Galactic magnetic fields and UHECR arrival and anisotropy

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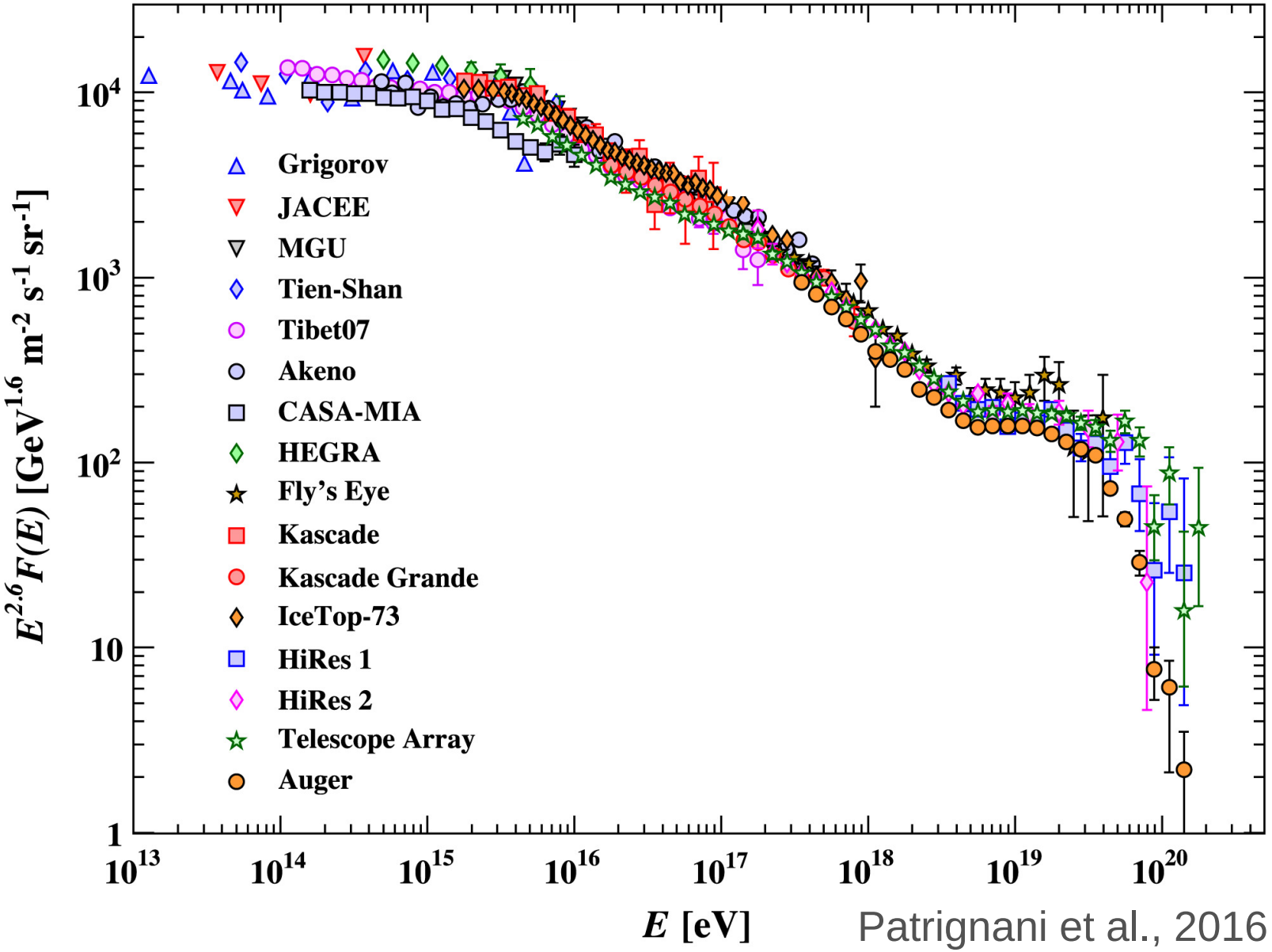
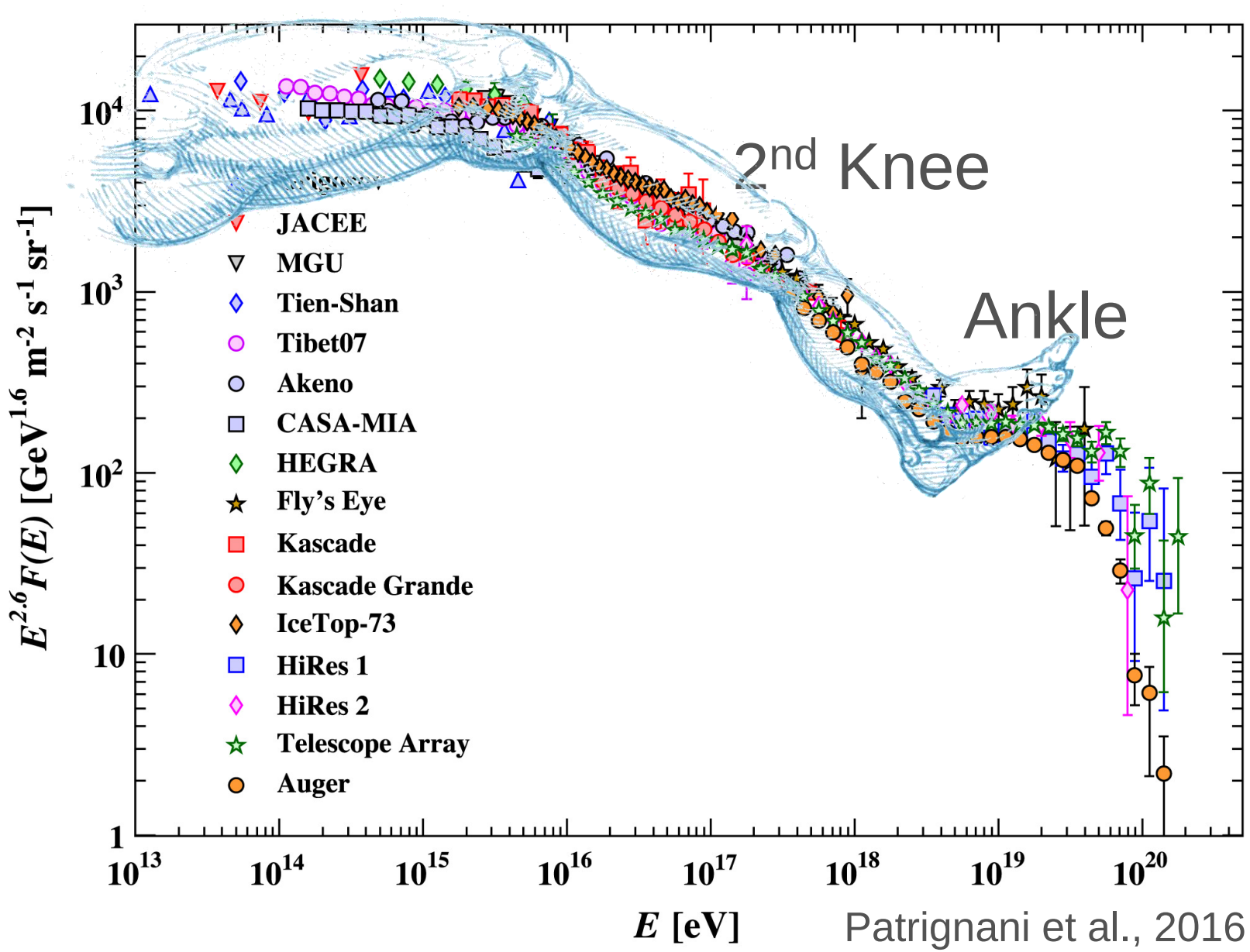
CR spectrum



