


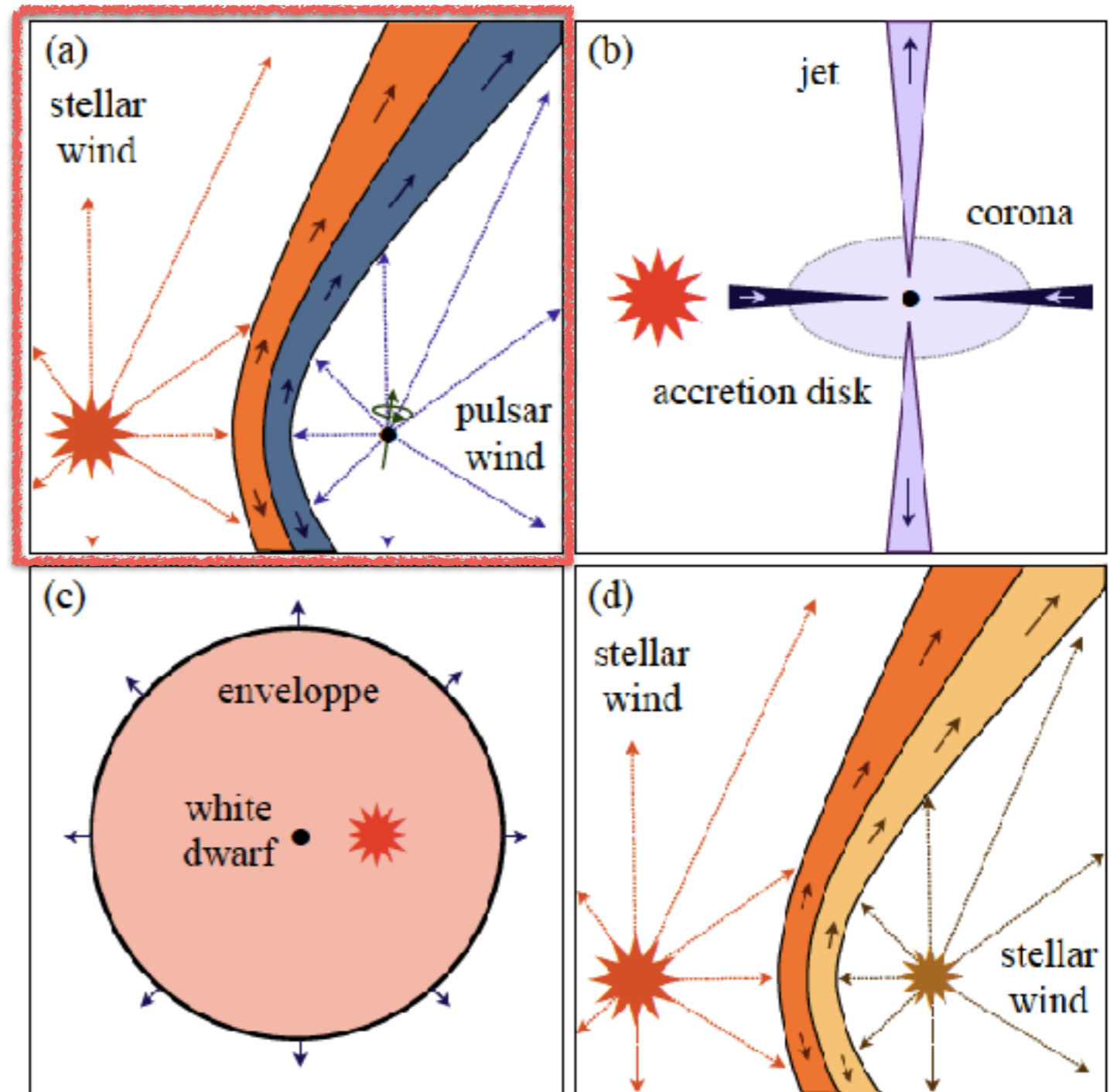
General sense: Gamma-ray binaries

Observations

- 1, Variable, timescale~binary
- 2, High Energy (0.1-100 GeV)
even
Very High Energy (>100 GeV)

Models

name	binary components	
(high-mass) gamma-ray binaries		
PSR B1259-63	pulsar	Be
HESS J0632+057	?	Be
LS I +61°303	?	Be
1FGL J1018.6-5856	?	O
LS 5039	? 	O
(low-mass) gamma-ray binaries (†)		
XSS J12270-4859	pulsar	red dwarf
PSR J1023+0038	pulsar	red dwarf
2FGL J0523.3-2530	?	red dwarf
PSR B1957+20	pulsar	brown dwarf
PSR J0610-2100	pulsar	brown dwarf
PSR J1311-3430	pulsar	brown dwarf

