A torus+jet model for Sgr A* (and M87*)

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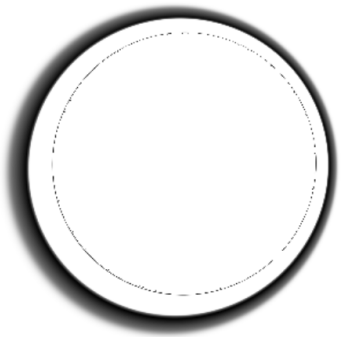
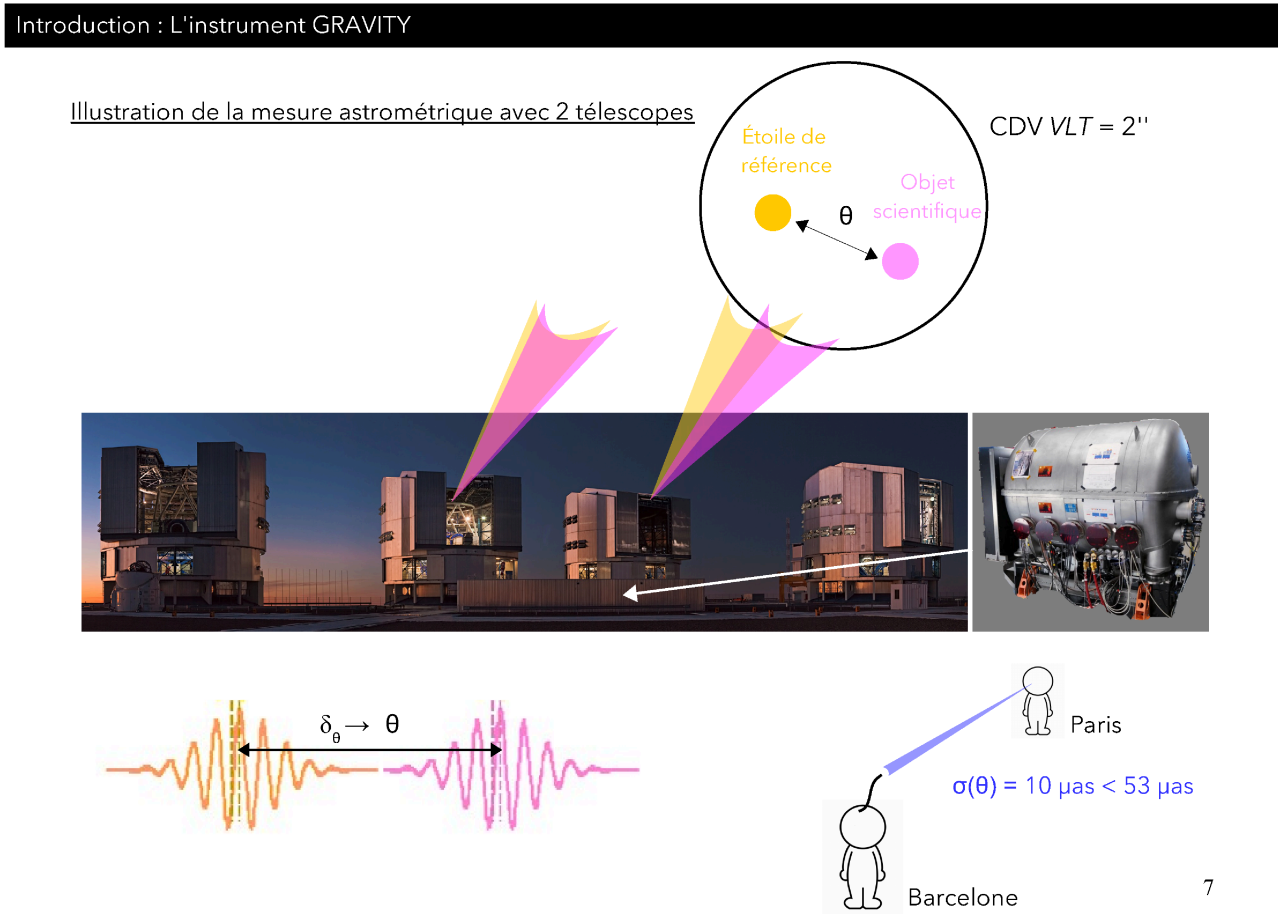
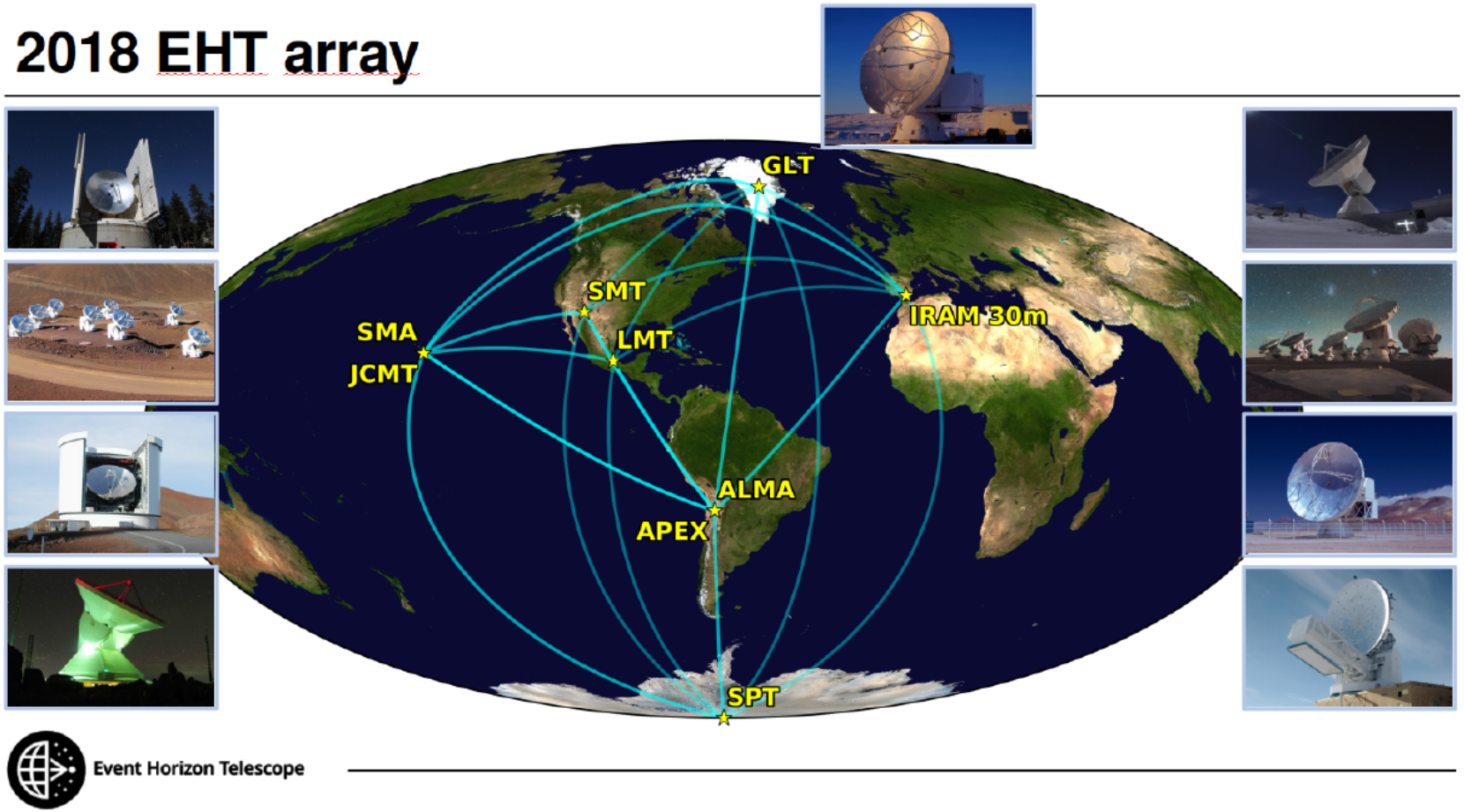




