Discussion GRB, Rubin et FINK

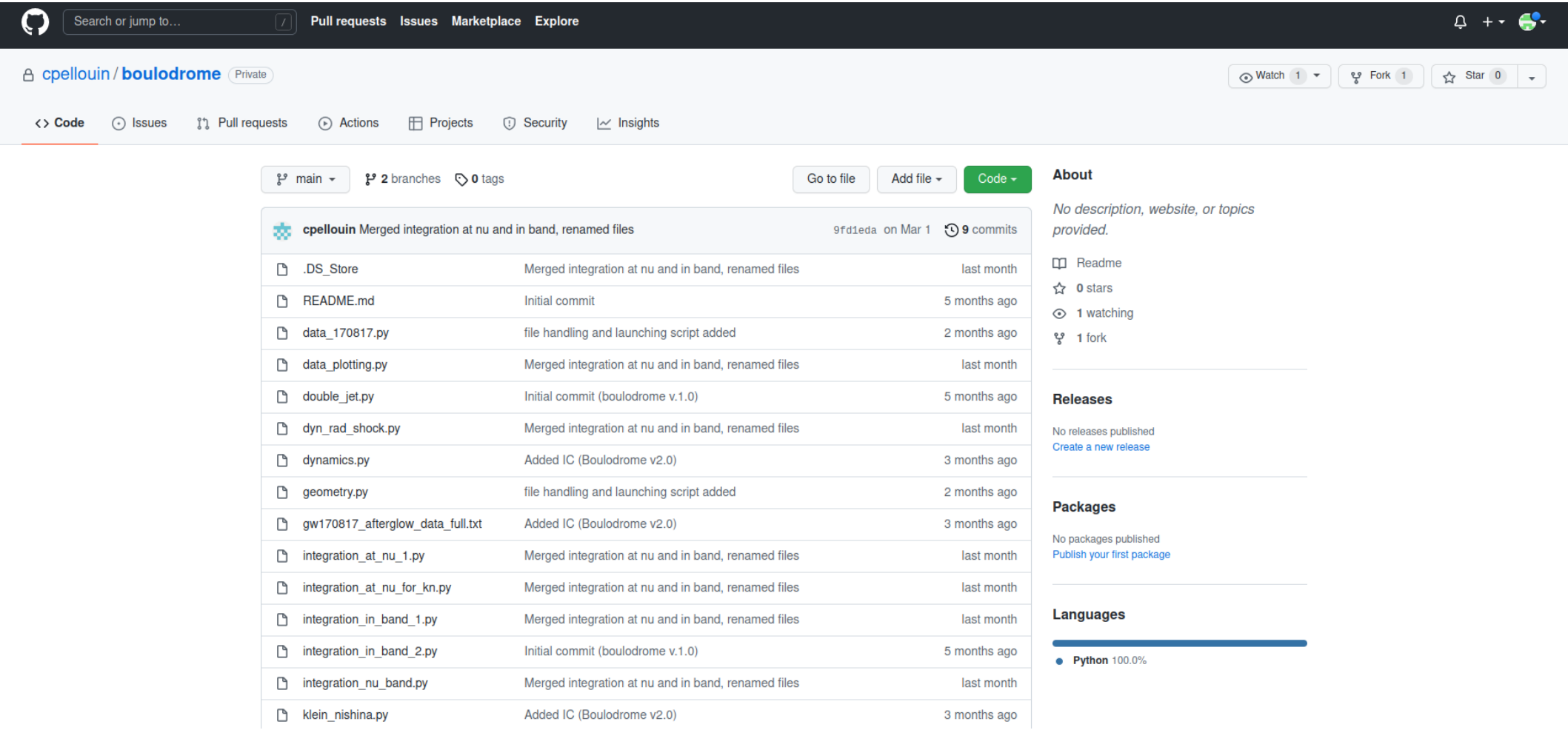
Simulation de courbes de lumière d'afterglows

