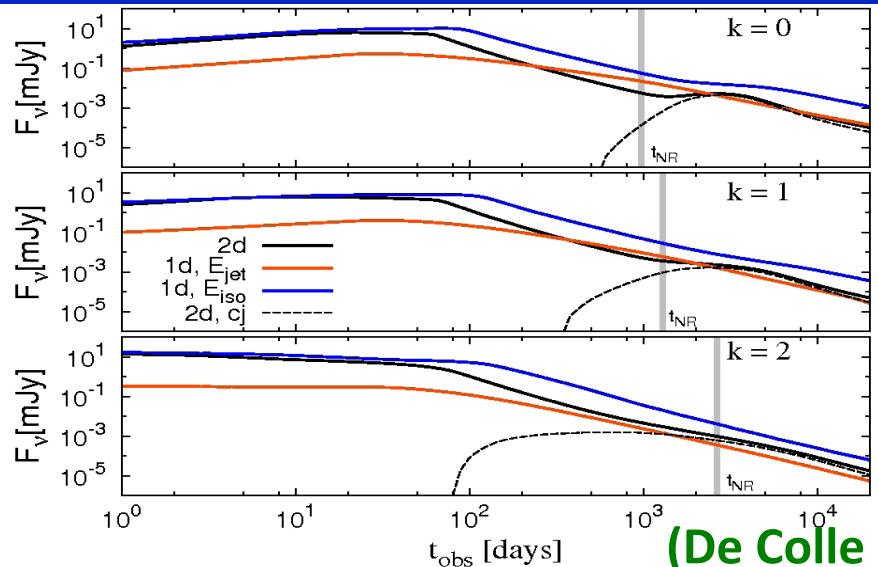


Late Time GRB Radio Emission: Calorimetry & Identifying Orphan Afterglows

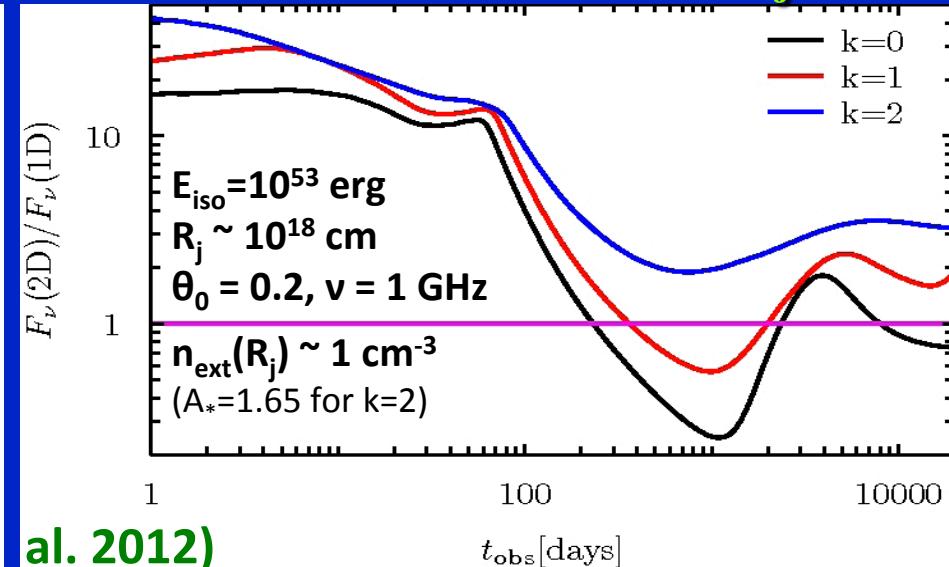
- For larger k ($\rho_{\text{ext}} \propto R^{-k}$) the bump in the lightcurve from the counter jet is much less pronounced (as the counter jet decelerates & becomes visible more slowly) \Rightarrow hard to detect
- The error in the estimated energy assuming a spherical flow depends on the observation time t_{obs} & on k