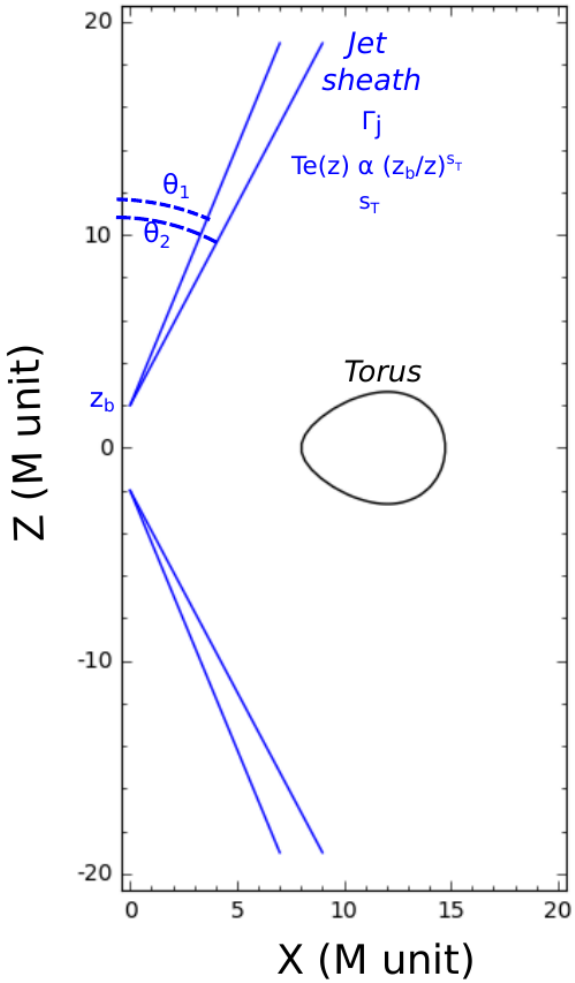
Motivation: GRAVITY

- Flares of Sgr A* $\rightarrow$ understand accretion flow



Motivation: EHT

- Image of Sgr A* $\rightarrow$ understand accretion flow



Torus+Jet

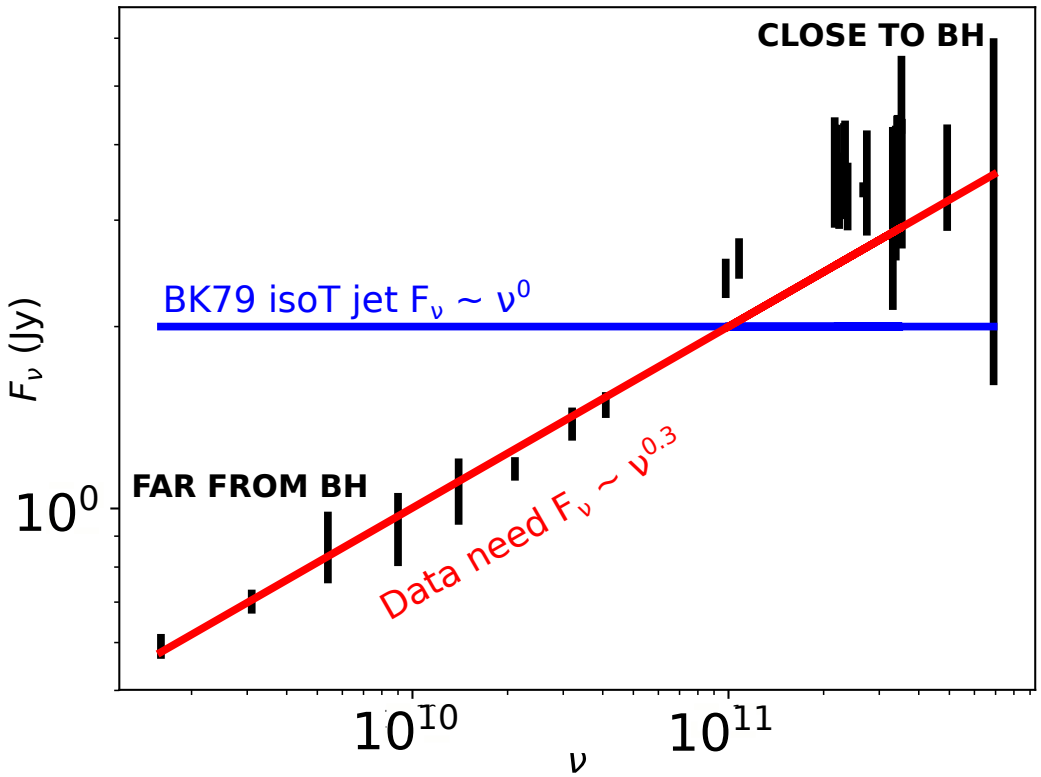
- Torus: “standard” ion-torus model
- Adding the simplest (analytic) jet model

