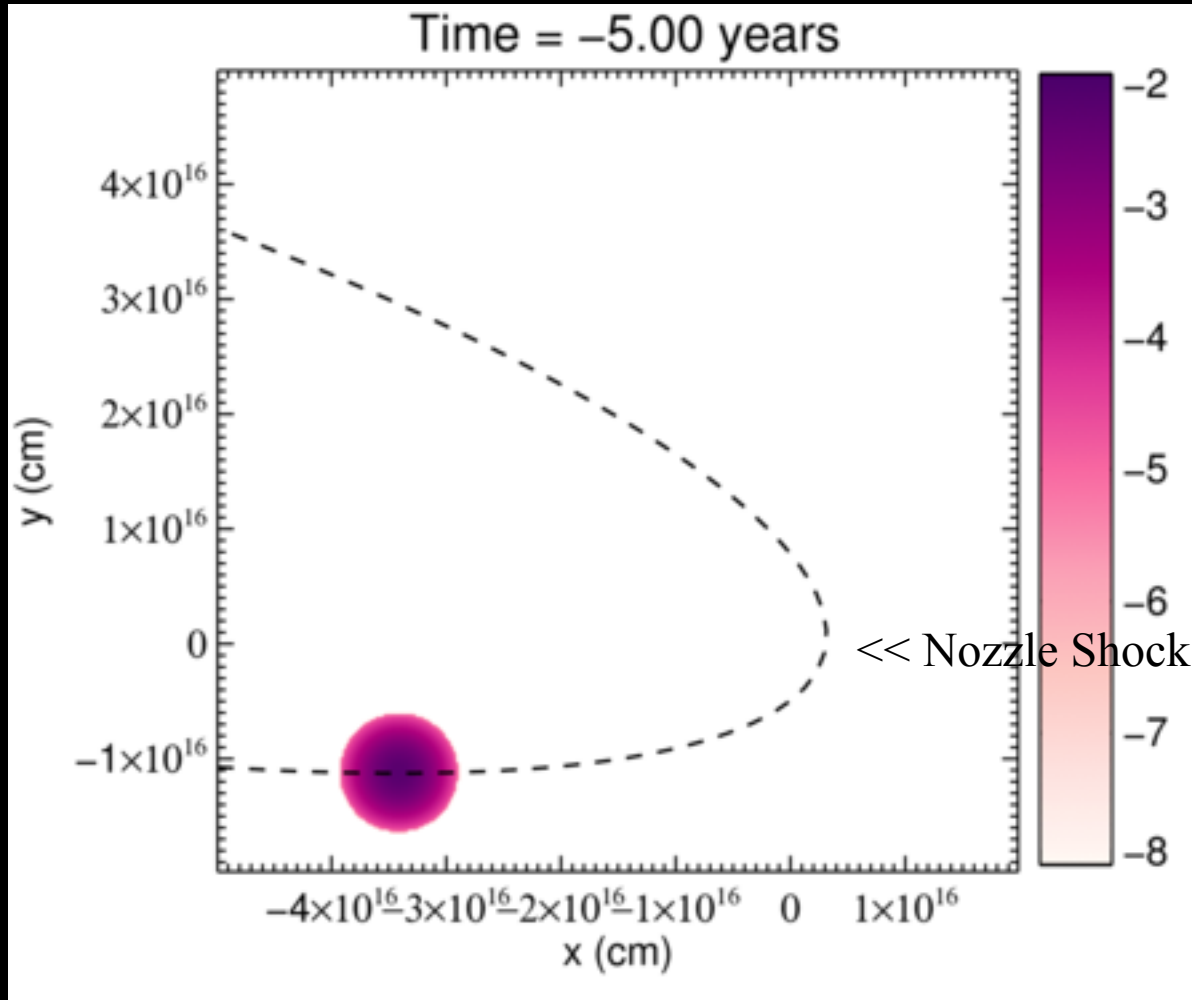
# Conclusions

- Why didn't we see anything spectacular?
  - Cloud is not massive enough, doesn't get close enough to significantly change accretion
- What is G2?
  - Seems to need an extended gas component and a compact component