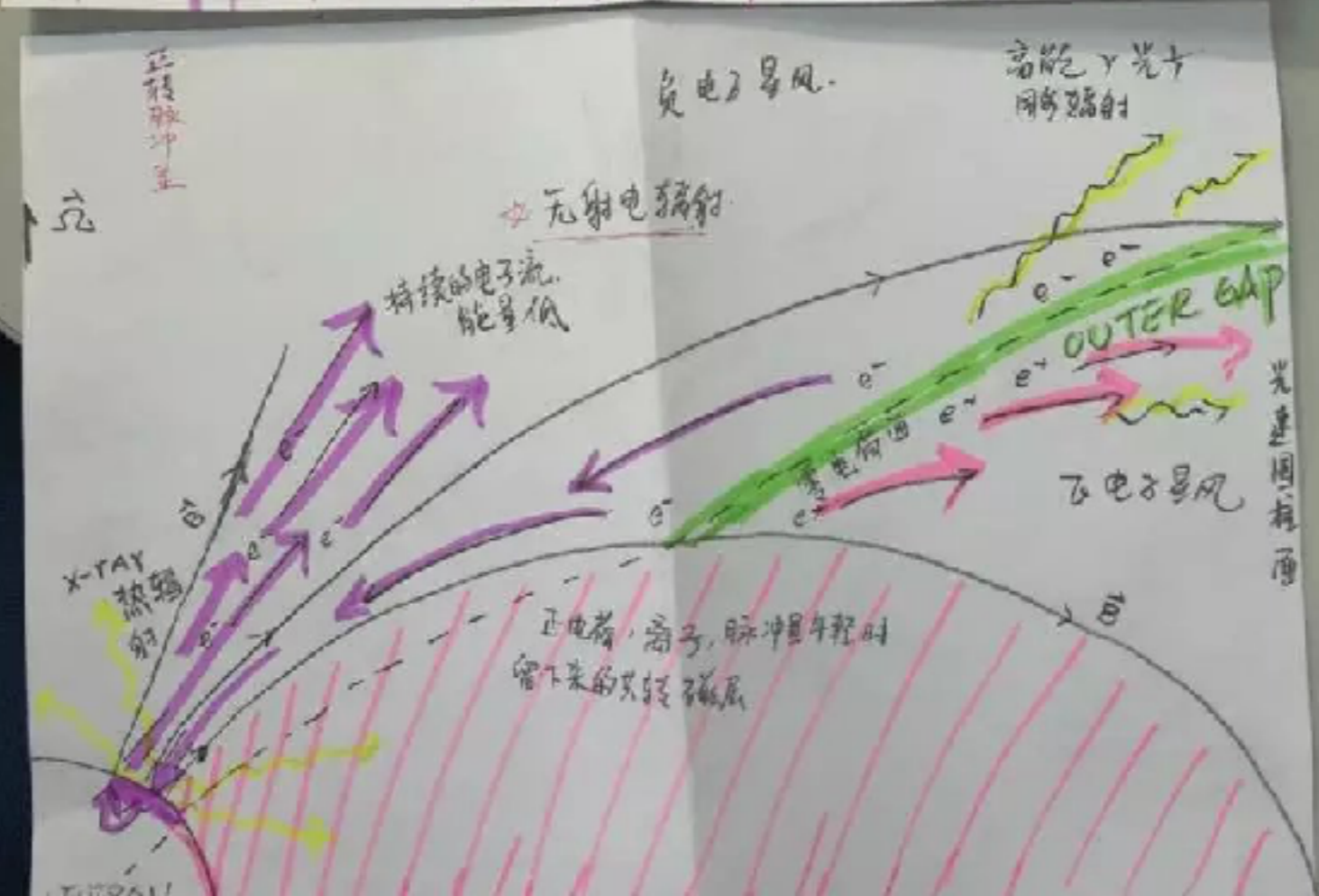
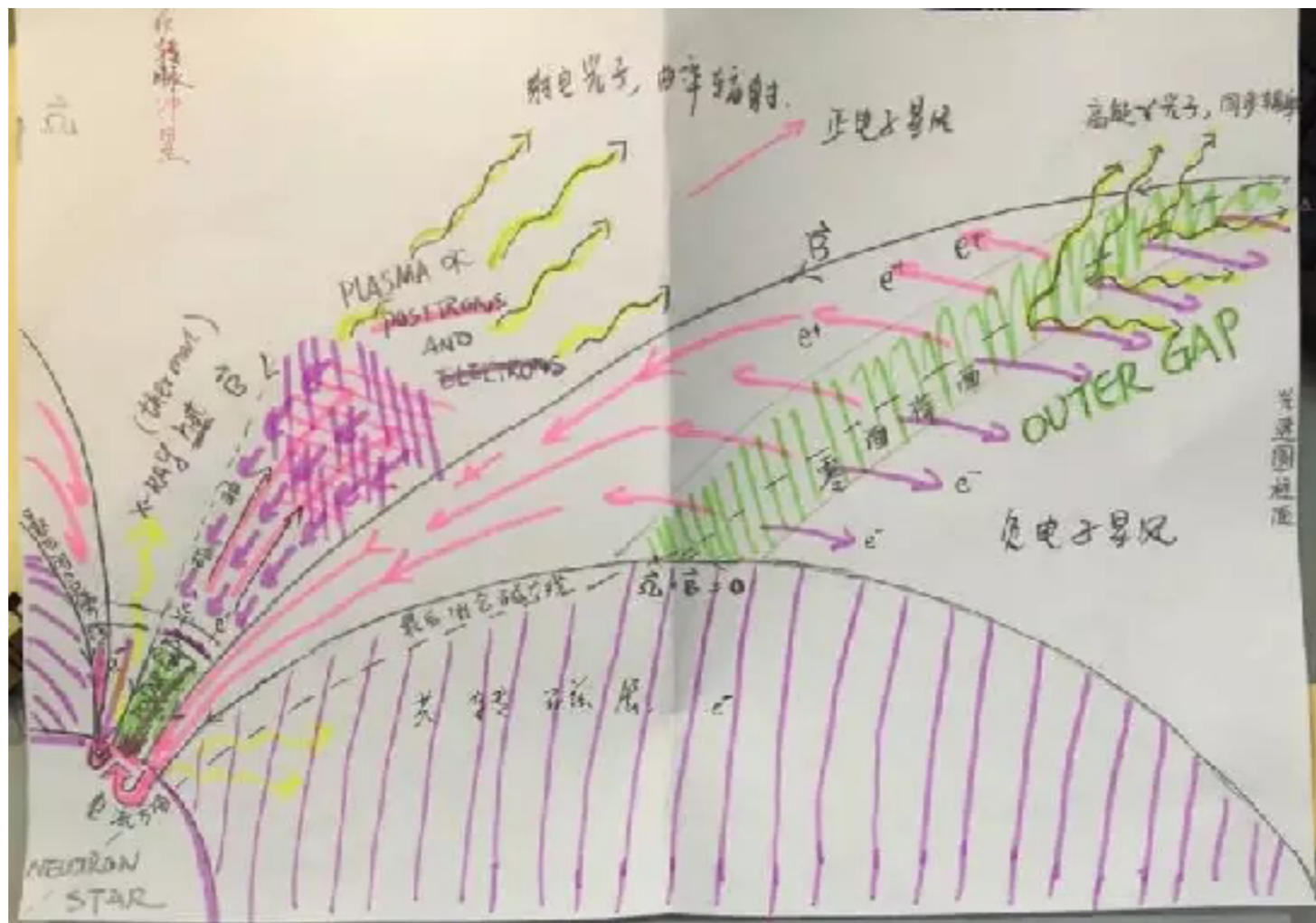


A (PSR 1259)



B (LS 5039)





radio pulsed

gamma-ray pulsed

A

B ?