SORBONNE UNIVERSITÉ

Ducoin Jean-Grégoire
Frédéric Daigne

17/11/22

Boulodrome pipeline

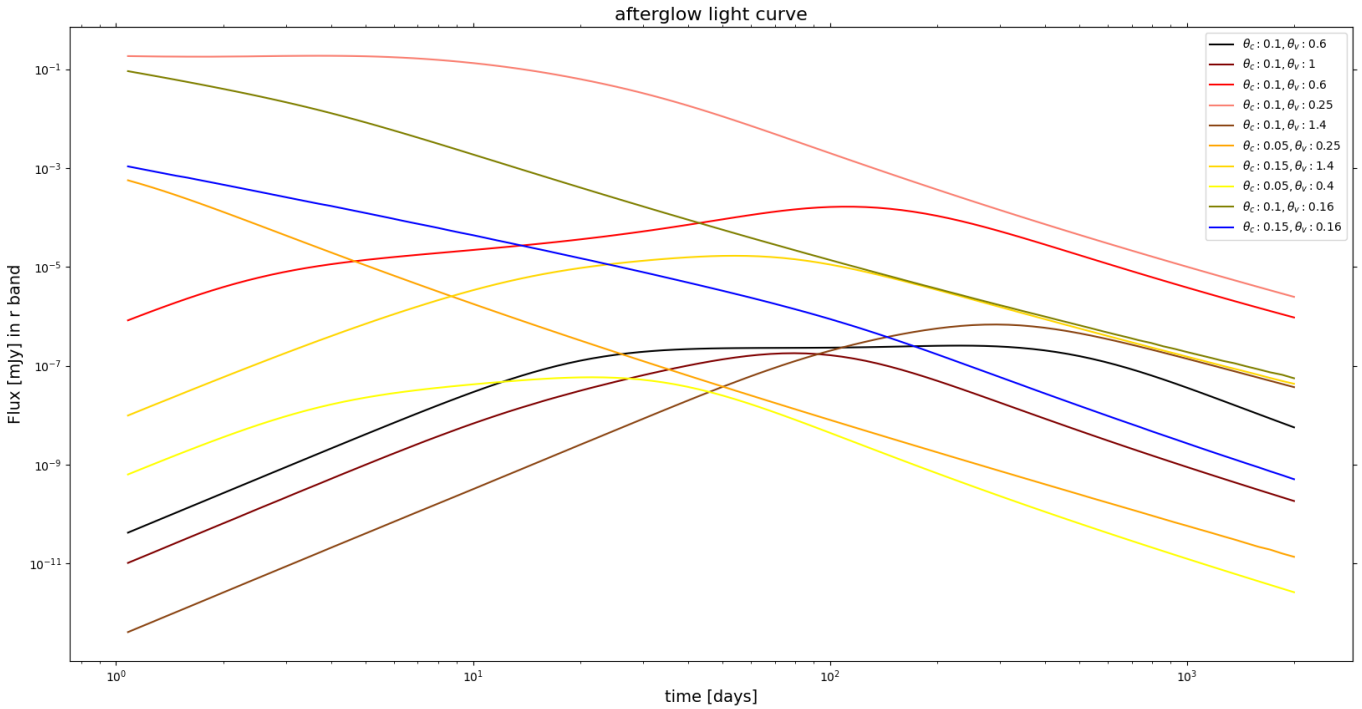


Boulodrome pipeline

Build a template bank with this code to implement a match filtering test in FINK:

Objectives/parameters:

- Synchrotron only
- ZTF g,r,i bands + MXT
- Time sampling coherent with ZTF cadence
- Efficient sampling of the parameter space



Boulodrome pipeline

Long GRB template bank parameters:

Table 3. Parameters values used in the bank

Parameter	Symbol	Range
Jet parameters		
Isotropic energy	E_{iso}	1e+50,3.1623e+50,1e+51,3.1623e+51,1e+52,3.1623e+52, 1e+53,3.1623e+53,1e+54,3.1623e+54,1e+55
Lorentz factor at $t = 0$	Γ_0	100
density of the ambient medium	n_{ext}	1e-1,1,1e1,1e2,1e3
Fraction of the energy which accelerates the electrons	ϵ_E	0.1
Fraction of the energy which generates the magnetic field	ϵ_B	1e-4,1e-3,1e-2,1e-1
Slope of the electrons Lorentz factors profile	p	2.2,2.5,2.8
Opening angle of the core of the jet	θ_{jet}	0.05,0.1,0.15,0.2
Viewing angle	θ_{obs}	0.0001,0.06,0.11,0.16,0.25,0.30,0.40,0.50,0.60,0.70,0.80,1,1.2,1.4
fraction of electrons accelerated at the shock	ζ	1.0
Lateral profile		core + powerlaw
	a	2.5,4.5
	b	2.5,4.5
Number of rings	N_{ring}	20
Distance in Mpc	D	40
Frequency bands		[g,r,i,MXT]
Observation time (observer frame)	T_{obs}	10 secondes to 2000 days
Number of points on the light curve	N_{tobs}	200