Jet model

- Moscibrodzka+13: jet sheath is emitting

  $\rightarrow z_{\rm base}, \theta_{\rm in}, \theta_{\rm out}$
- Constant Lorentz Γ_j
- Mass conservation: $n_e \propto r_{\rm cyl}^{-2}$
- Approximate equipartition: $B^2 \propto n_e$
- Power-law temperature

  $\rightarrow T_e(z) = T_e(z_{\rm base}) \left(\frac{z_{\rm base}}{z}\right)^s$
- Synchrotron emission (thermal/non-thermal)
- Ray tracing in Kerr metric



Flat radio spectrum

- $F_\nu \propto \nu^{0.3} \rightarrow$ more flux closer, less flux further
- Power-law temperature:

  $\rightarrow T_e(z) = T_e(z_{\rm base}) \left(\frac{z_{\rm base}}{z}\right)^s$

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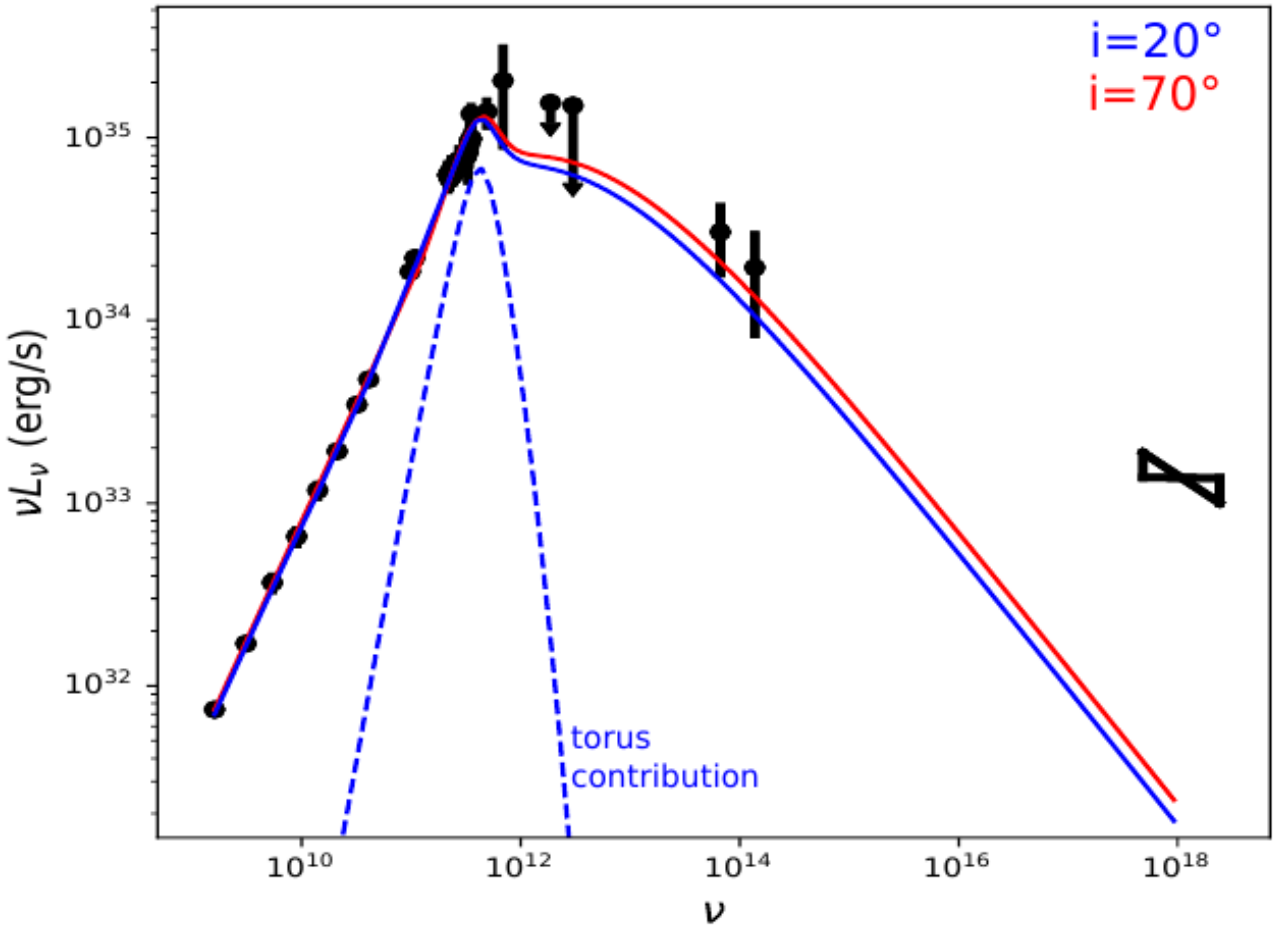
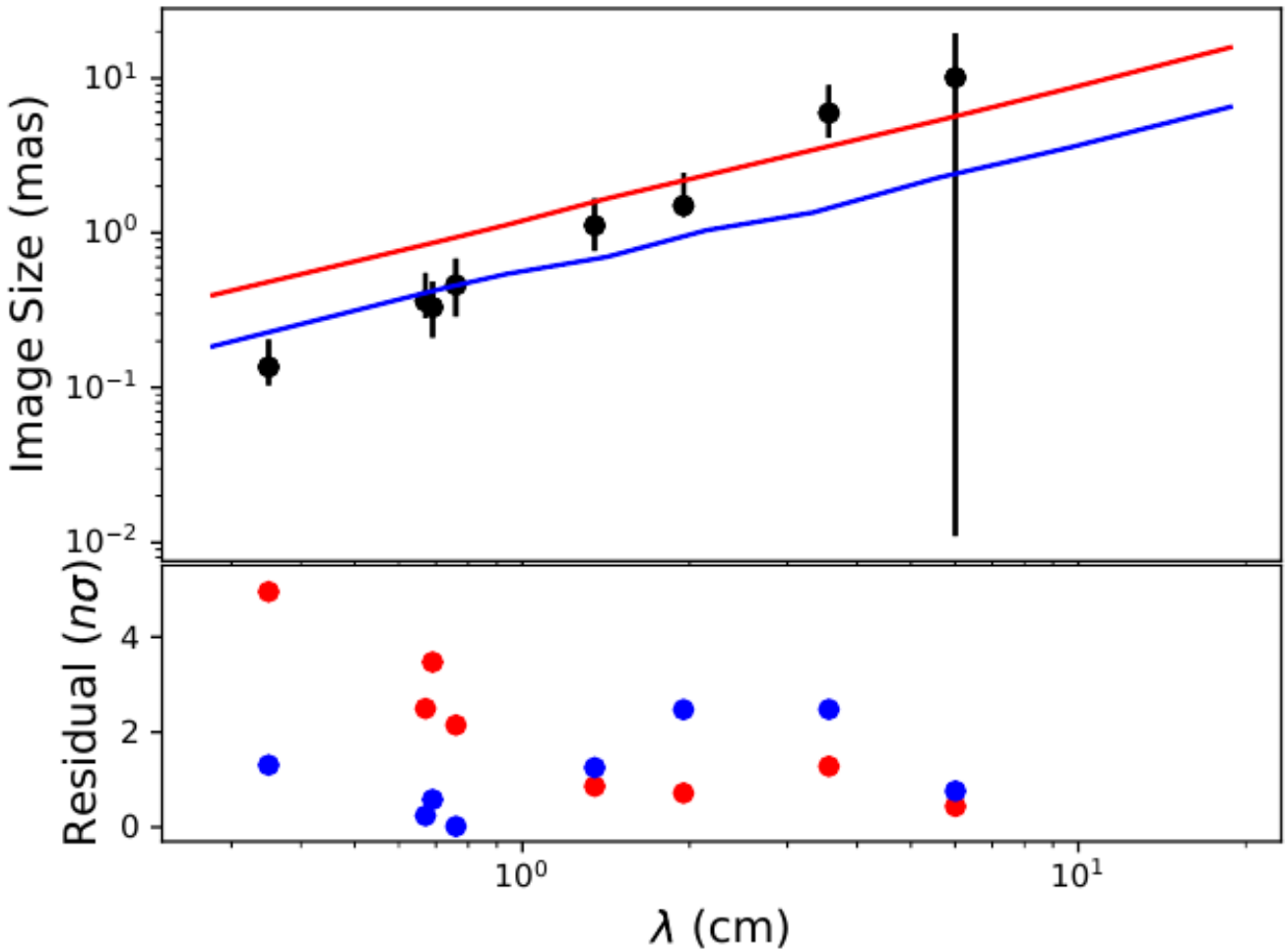