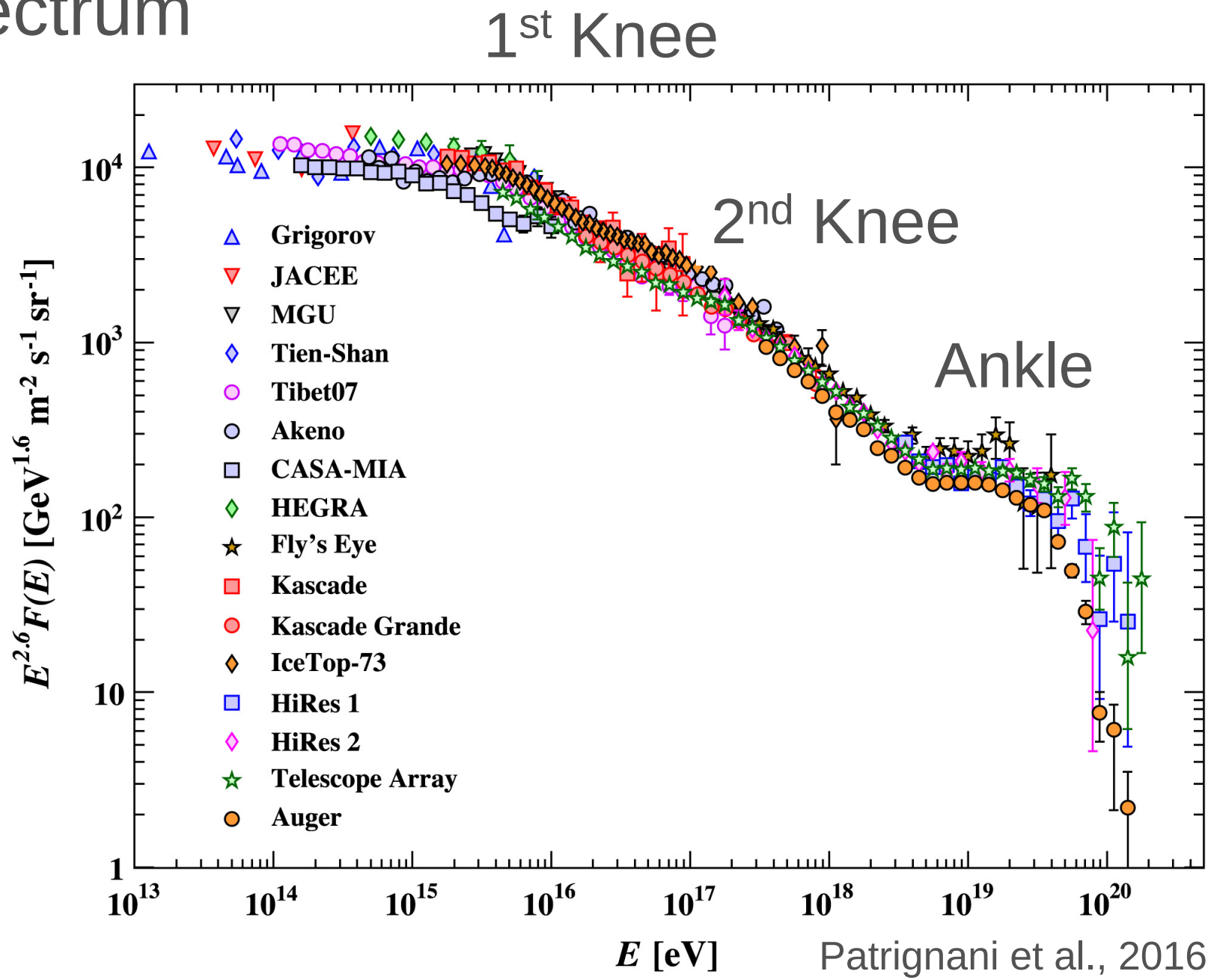
Patrignani et al., 2016

CR spectrum



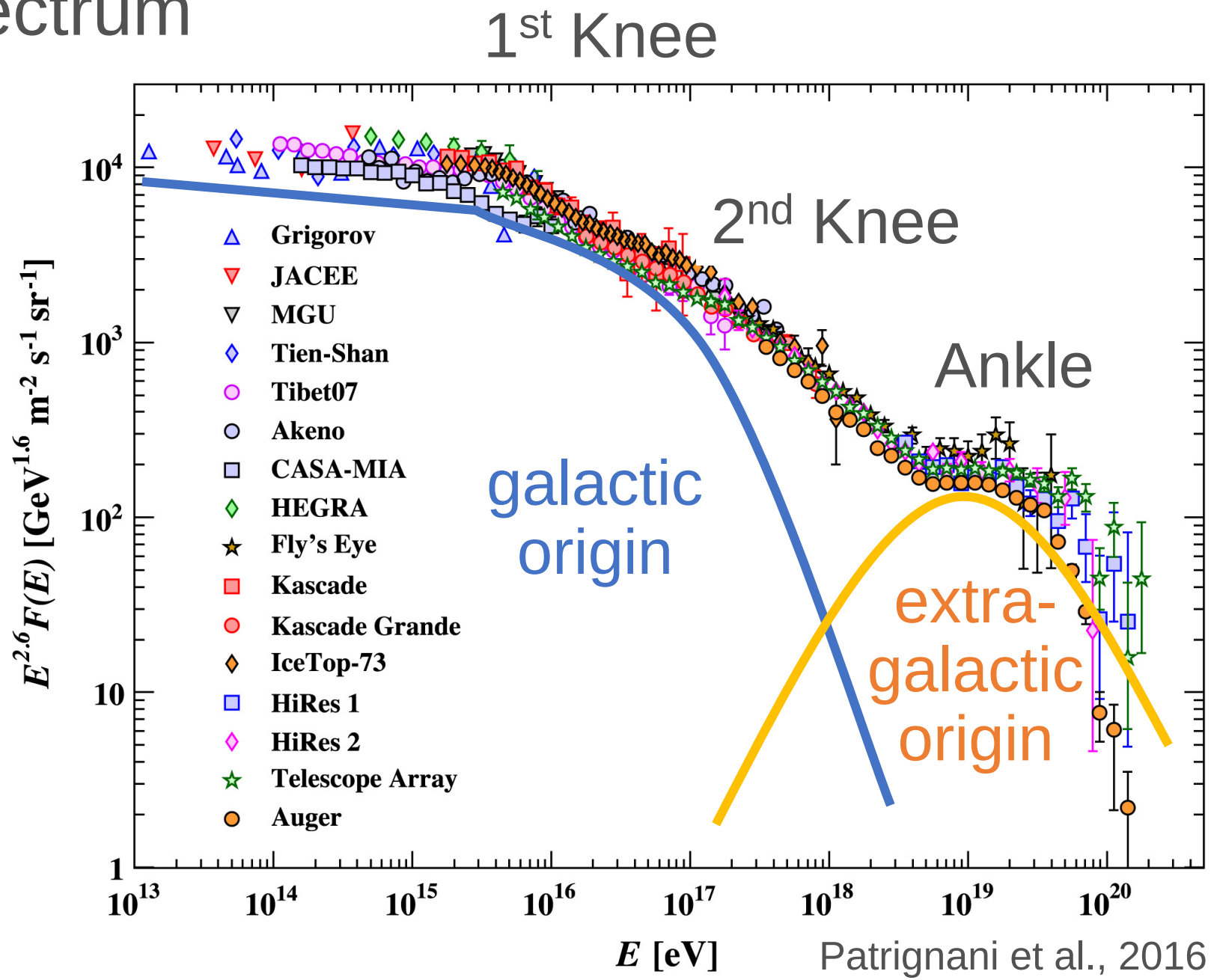
Patrignani et al., 2016

CR spectrum