147 840 light curves

Boulodrome pipeline

Short GRB template bank parameters:

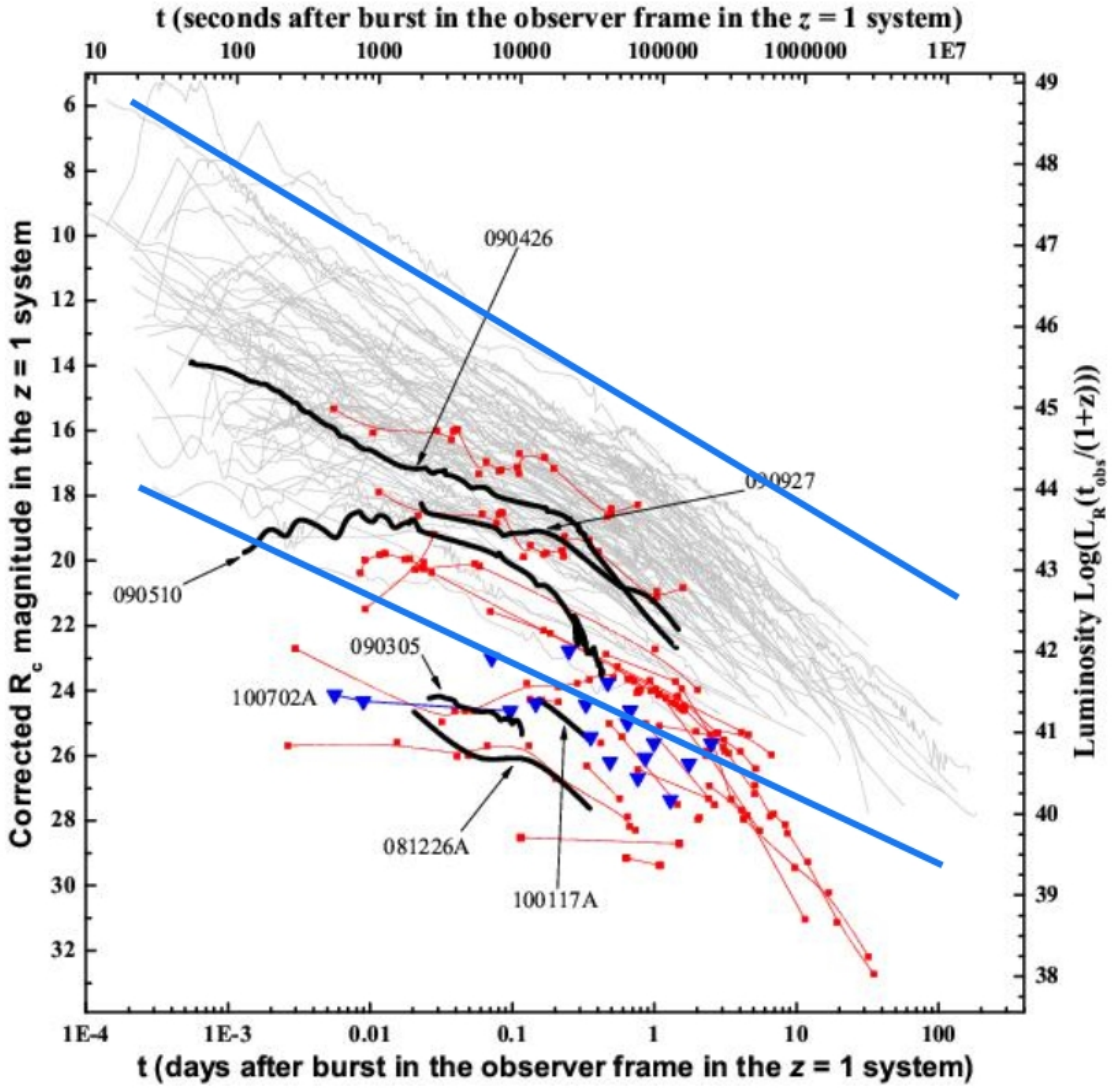
Table 3. Parameters values used in the bank