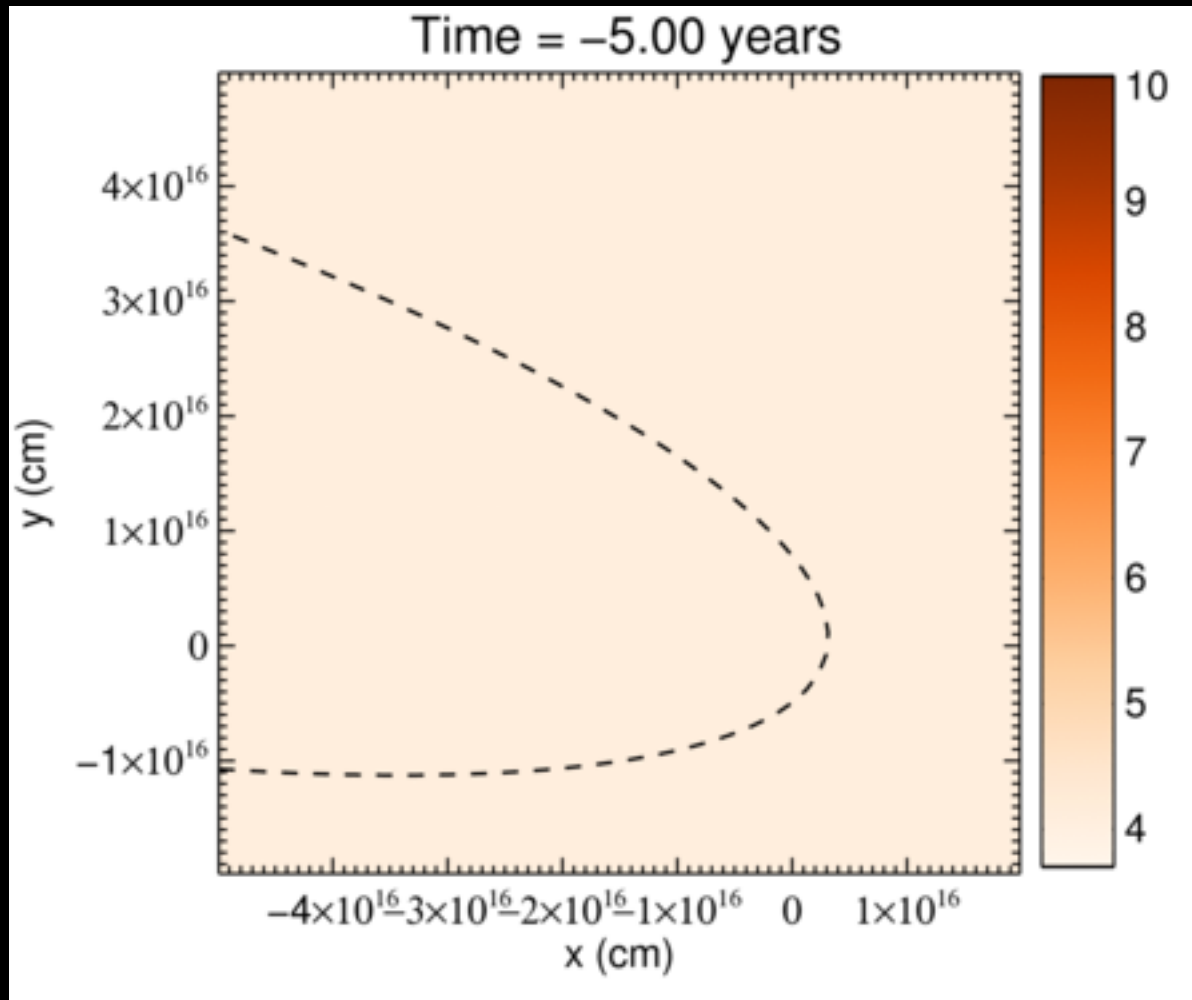




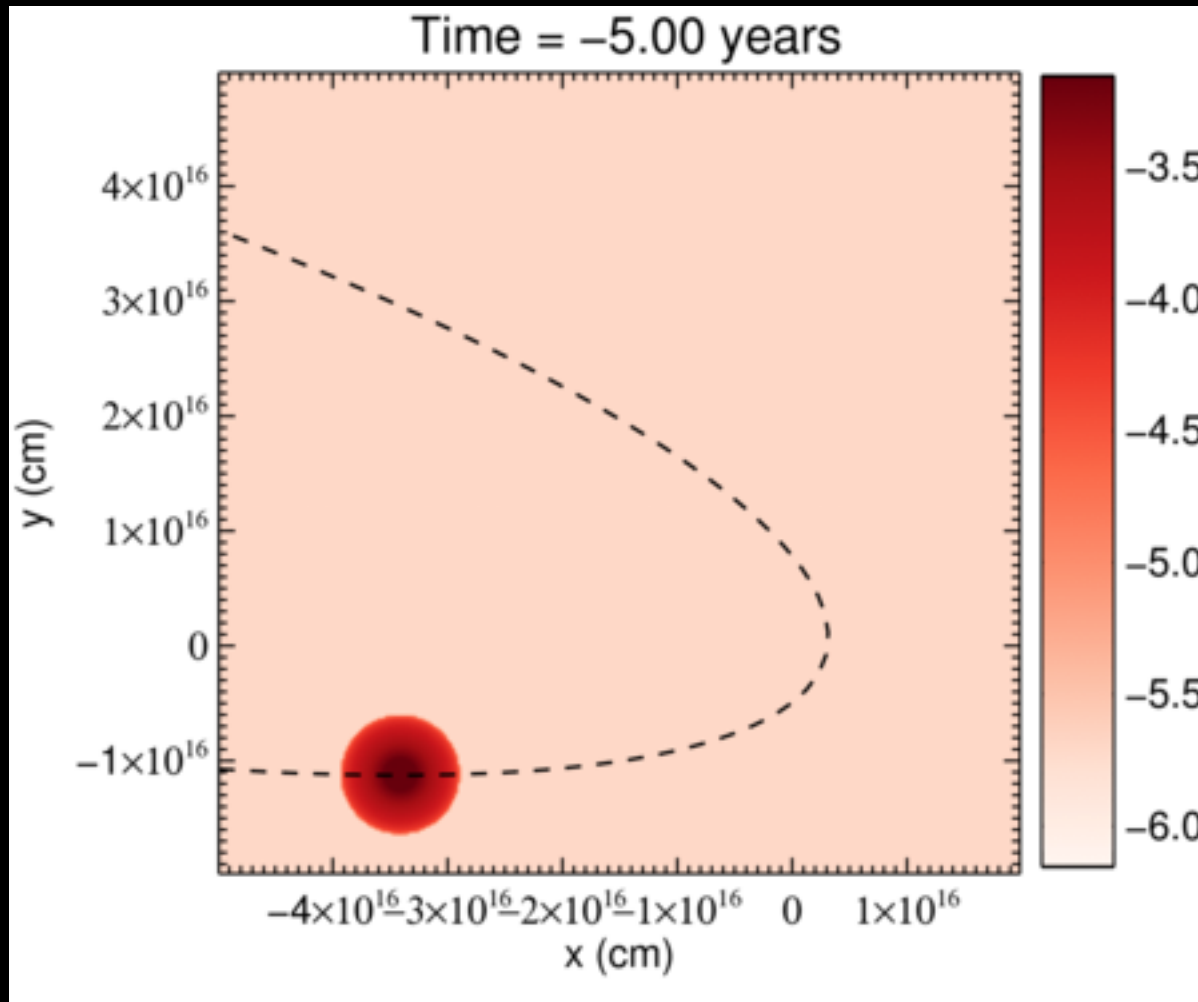
# Norm Br-Gamma