Radio Lightcurves

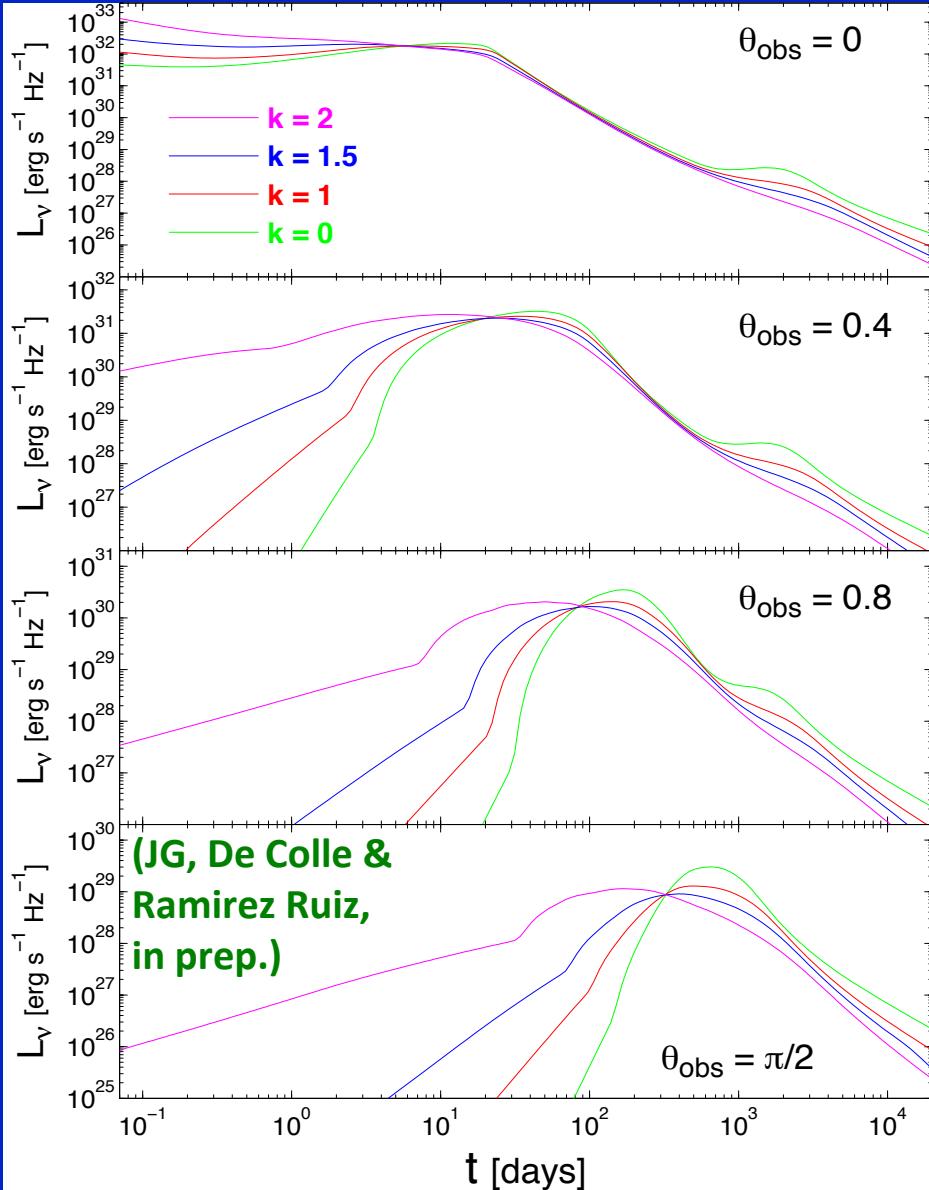
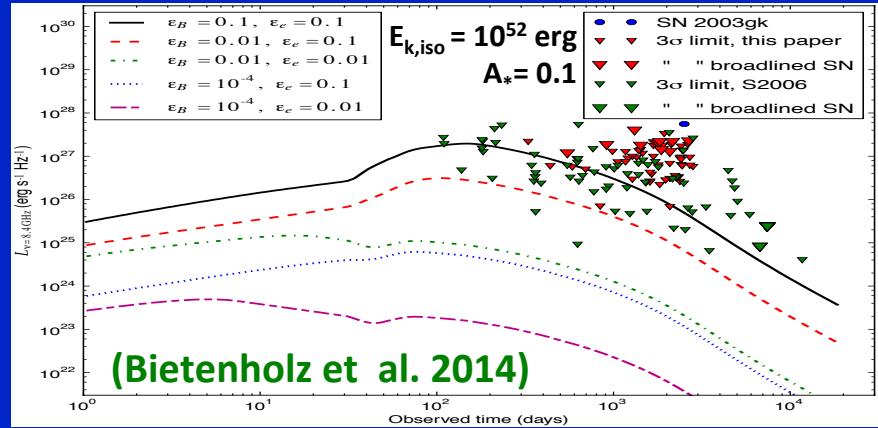