Parameter	Symbol	Range
Jet parameters		
Isotropic energy	E_{iso}	1e+50,3.1623e+50,1e+51,3.1623e+51,1e+52,3.1623e+52,1e+53
Lorentz factor at $t = 0$	Γ_0	100
density of the ambient medium	n_{ext}	1e-4,1e-3,1e-2,1e-1,1,1e1
Fraction of the energy which accelerates the electrons	ϵ_E	0.1
Fraction of the energy which generates the magnetic field	ϵ_B	1e-4,1e-3,1e-2,1e-1
Slope of the electrons Lorentz factors profile	p	2.2,2.5,2.8
Opening angle of the core of the jet	θ_{jet}	0.05,0.1,0.15
Viewing angle	θ_{obs}	0.0001,0.06,0.11,0.16,0.25,0.30,0.40,0.50,0.60,0.70,0.80,1,1.2,1.4
fraction of electrons accelerated at the shock	ζ	1.0
Lateral profile		core + powerlaw
	a	2.5,4.5
	b	2.5,4.5
Number of rings	N_{ring}	20
Distance in Mpc	D	40
Frequency bands		[g,r,i,MXT]
Observation time (observer frame)	T_{obs}	10 secondes to 2000 days
Number of points on the light curve	N_{tobs}	200

84 672 light curves

Boulodrome pipeline

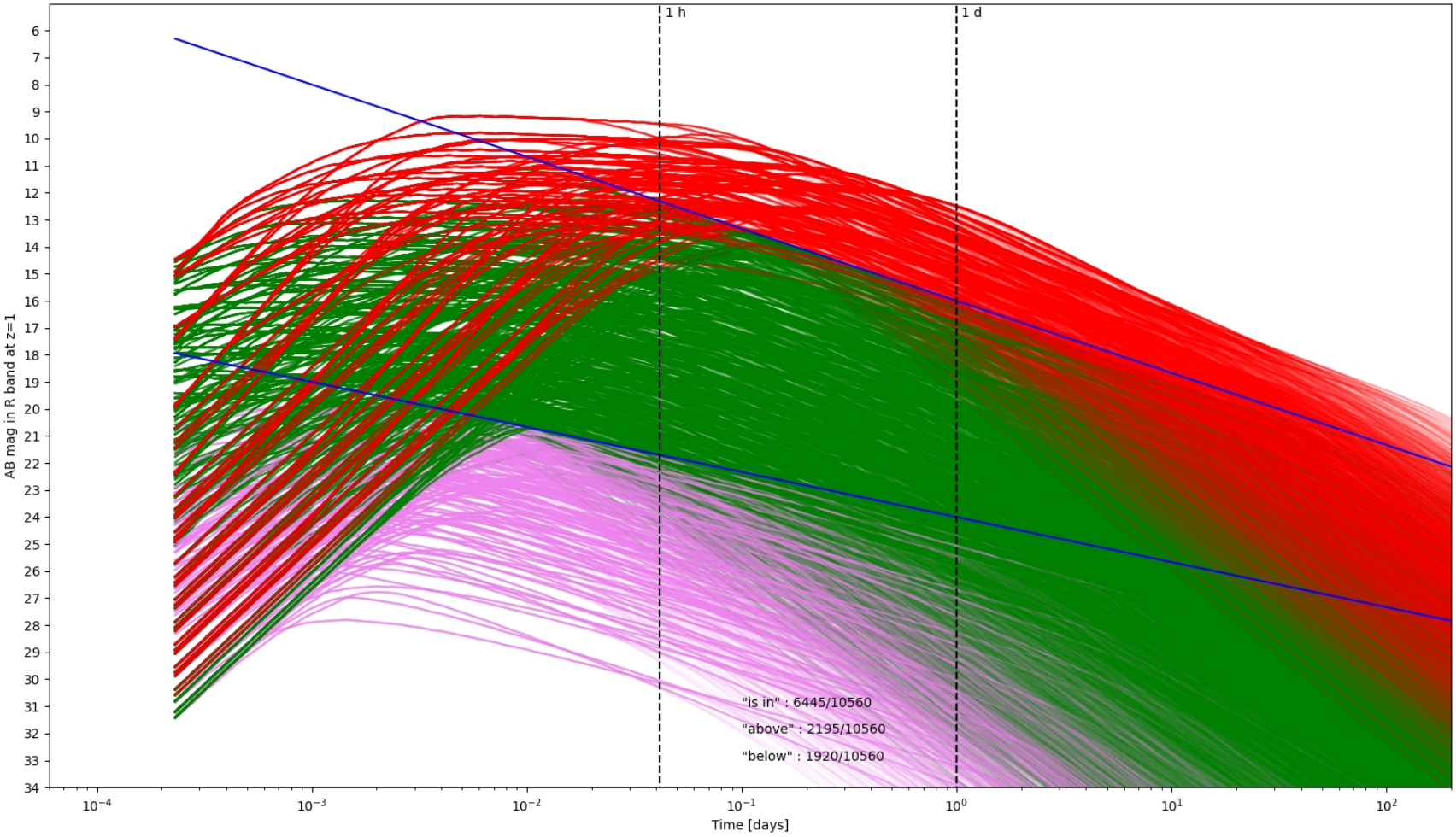
Compatibility with observed afterglow :