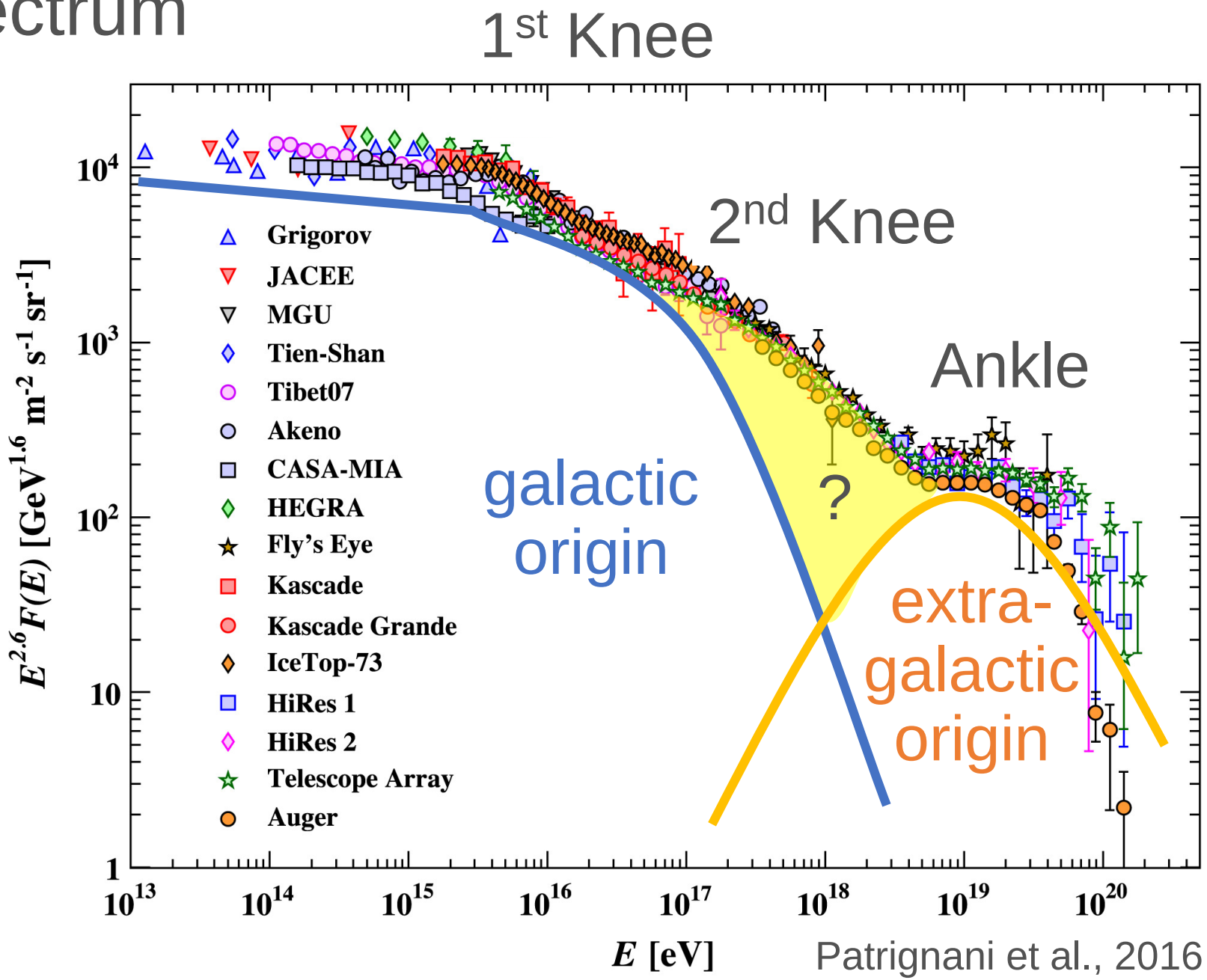
Patrignani et al., 2016

CR spectrum



Patrignani et al., 2016

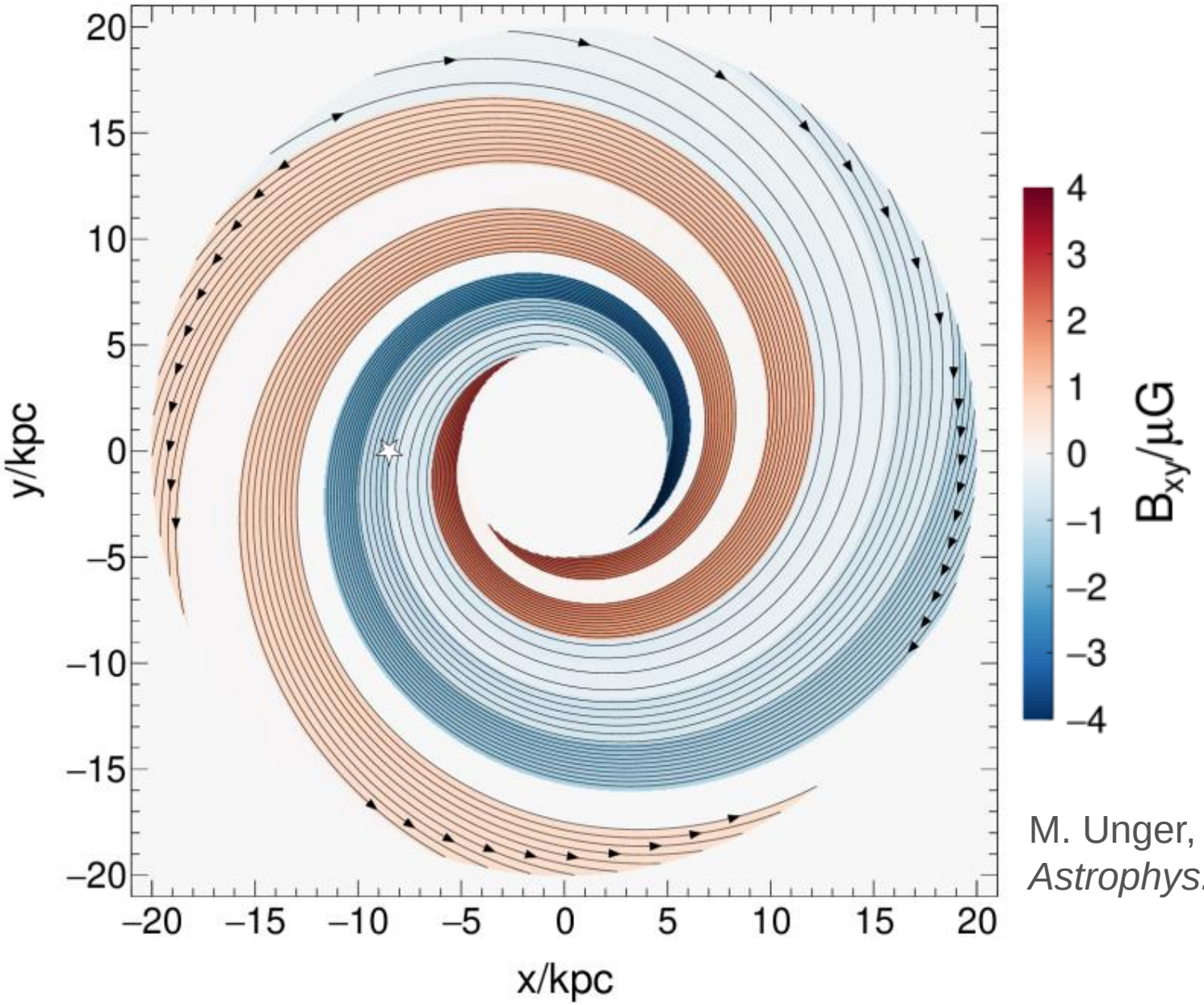
CR spectrum