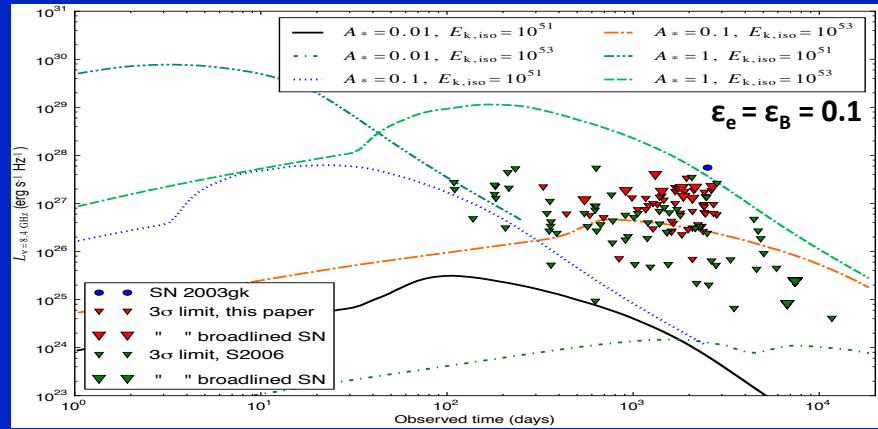
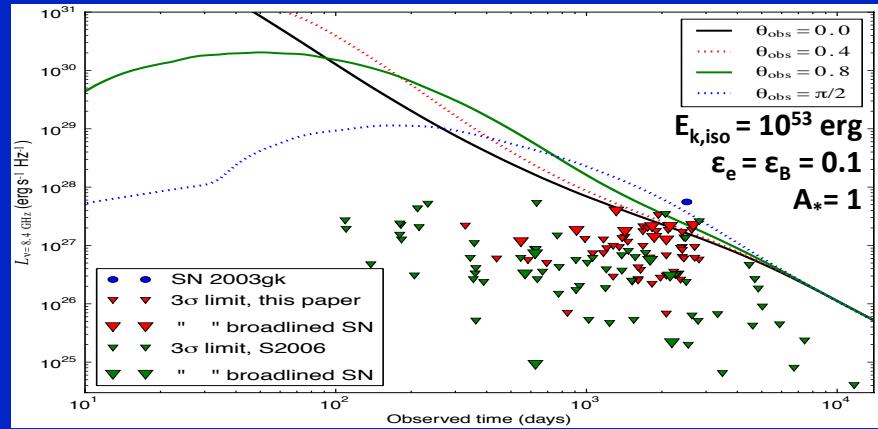