(Nicuesa Guelbenzu et al. 2012)

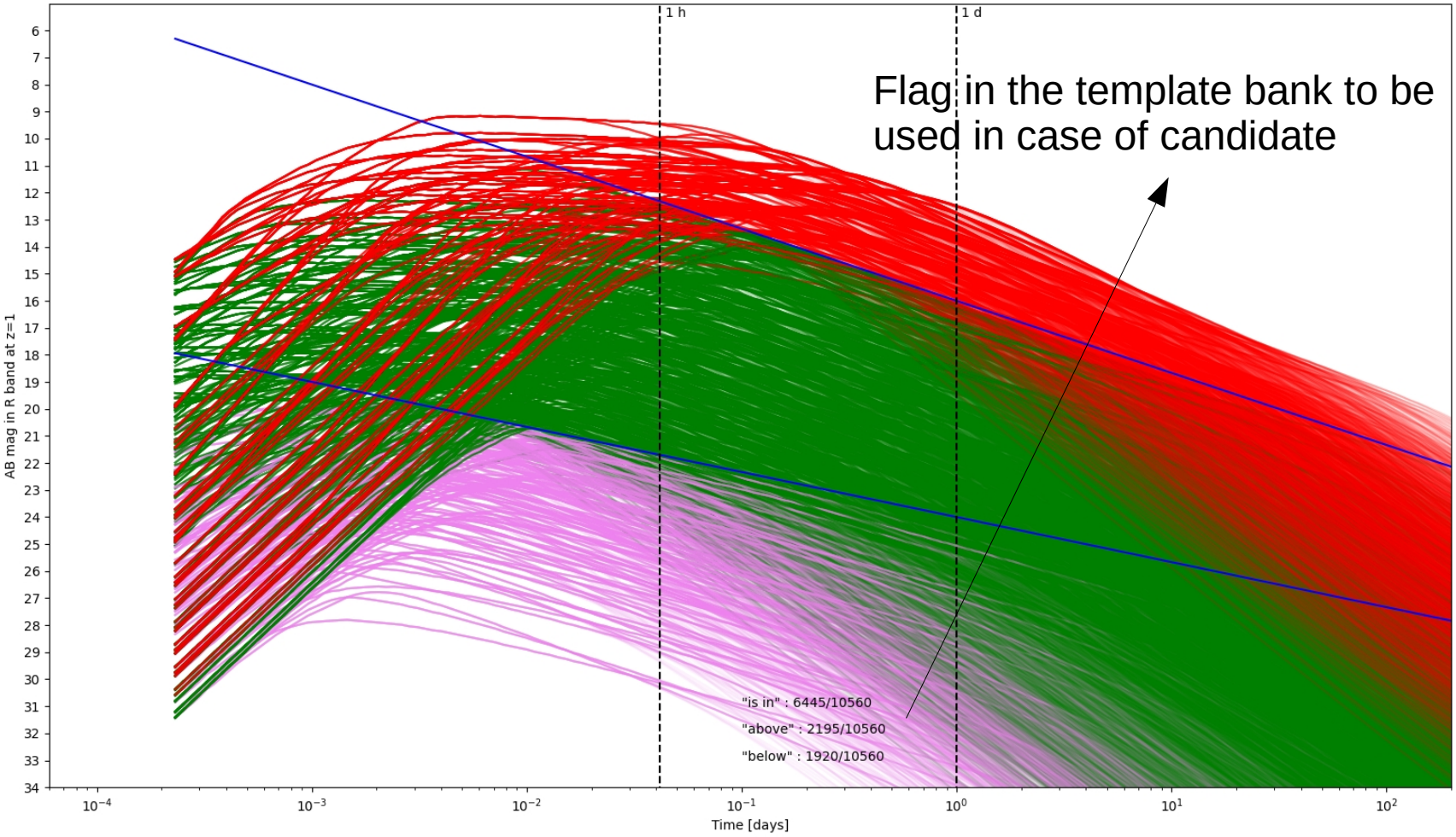
Boulodrome pipeline

Compatibility with observed onaxis afterglow :