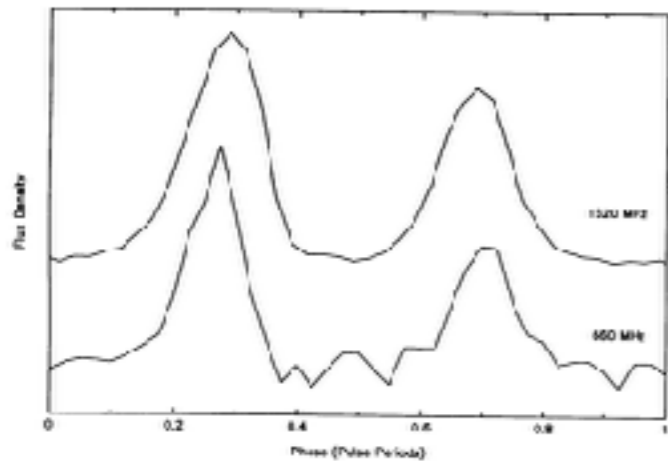


FIG. 1.—Mean pulse profile for PSR 1259–63 at two radio frequencies, 1520 and 660 MHz.

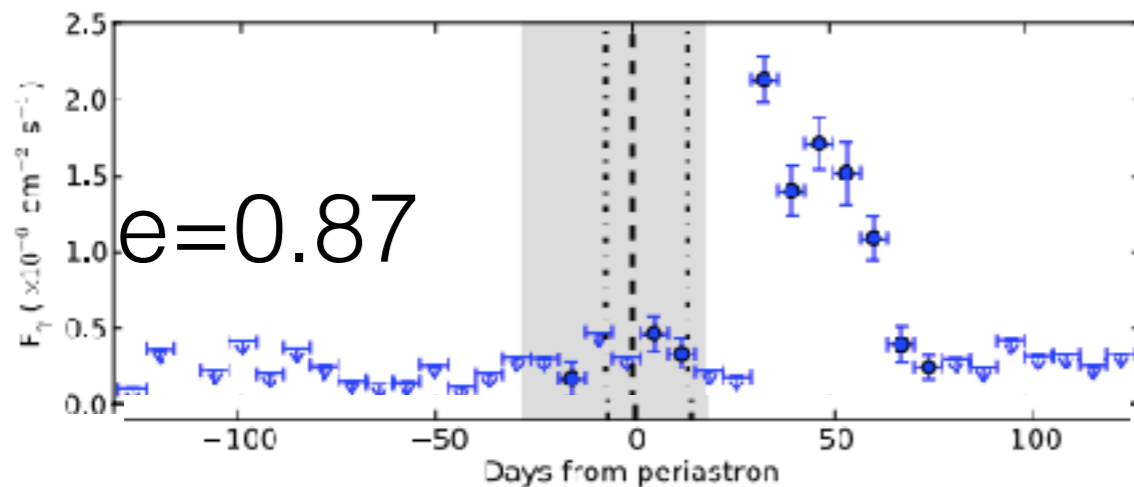
name	binary components	
(high-mass) gamma-ray binaries		
PSR B1259-63	pulsar	Be
HESS J0632+057	?	Be
LS I +61°303	?	Be
1FGL J1018.6-5856	?	O
LS 5039	?	O

no radio pulsation

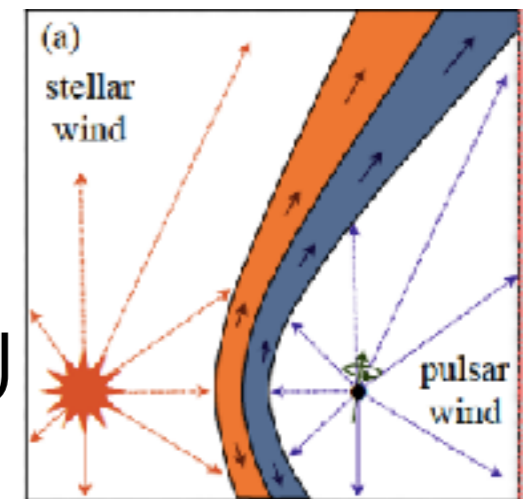
GeV all the time

gamma-ray pulsation??