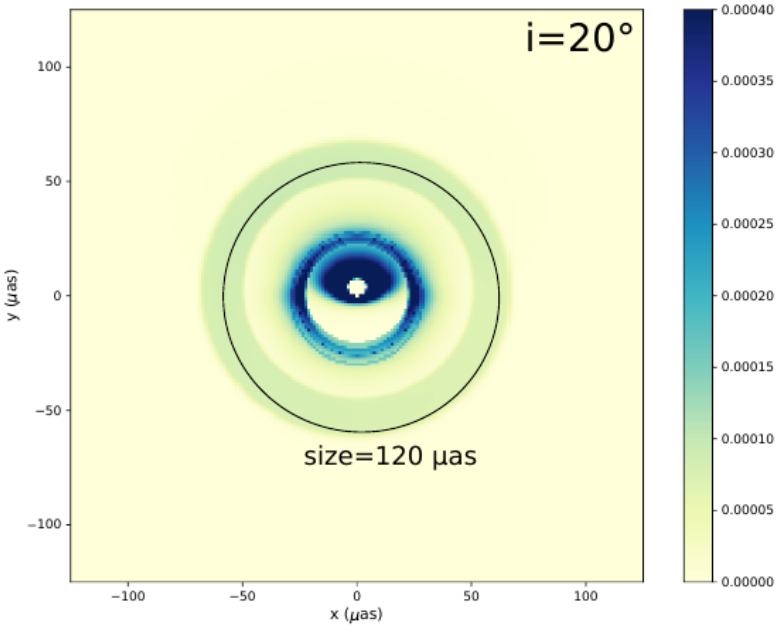
Spectral best fit

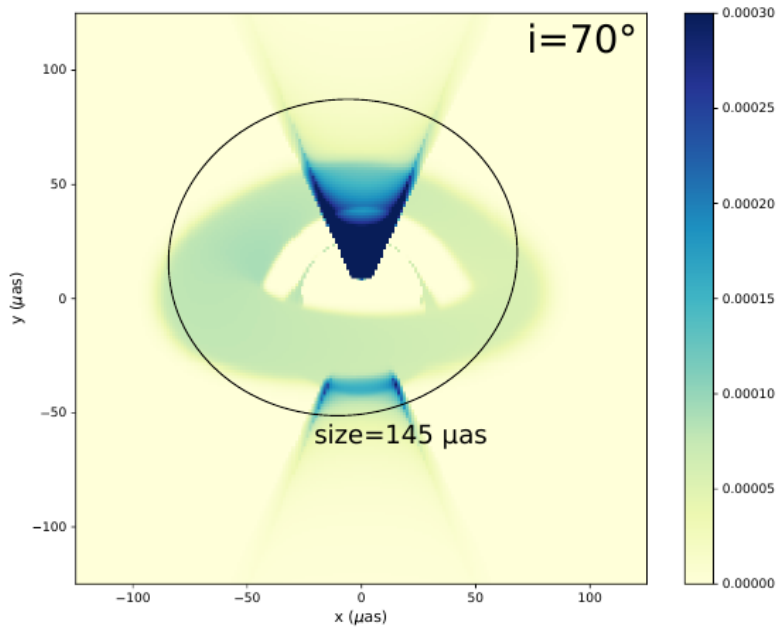
- Our model: $n_e = 5 \times 10^7 \mathrm{cm}^{-3}$, $T_e = 3 \times 10^{10}$ K
- Latest GRMHD: $n_e = 2.9 \times 10^7 \mathrm{cm}^{-3}$, $T_e = 1.2 \times 10^{11}$ K