Boulodrome pipeline

Compatibility with observed onaxis afterglow :

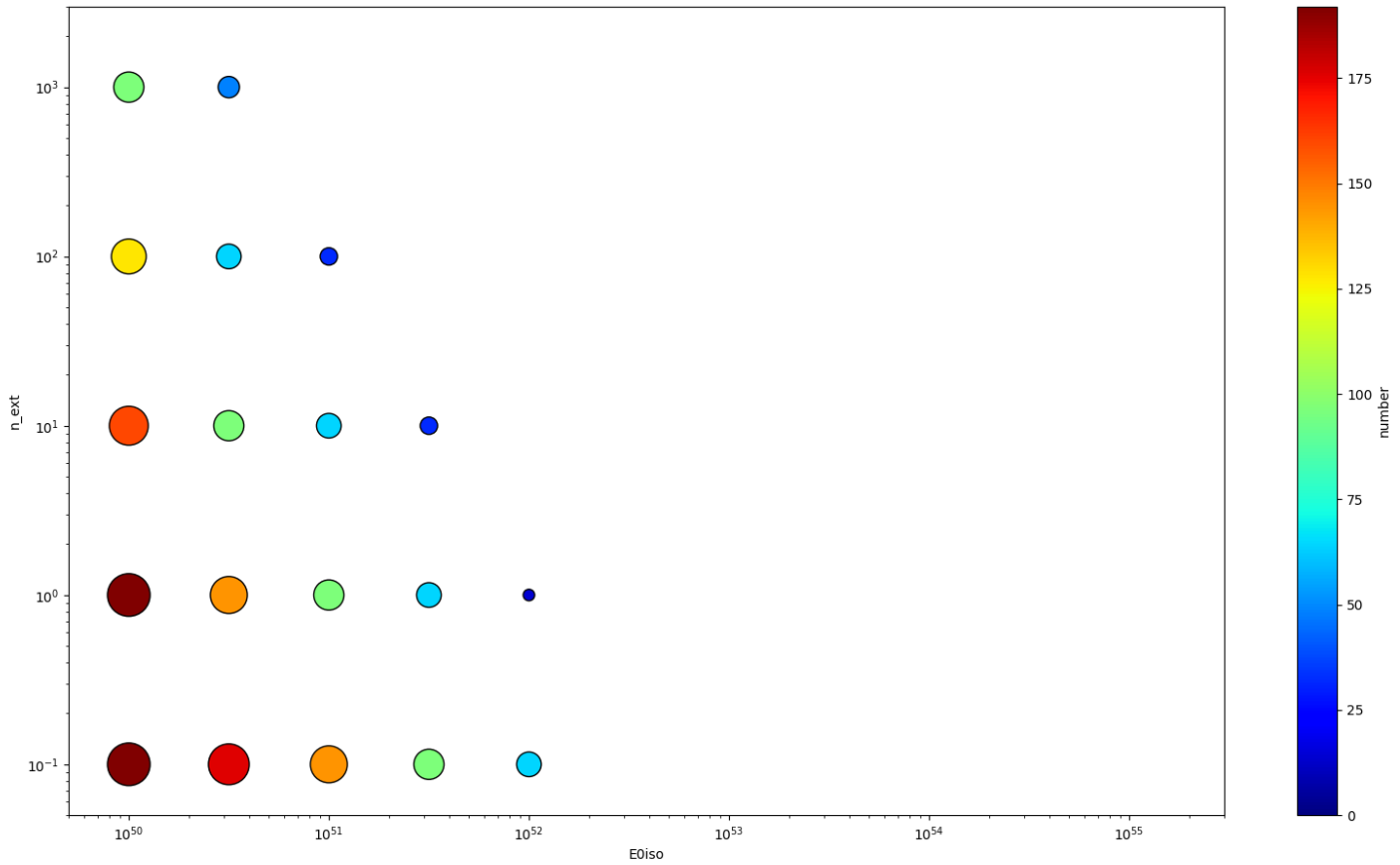


Boulodrome pipeline

Compatibility with observed onaxis afterglow :