THE ASTROPHYSICAL JOURNAL LETTERS, 736:L11 (6pp), 2011 July 20

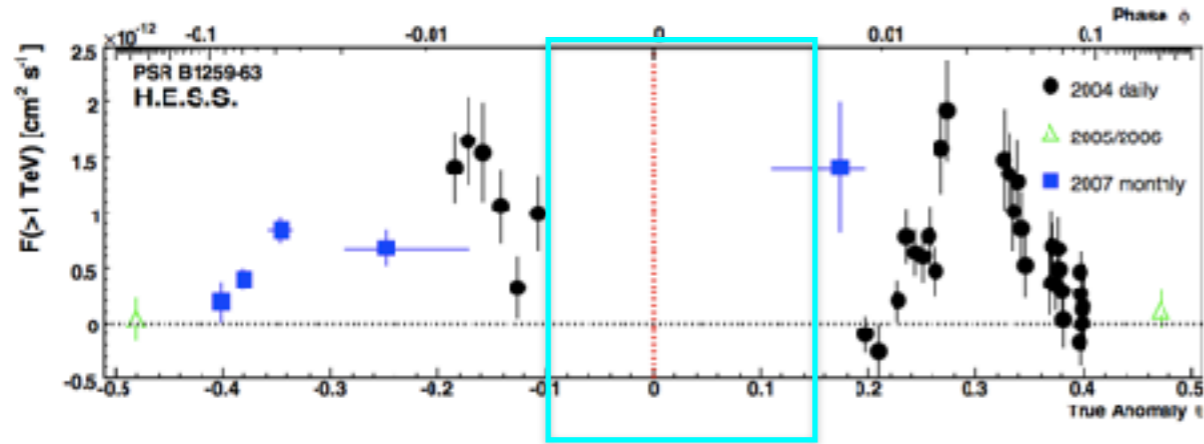


A: 0.9-13AU
B: 0.1-0.2AU

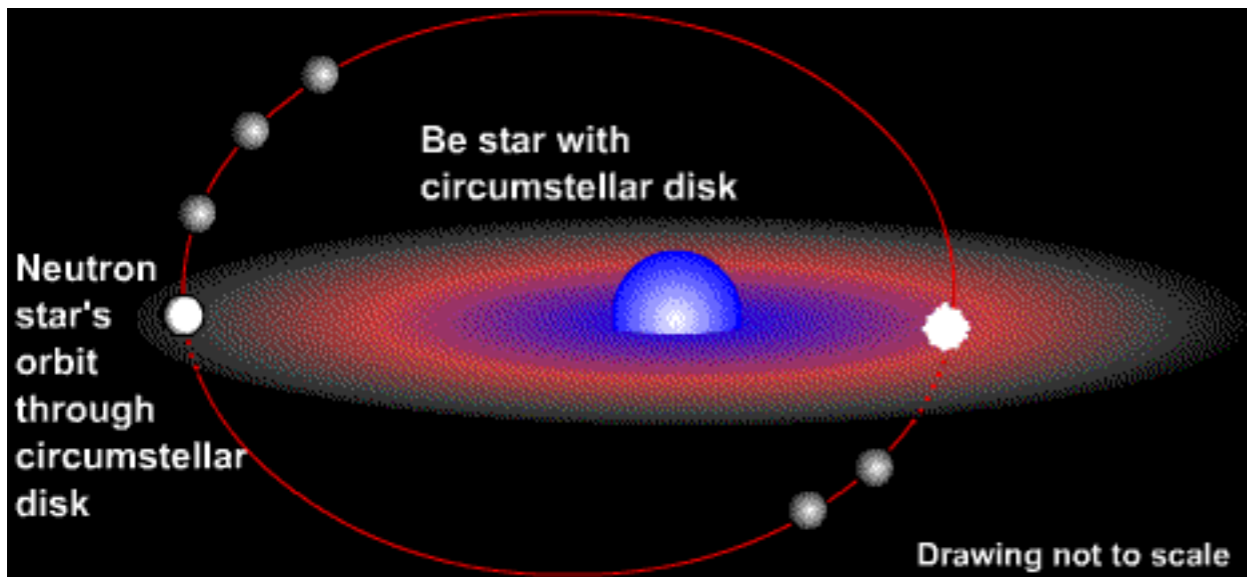
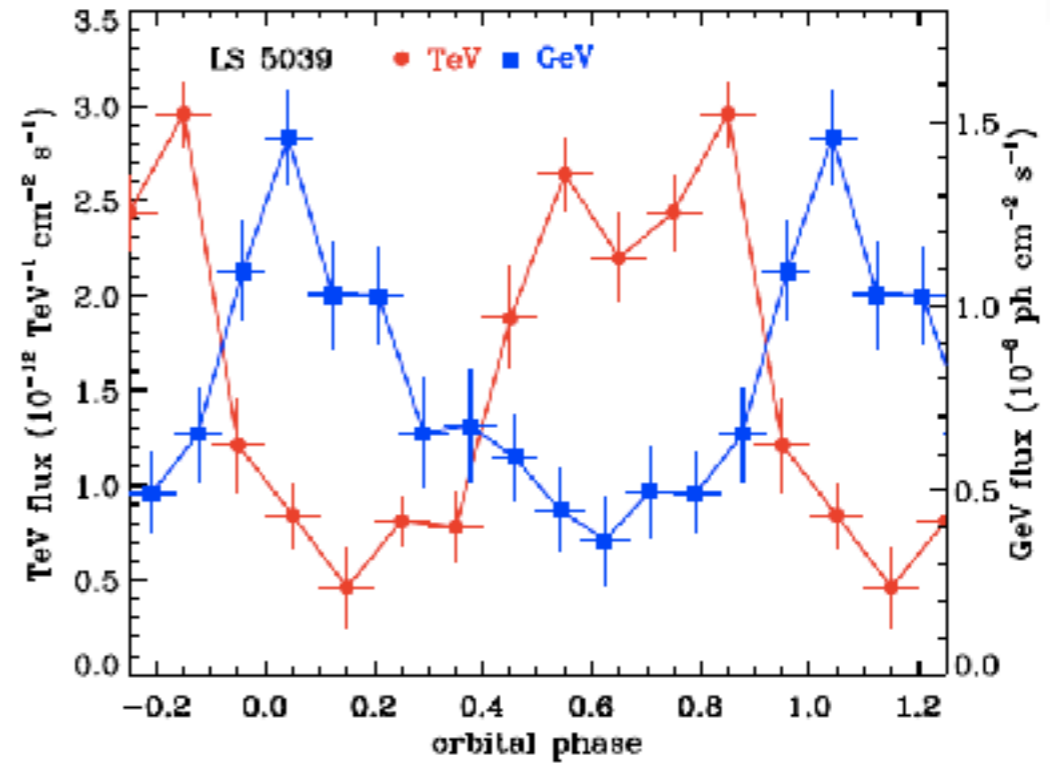


TeV light curves

A (PSR 1259)



B (LS 5039)