Patrignani et al., 2016

Galactic magnetic fields

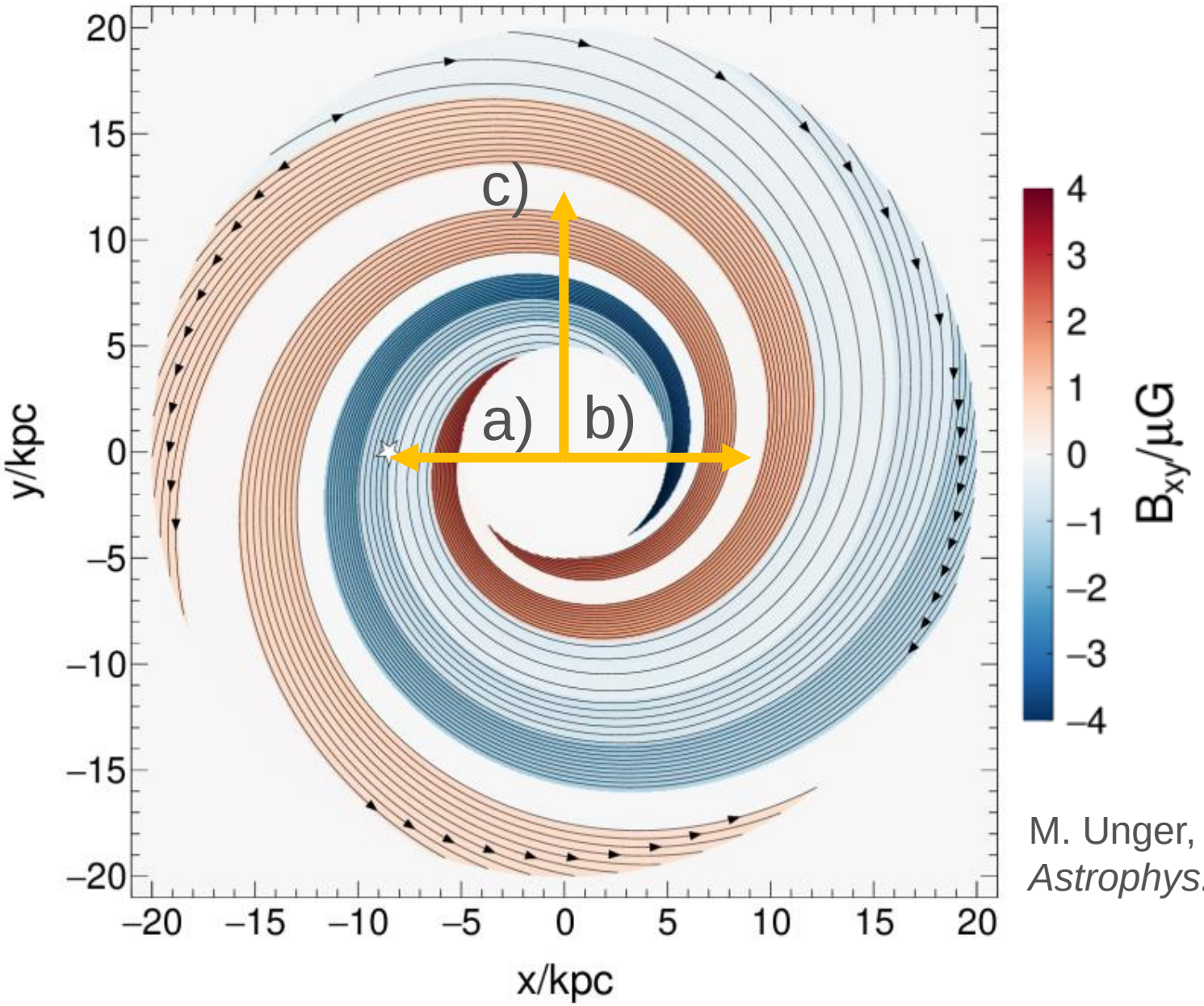
JF12



M. Unger, G. Farrar
Astrophys.J. 970 (2024) 1, 95