Check parameters leading the classification
Example of E_iso / n_ext

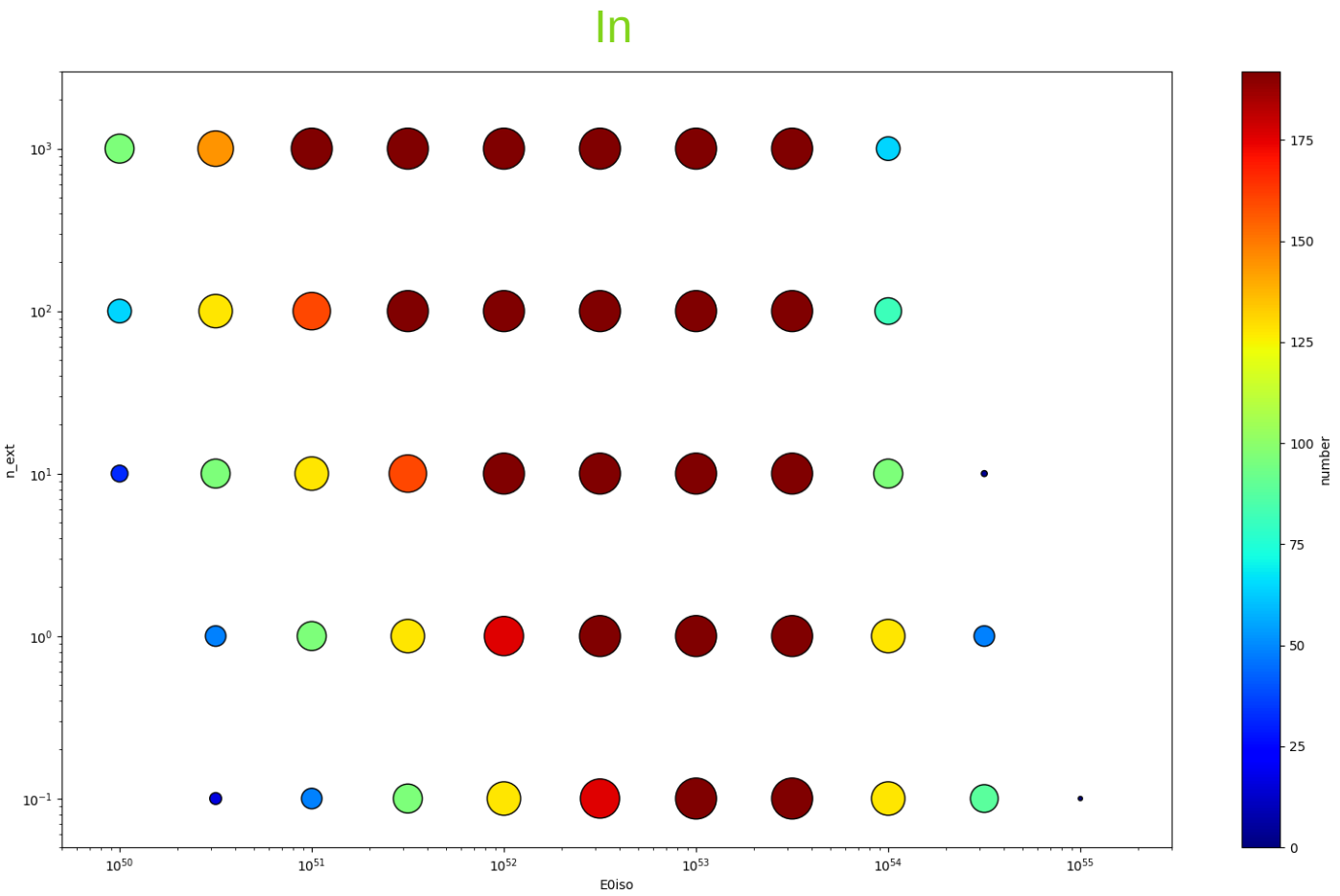
Below



Boulodrome pipeline

Compatibility with observed onaxis afterglow :