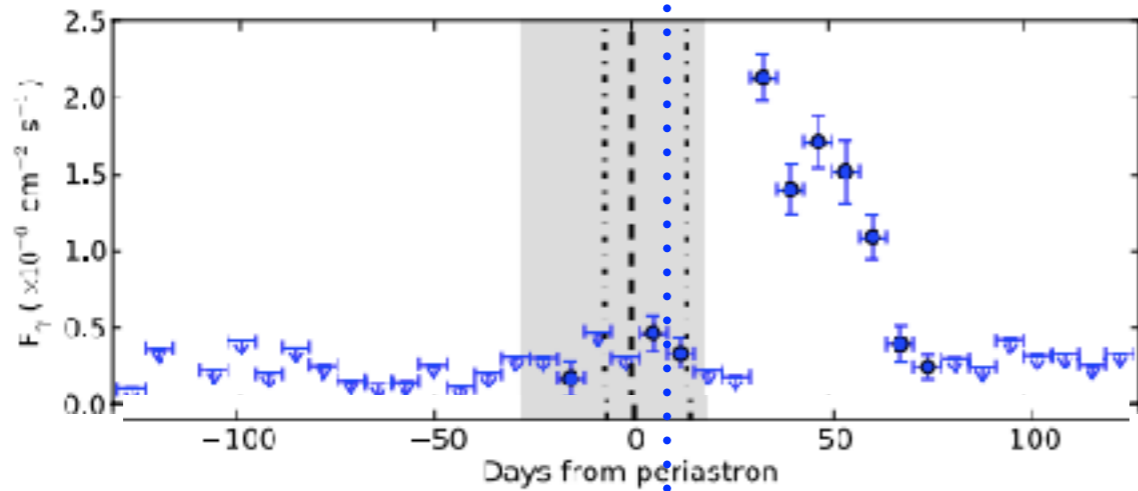
O star, no disc stellar wind

disc wind from Be star

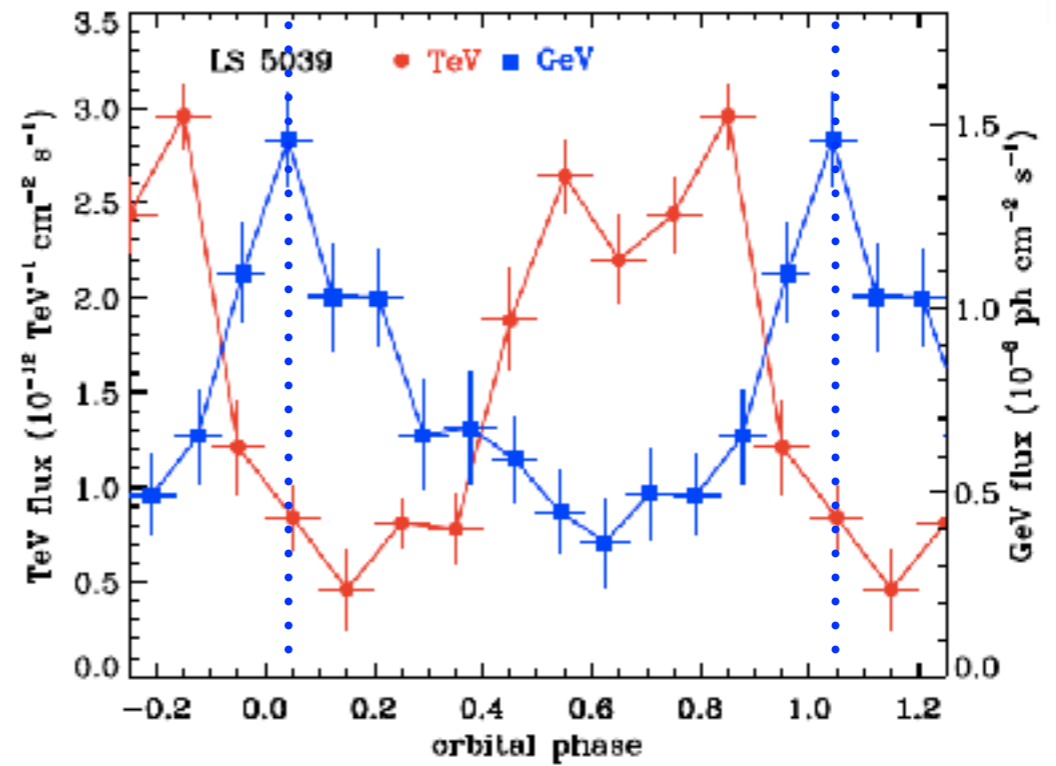
GeV light curves

A (PSR 1259)