Spectral best fit size

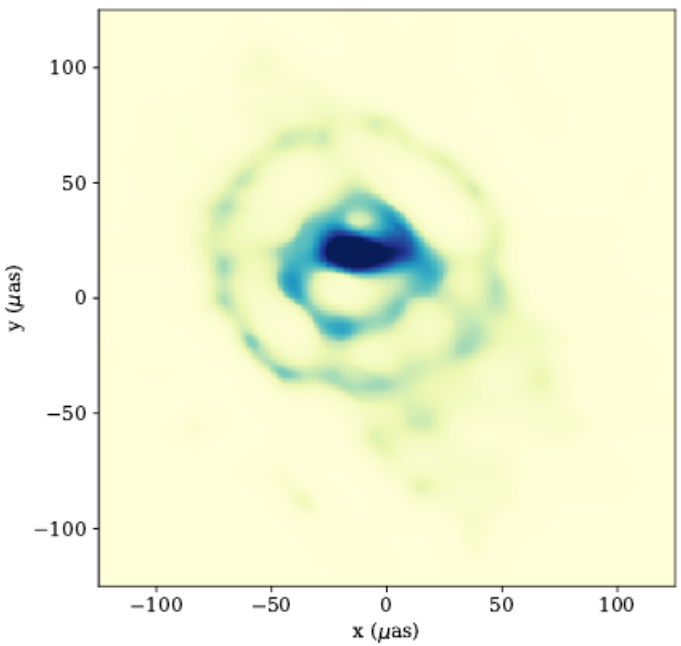
- Image major axis compared to Bower+06 constraints

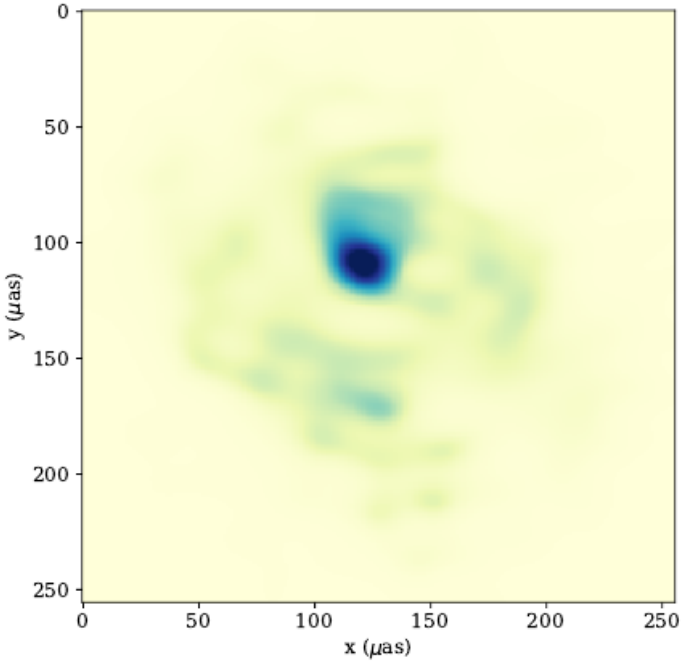




1.3mm image

- EHT 2008: intrinsic size for circ Gaussian = 37^{+16}_{-10} μas
  size increases to $\approx 80\mu$as for thick-ring model
- Our size bigger, but strong $\approx 40\mu$as features present
- In good agreement with GRMHD results