(De Colle et al. 2012)

Flux Ratio: 2D / 1D(E_{jet})

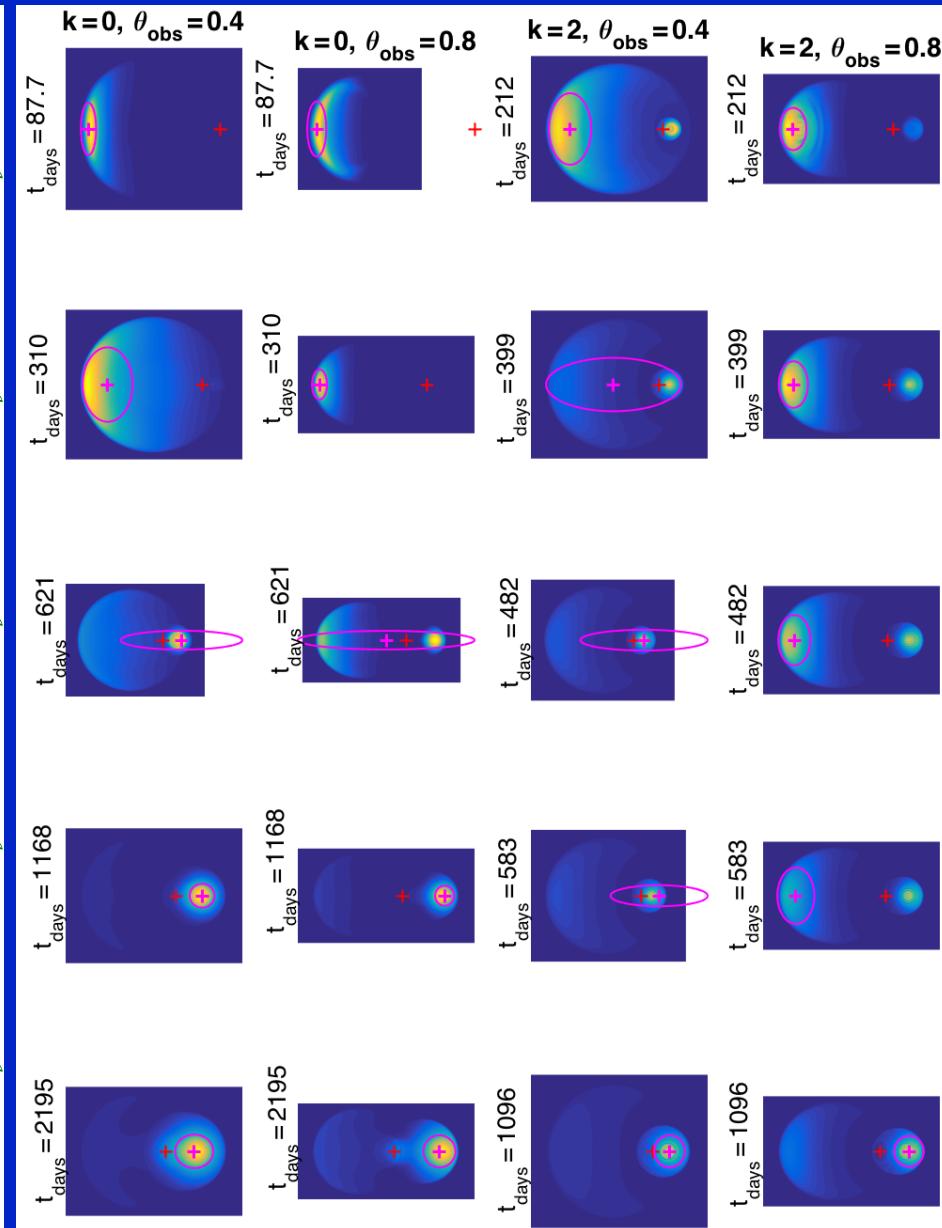
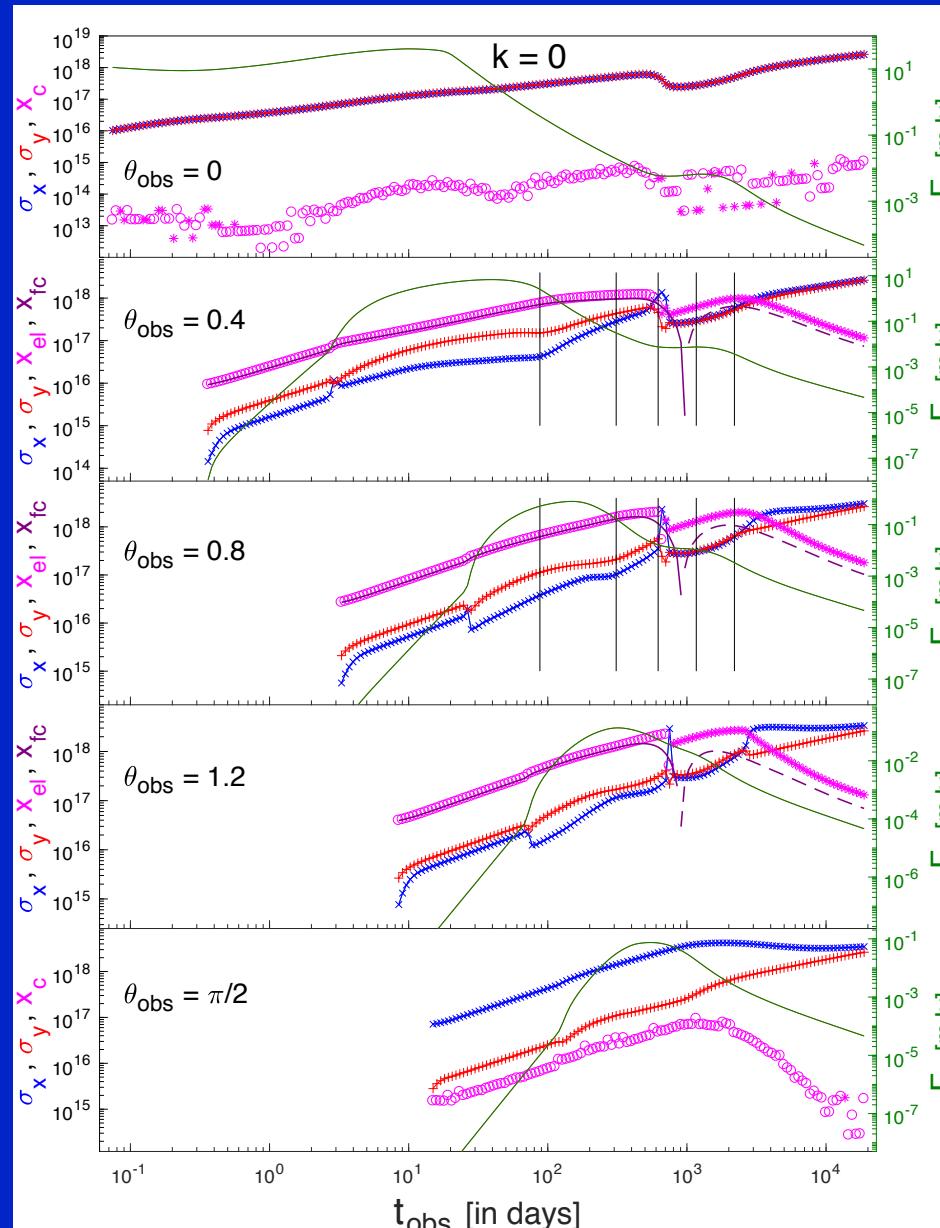