THE ASTROPHYSICAL JOURNAL LETTERS, 736:L11 (6pp), 2011 July 20

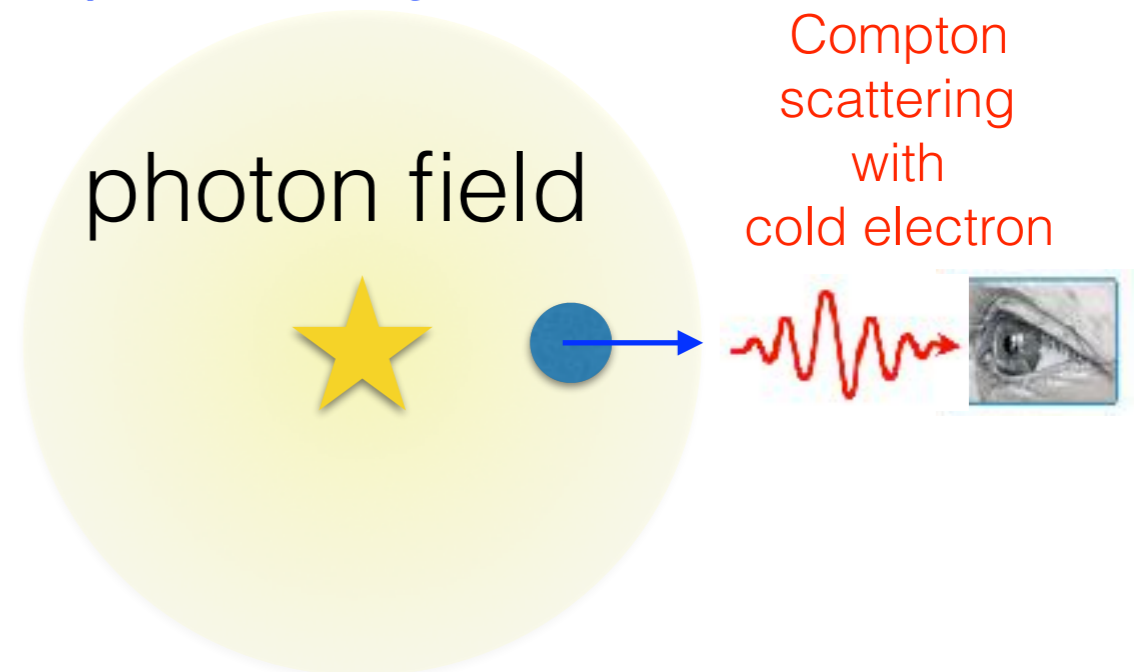
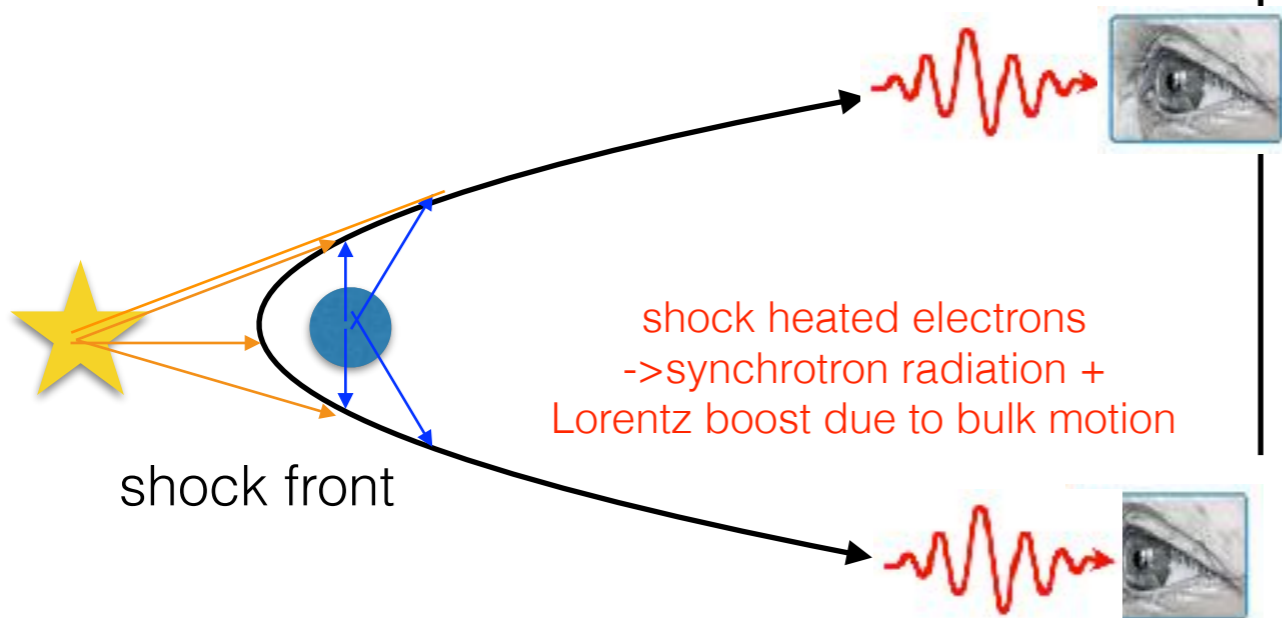


B (LS 5039)