Check parameters leading the classification
Example of E_iso / n_ext

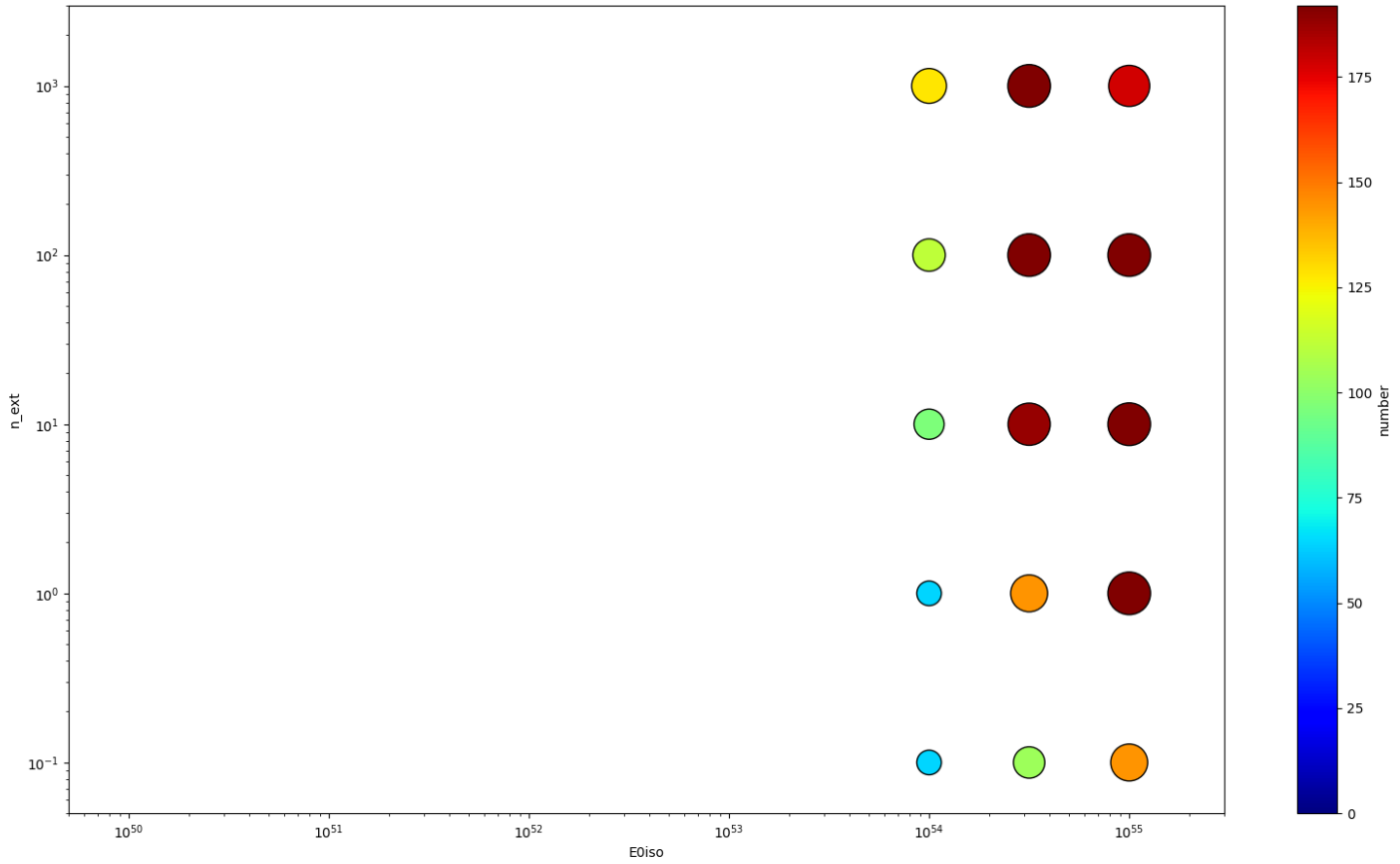


Boulodrome pipeline

Compatibility with observed onaxis afterglow :

Check parameters leading the classification
Example of E_iso / n_ext

Above



Boulodrome pipeline

Compatibility with observed onaxis afterglow :

Concrete implementation of the fink filter still need to be defined :

- ML training with the template bank ?
- Match filtering ?
- Slope + color ?
- Host galaxy ?
- combination of that ?