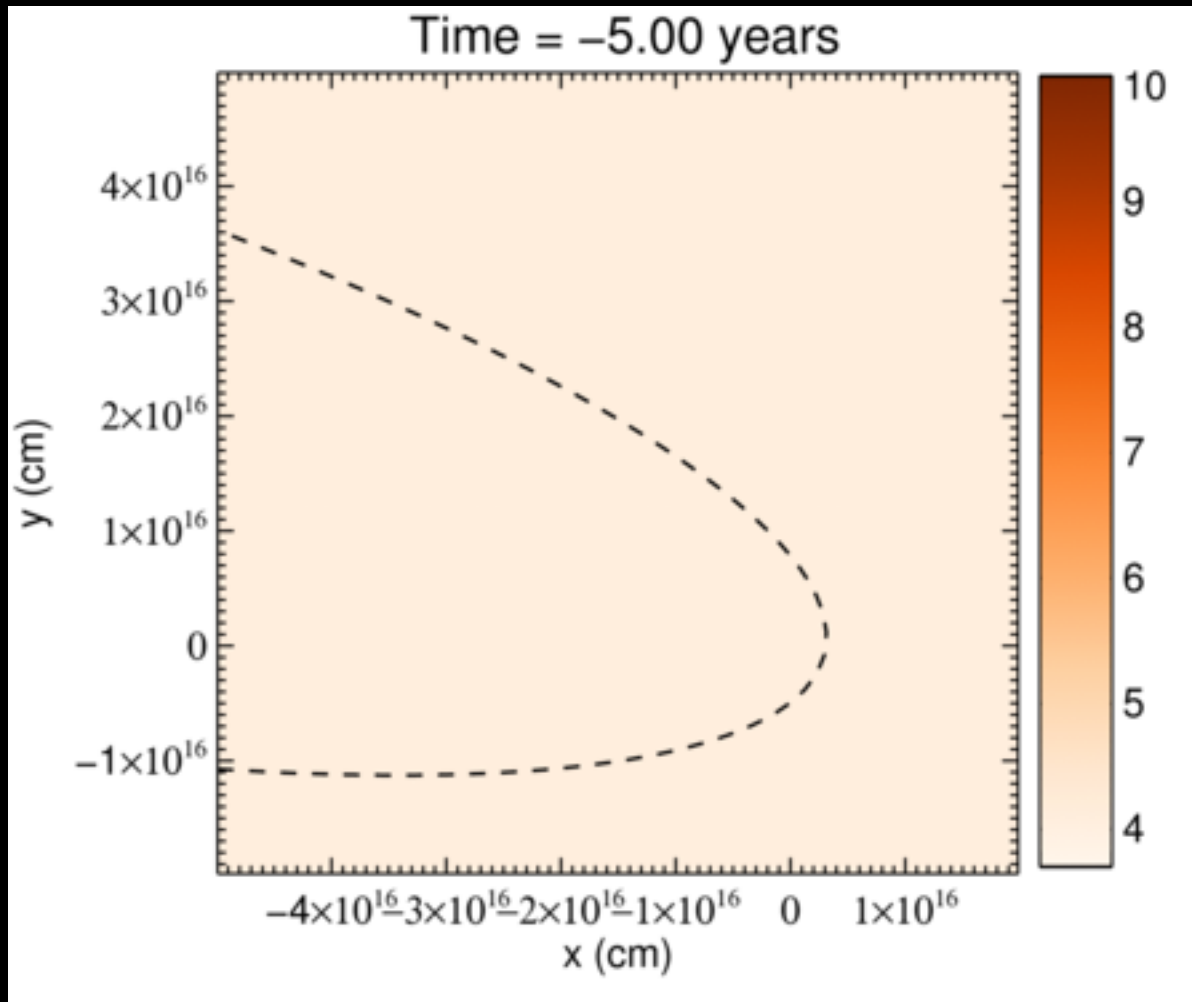
# Norm Temperature



# R2 Density

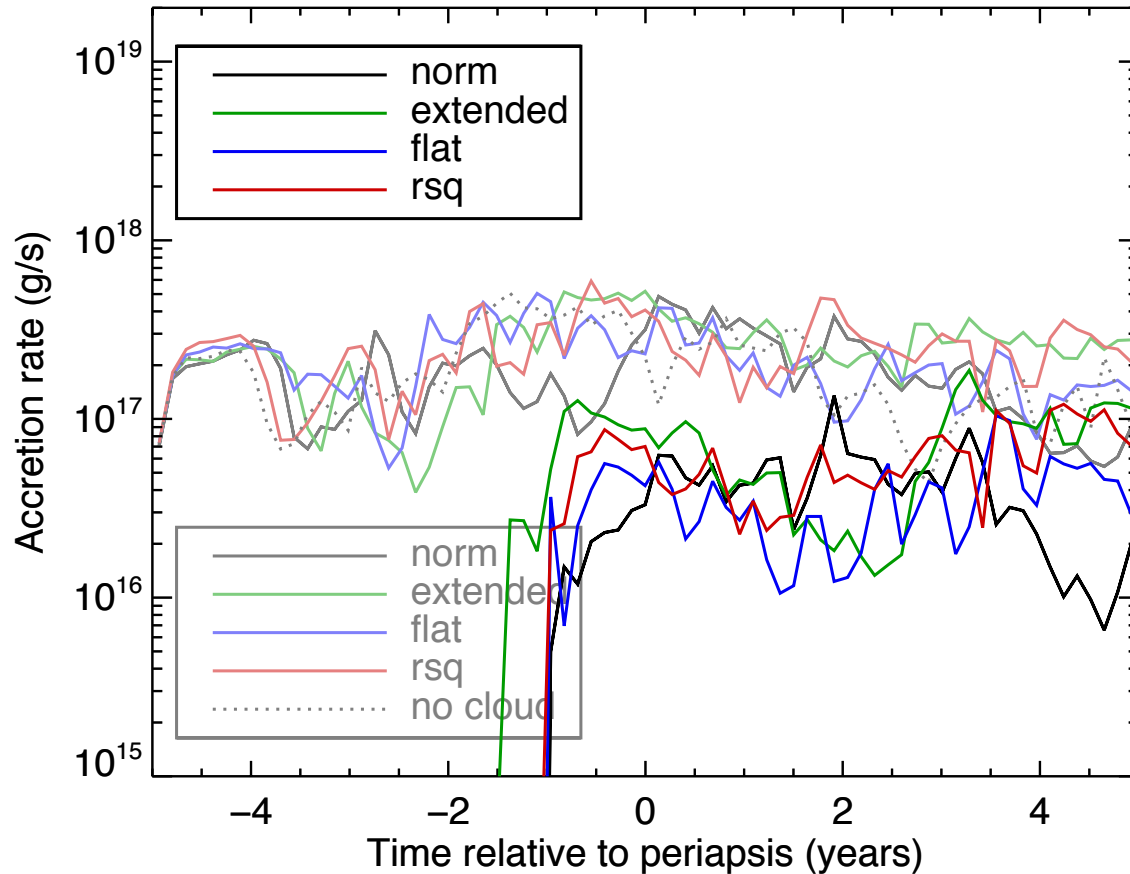


# R2 Temperature



# Sgr A\* accretion rate

• a



# Sgr A\* accretion rate