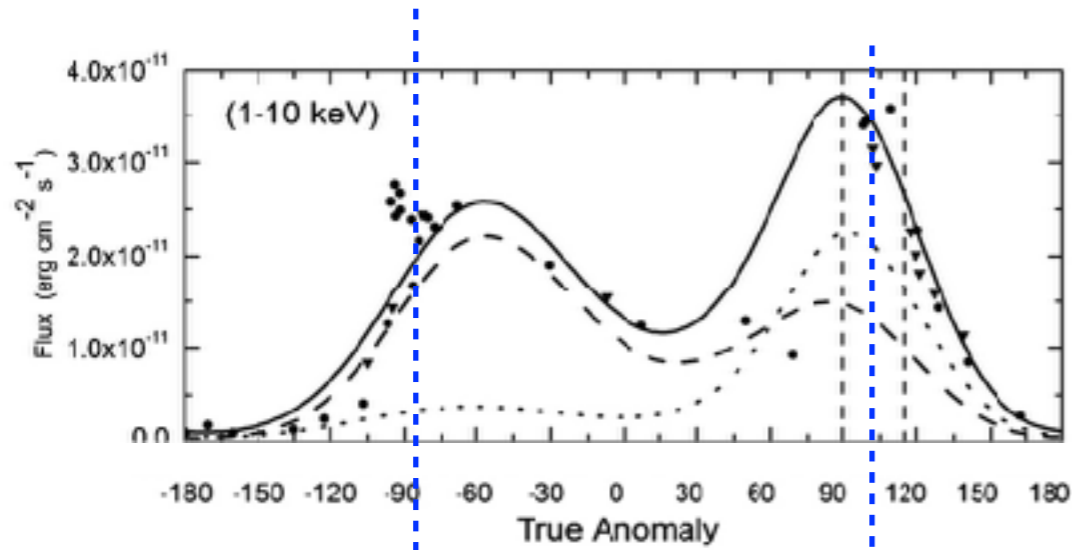
super conjunction

super conjunction

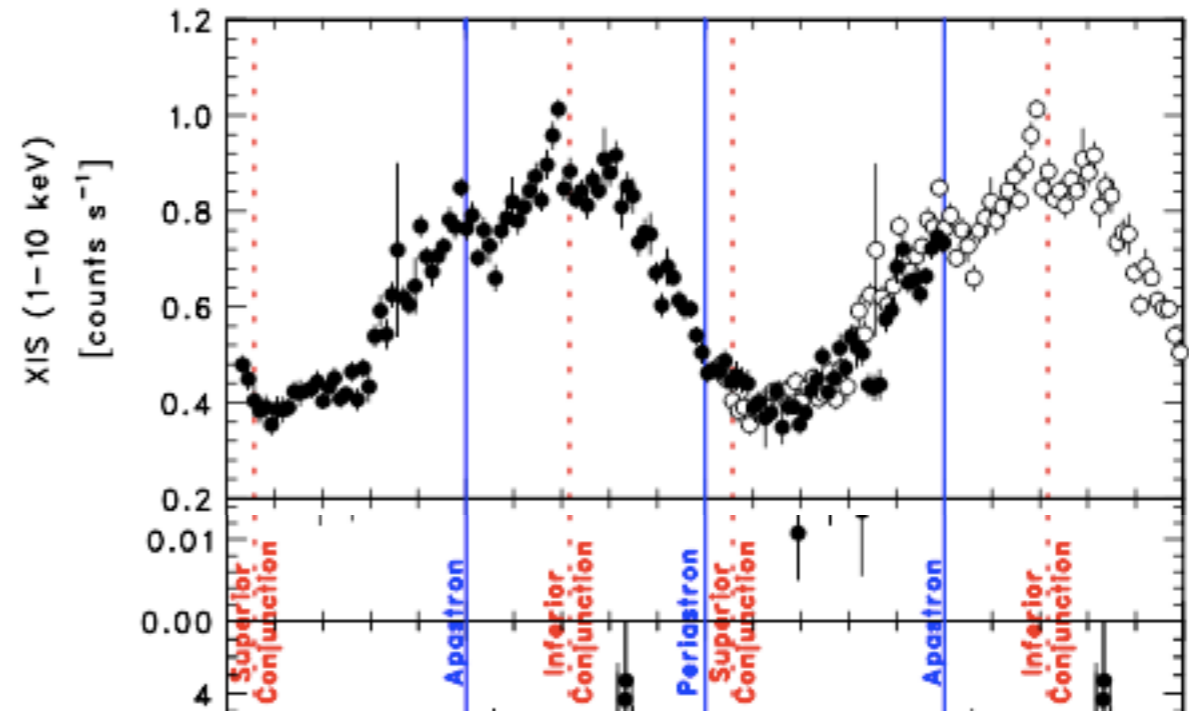


X-ray light curves

A (PSR 1259)



B (LS 5039)