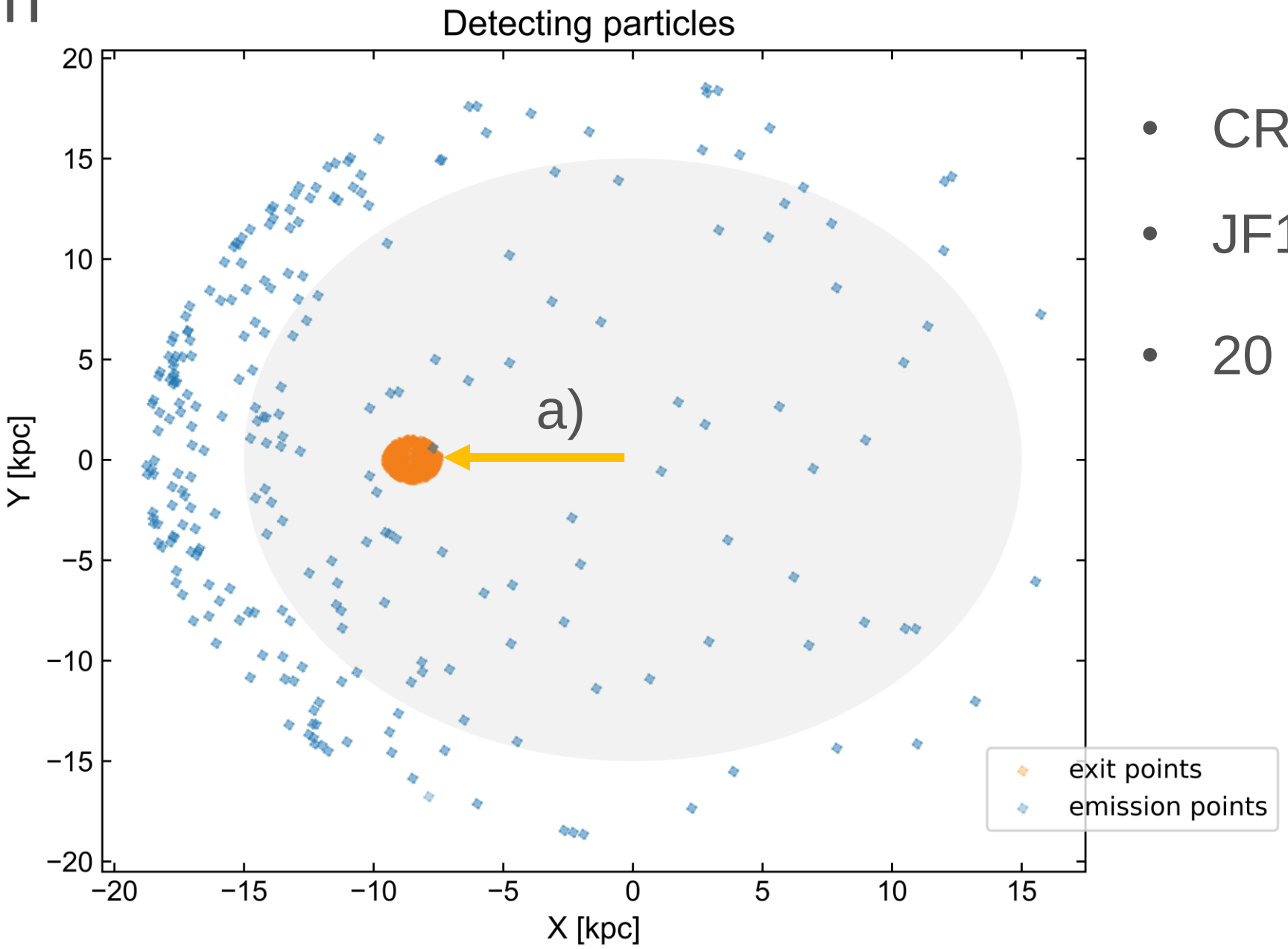
Galactic magnetic fields

JF12



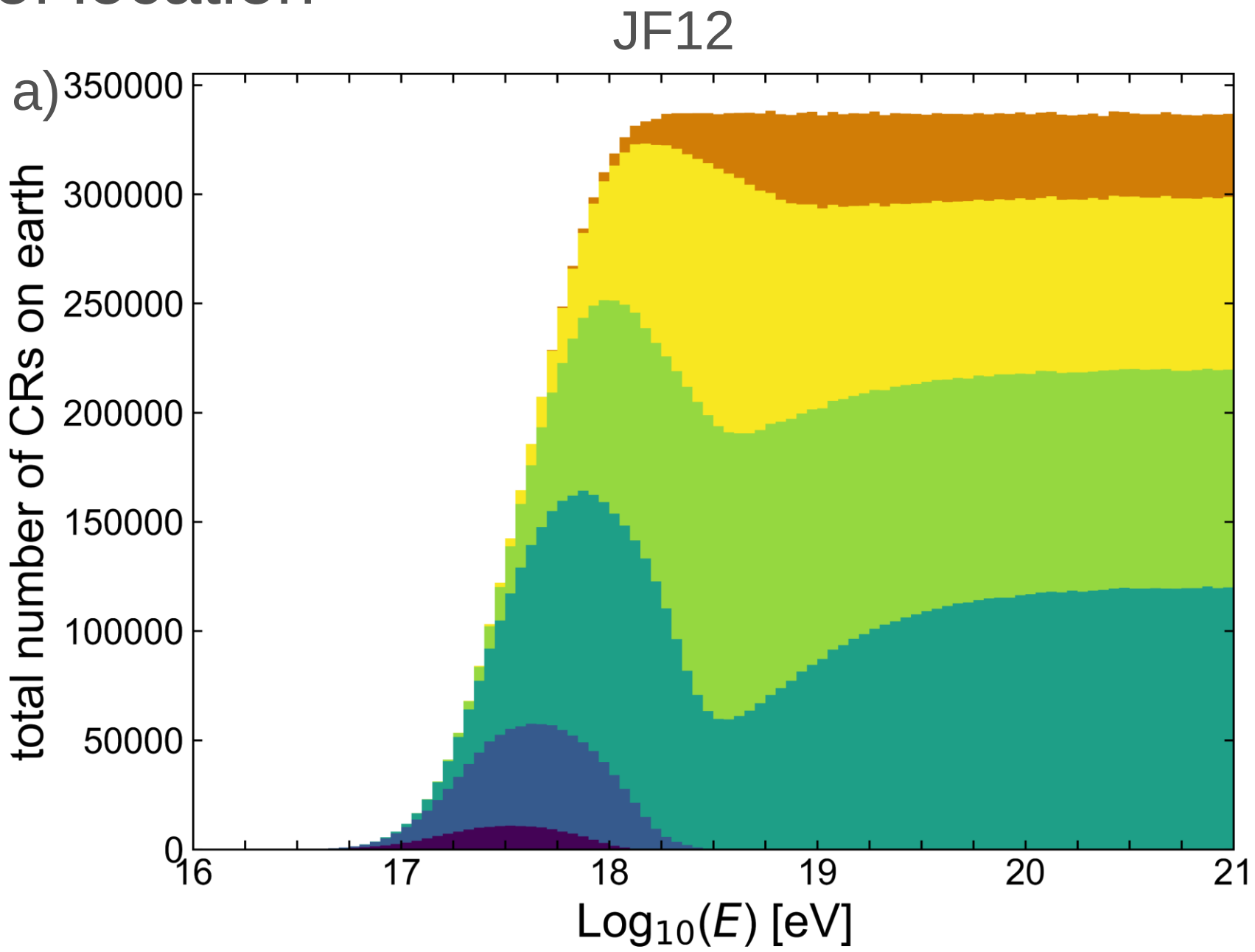
M. Unger, G. Farrar
Astrophys.J. 970 (2024) 1, 95