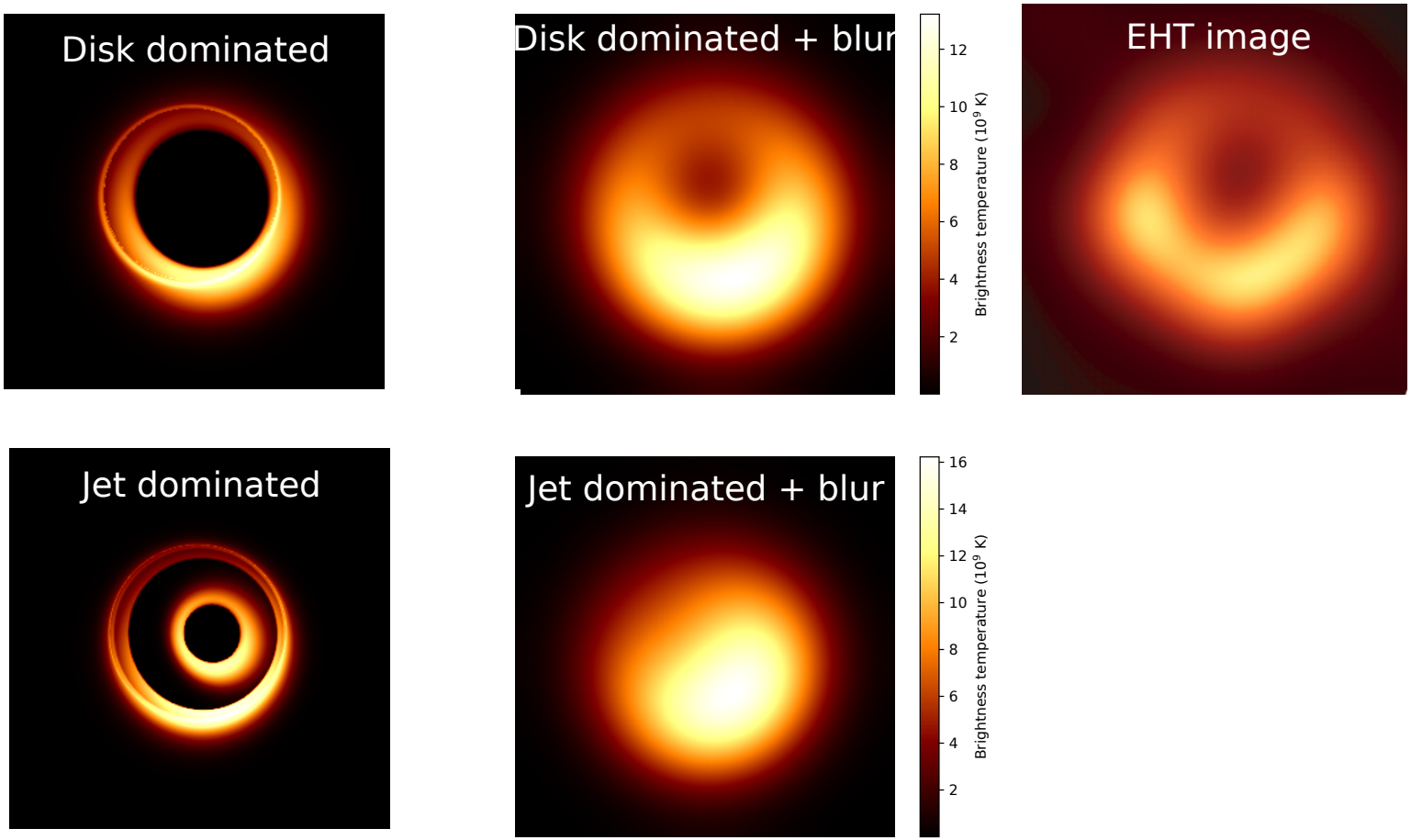




EHT-simulated image

- Torus and jet contributions well visible for face-on
- Rather clear difference with inclination
- EHT Sgr A* image: strong constraint on accretion flow

→ Vincent, Abramowicz, Zdziarski, Wielgus, Paumard, Perrin, Straub, A&A, 624, A52 (2019)



→ Vincent, Wielgus, Abramowicz, Gourgoulhon, Lasota, Paumard, Perrin, to be hopefully soon submitted (disk-dominated case)