inferior conjunction

super conjunction

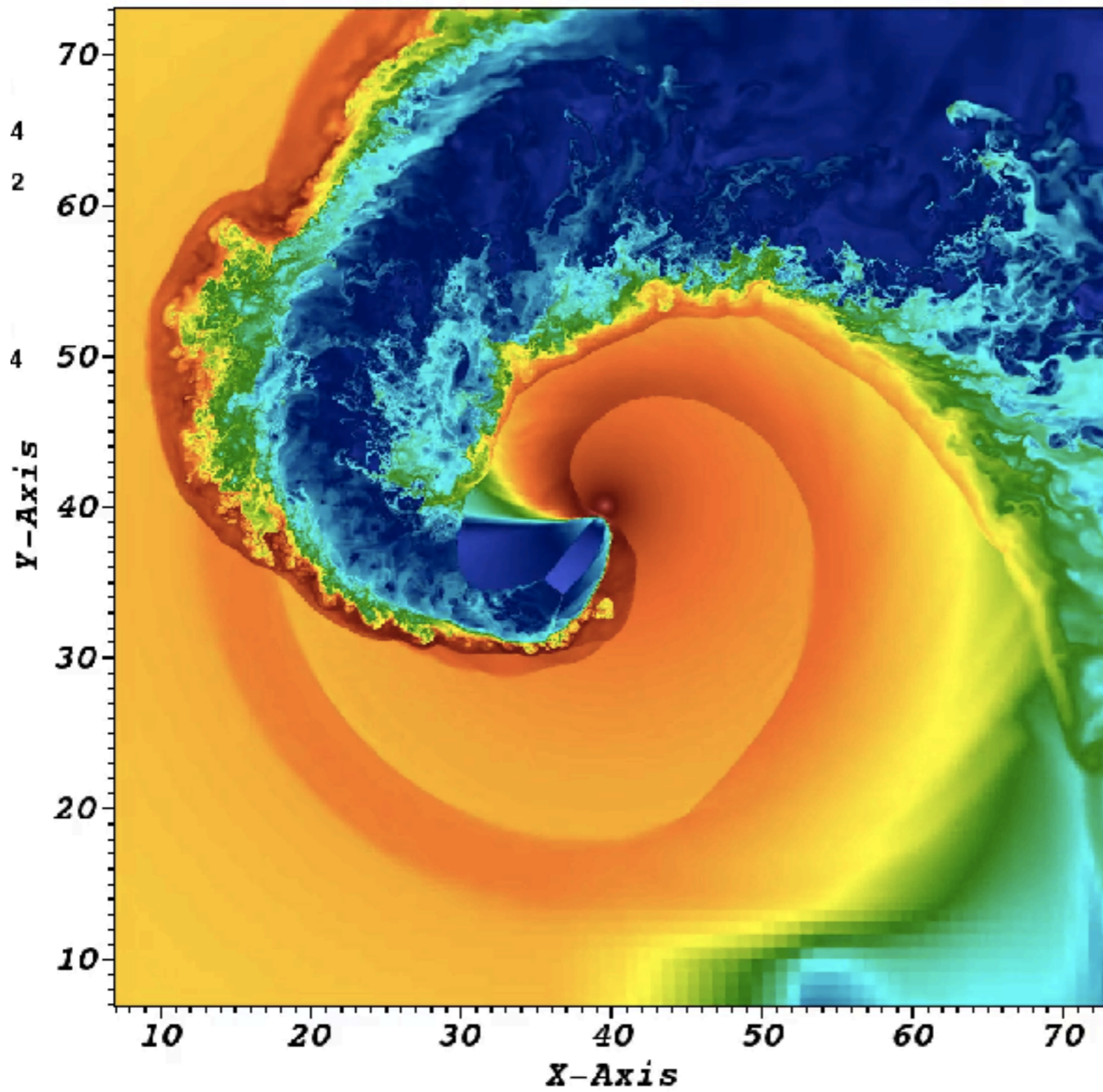


shock apex

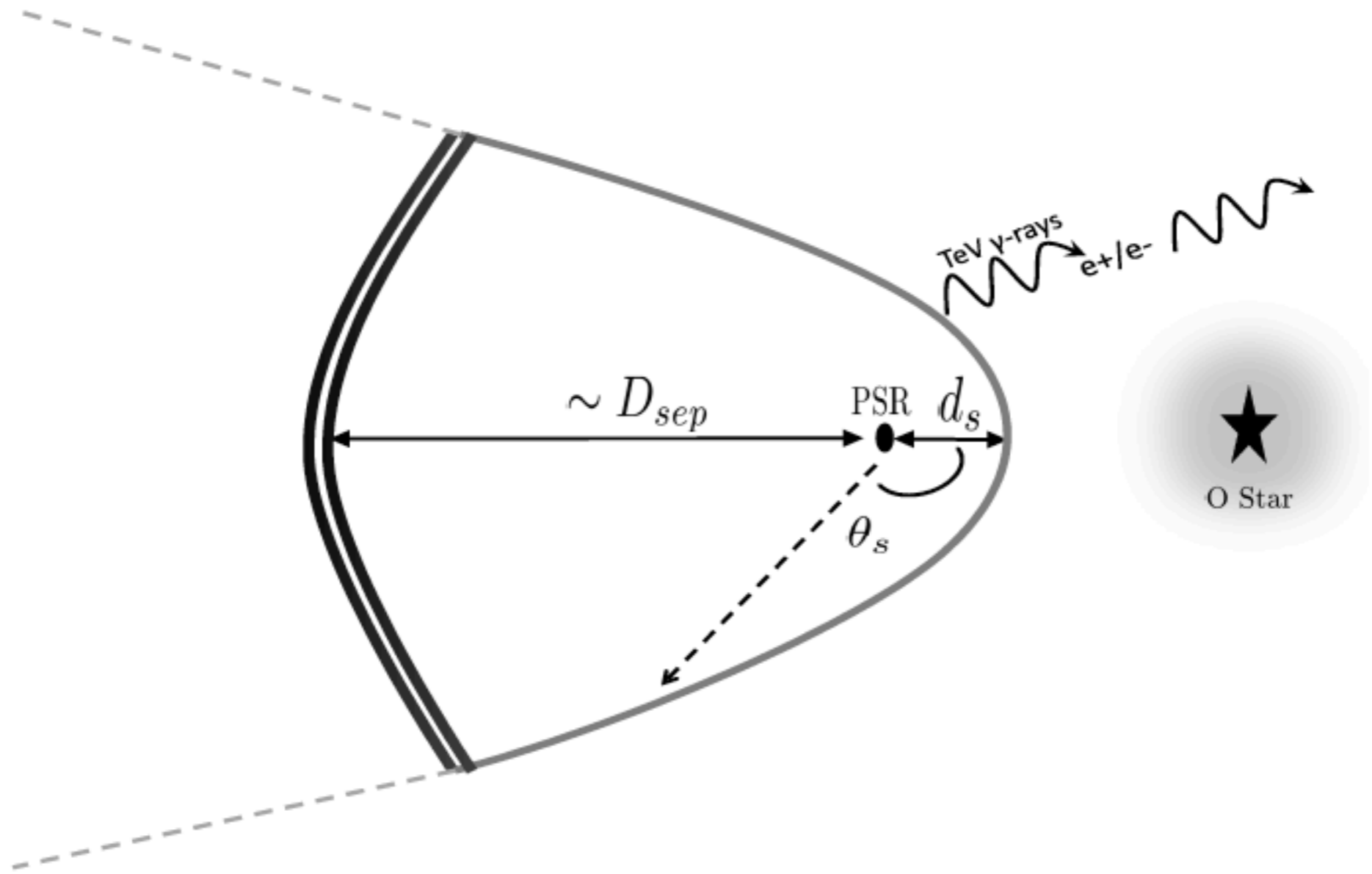


shock tail





Why not
sys A?



	A	B
pulsar	radio loud, gamma-ray quiet	gamma-ray quiet, radio loud
Massive star	Be star, stellar disc	O star, isotropic
shock	straight shock tail	spiraling shock tail

PSR B1259-63 vs. LS 5039

Same and Difference

Model

the Pulsar





	Motivation	1259 (A)	5039 (B)
Magnetosphere radiation Curvature radiation	1. theory self-consistency 2. 1-10 GeV spectrum 3. 1259 has no steady gamma-ray emission, so we suppose it has no Magnetosphere gamma-ray radiation.	✗	✓
Non-isotropic pulsar wind	1. theory possibility 2. two-peak structure in X-ray and TeV LC of 1259	✓	✗
isotropic pulsar wind bulk IC	1.theory self-consistency 2.<1GeV spectrum, enhanced@SUPC	✗	✓
Changing magnetization Parameter	1. theory self-consistency 2. (+disc stellar wind) two-peak LC	✓	✓

PSR B1259-63 vs. LS 5039

Same and Difference

Model

the Main sequence star

	Motivation	1259	5039
Two-components stellar wind (disc wind)	<ol style="list-style-type: none">1. theory self-consistency2. (+changing σ) two-peak LC around periastron of 1259		
isotropic stellar wind	<ol style="list-style-type: none">1. theory self-consistency2. give shock		

PSR B1259-63 vs. LS 5039

Same and Difference

Model

shock

	Motivation	1259 (A)	5039 (B)
Shock apex heating + Synchrotron radiation+IC	<ol style="list-style-type: none"> theory self-consistency X-ray & TeV emission 	✓	✓
Shock tail heating+Synchrotron+IC+Bulk Boosting	<ol style="list-style-type: none"> theory self-consistency GeV enhance @ SUPC (flare) Two peak structure in X-ray 	✓	✗
backside Shock heating+Syn+IC	<ol style="list-style-type: none"> theory possibility LC difference between X-ray & TeV of 5039 	✗	✓

Absorbtion

	Motivation	1259 (A)	5039 (B)
pair cascade	<ol style="list-style-type: none"> theory self-consistency lower TeV spectrum of 5039 	✗	✓