Simulation

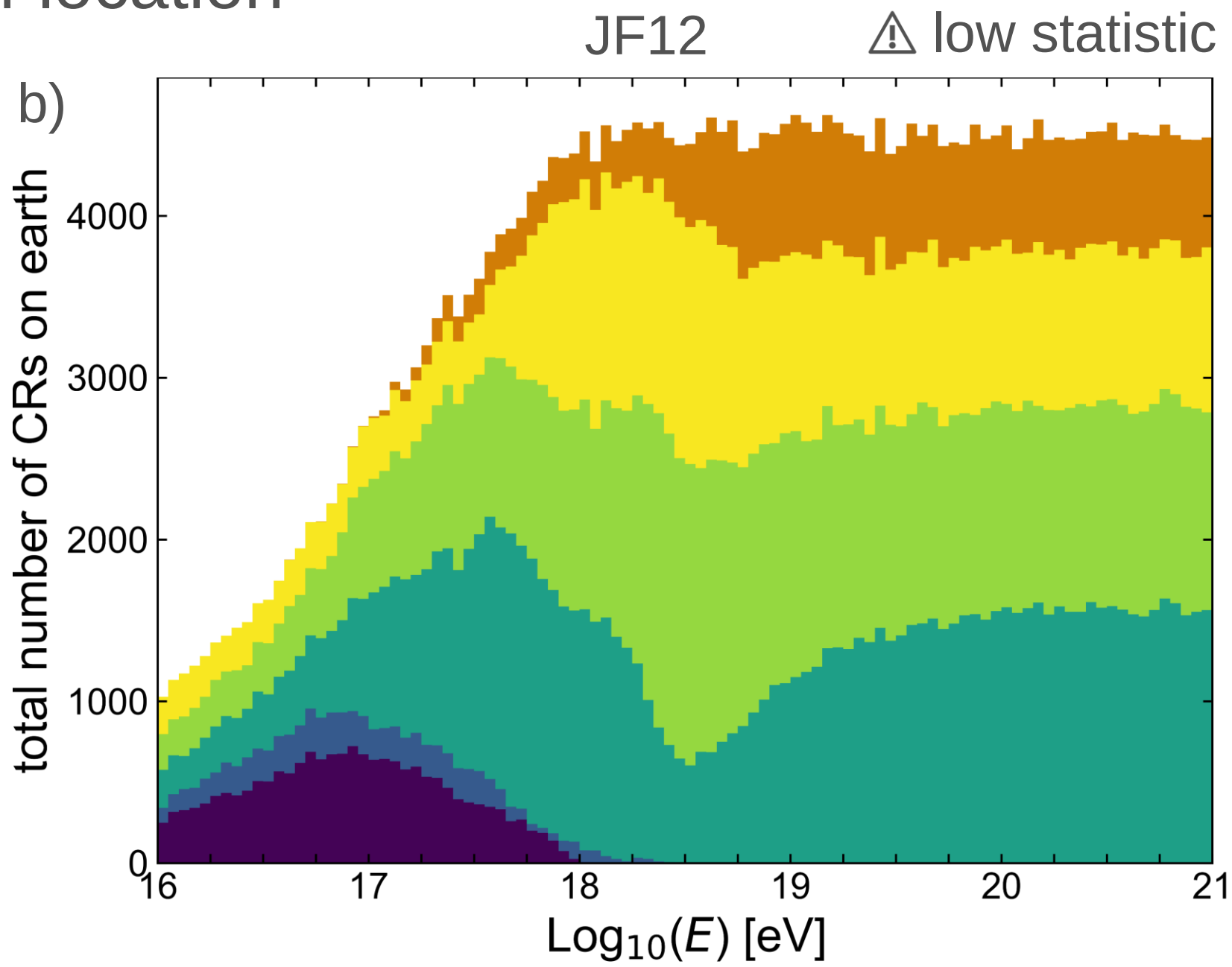


- CRPropa
- JF12
- 20 kpc

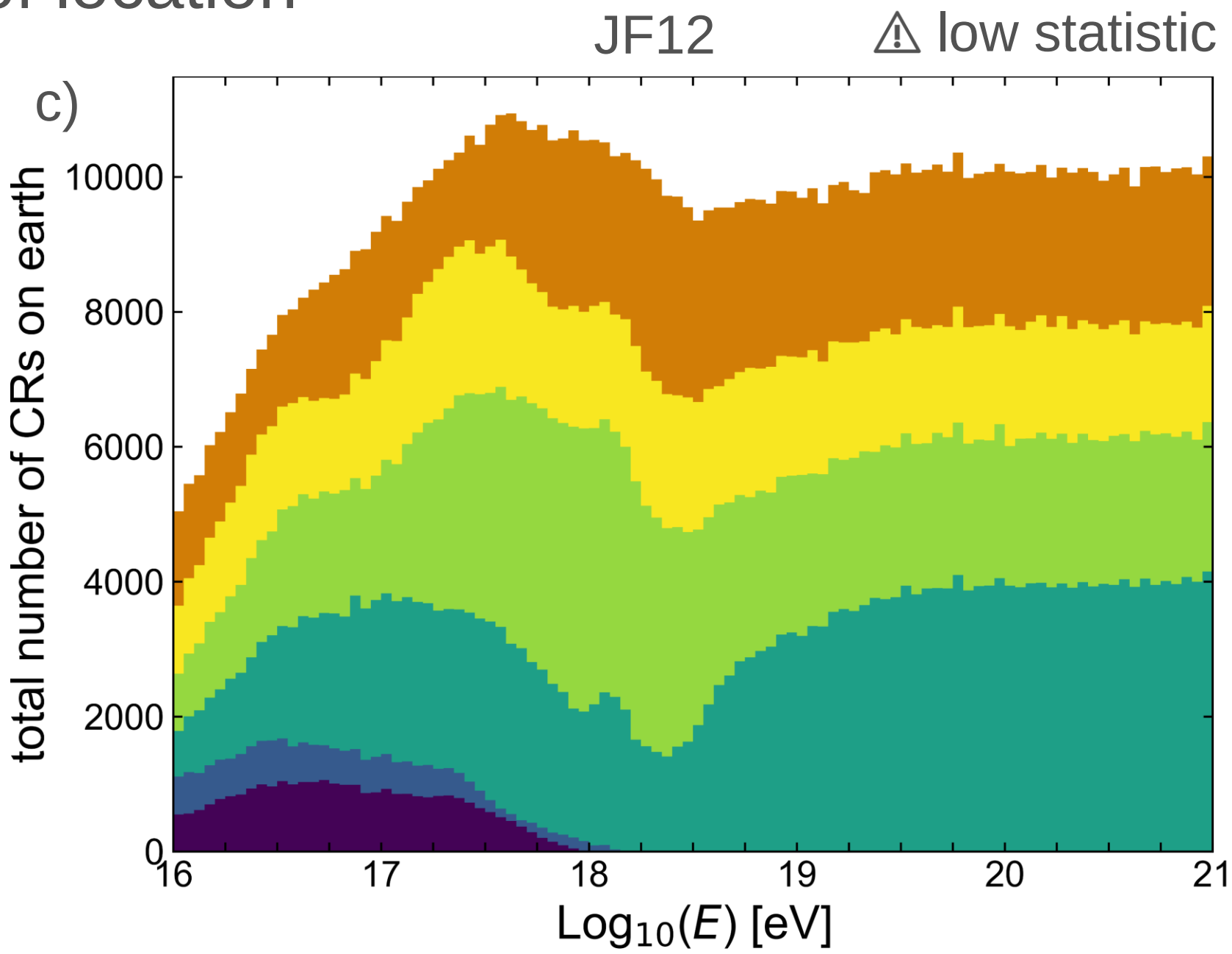
Impact of location



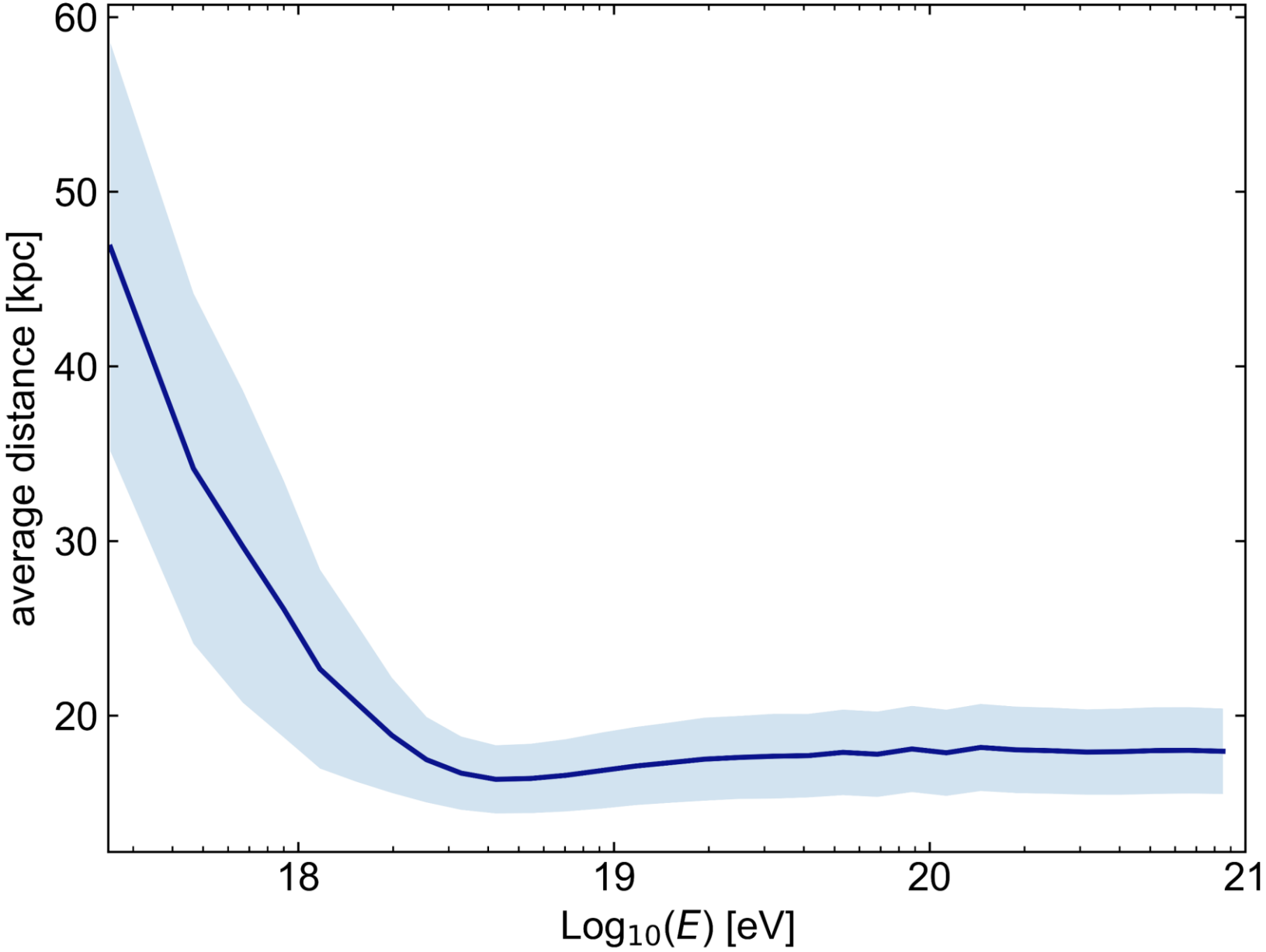
Impact of location