Off-Axis Lightcurves: Orphan Afterglows



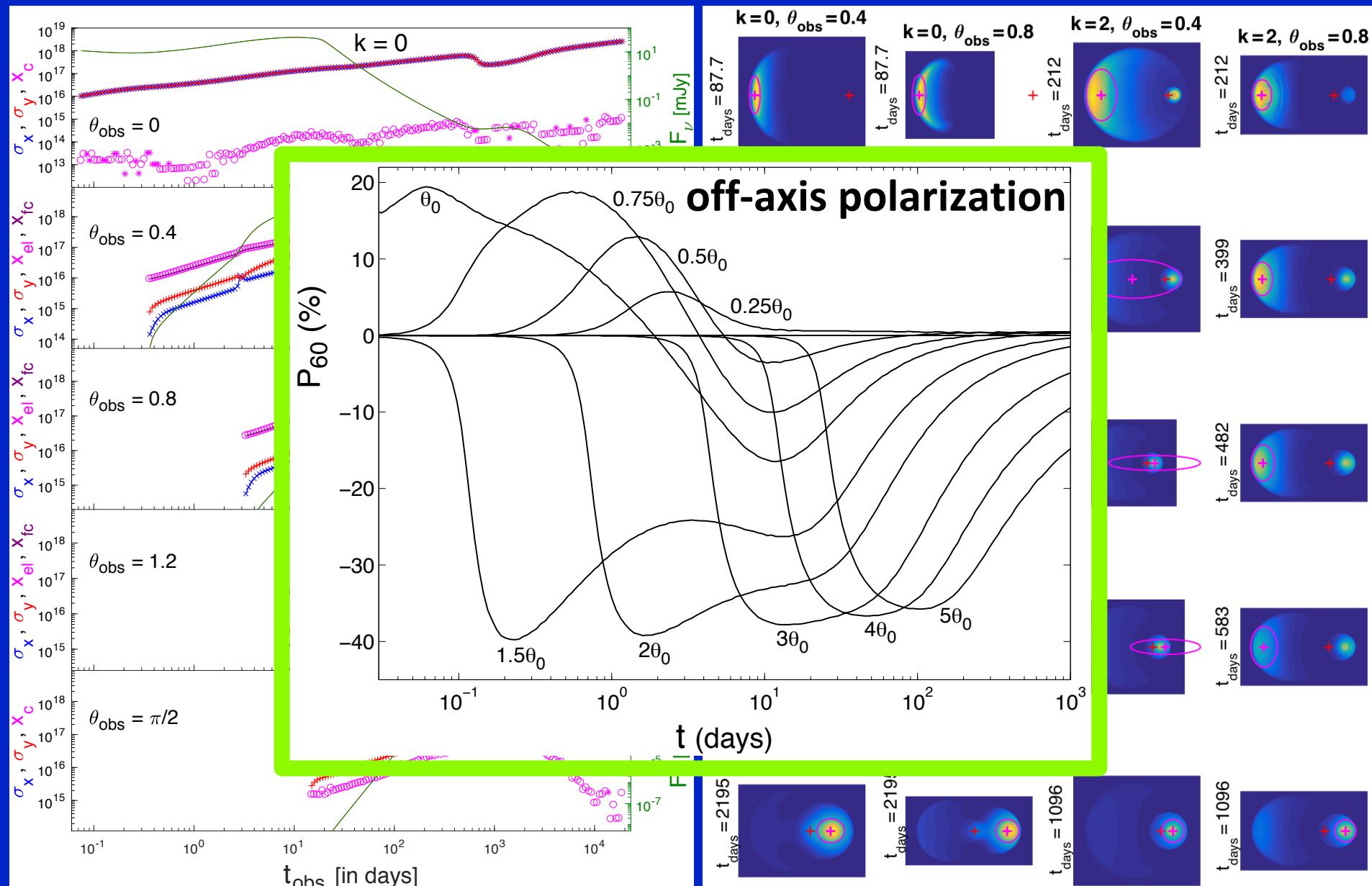
$\nu = 8.46 \text{ GHz}$, $E_{\text{iso}} = 10^{53} \text{ erg}$, $\theta_0 = 0.2$, $R_j \sim 10^{18} \text{ cm}$,
 $n_{\text{ext}}(R_j) \sim 1 \text{ cm}^{-3}$ ($A_* = 1.65$ for $k=2$), $p = 2.5$, $\epsilon_e = \epsilon_B = 0.1$

Images: Flux Centroid & Elliptical Gaussian Fits



$v = 8.46 \text{ GHz}, E_{\text{iso}} = 10^{53} \text{ erg}, \theta_0 = 0.2, R_j \sim 10^{18} \text{ cm}, n_{\text{ext}}(R_j) \sim 1 \text{ cm}^{-3}$ ($A_* = 1.65$ for $k=2$)

Images: Flux Centroid & Elliptical Gaussian Fits



$v = 8.46 \text{ GHz}$, $E_{iso} = 10^{53} \text{ erg}$, $\theta_0 = 0.2$, $R_j \sim 10^{18} \text{ cm}$, $n_{ext}(R_j) \sim 1 \text{ cm}^{-3}$ ($A_* = 1.65$ for $k=2$)