Impact of location

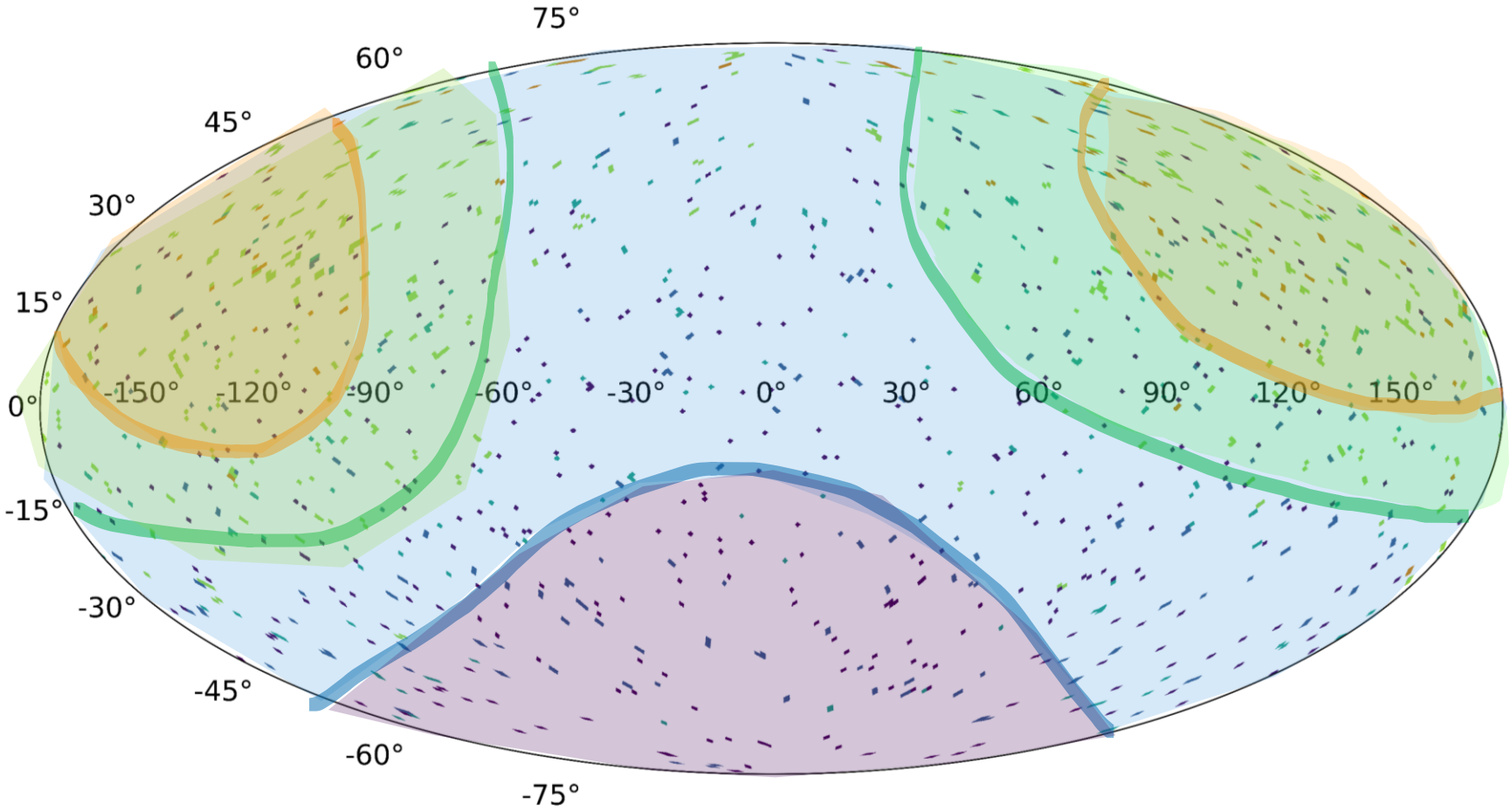


Average propagated distance



Arrival position on observer

Log(E)/eV 17-18



propagated distance

- >= 9 kpc
- >= 12 kpc
- >= 15 kpc
- >= 20 kpc
- >= 60 kpc
- >= 80 kpc

UHECR arrival and anisotropy

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Anisotropy

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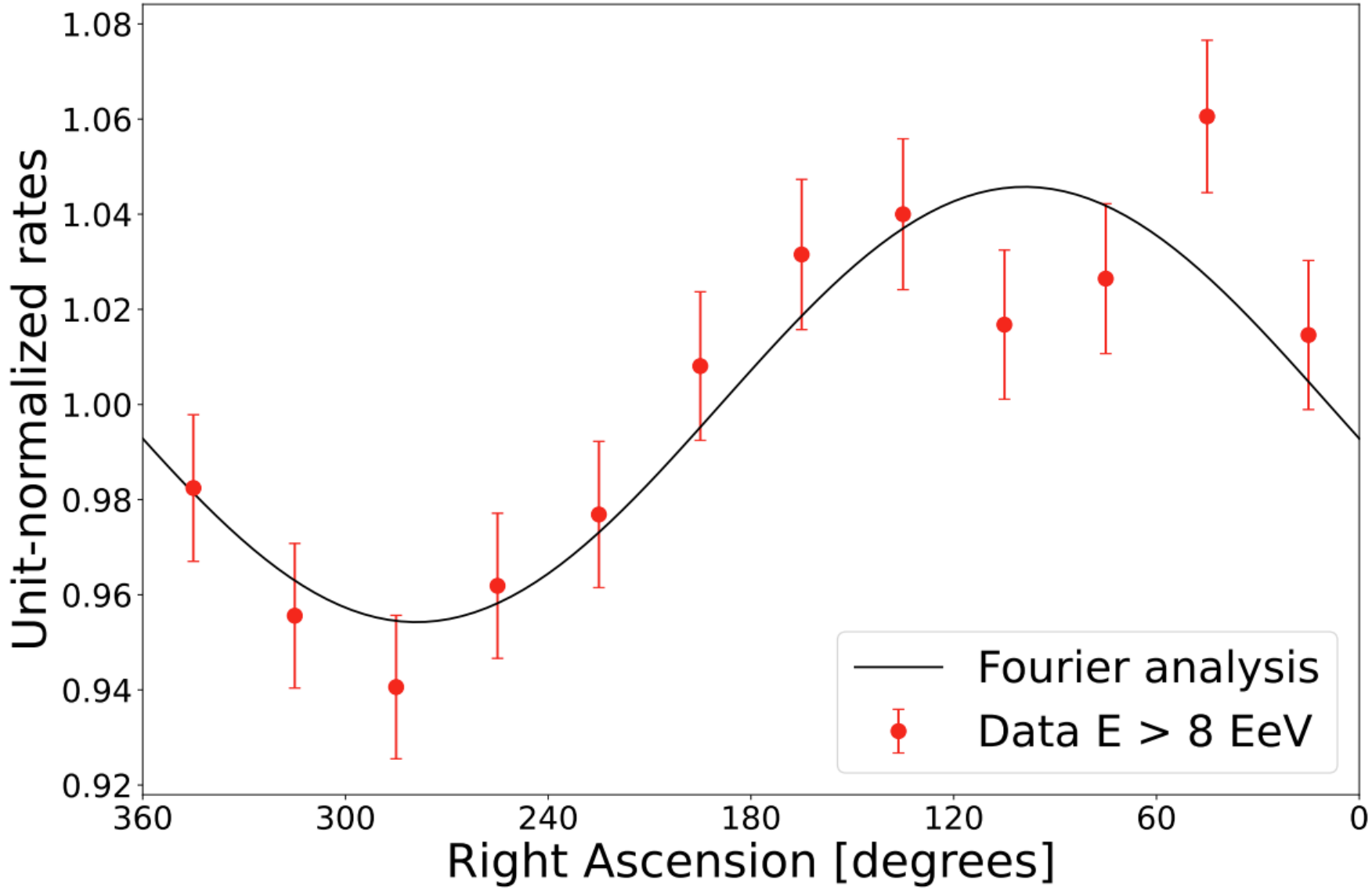
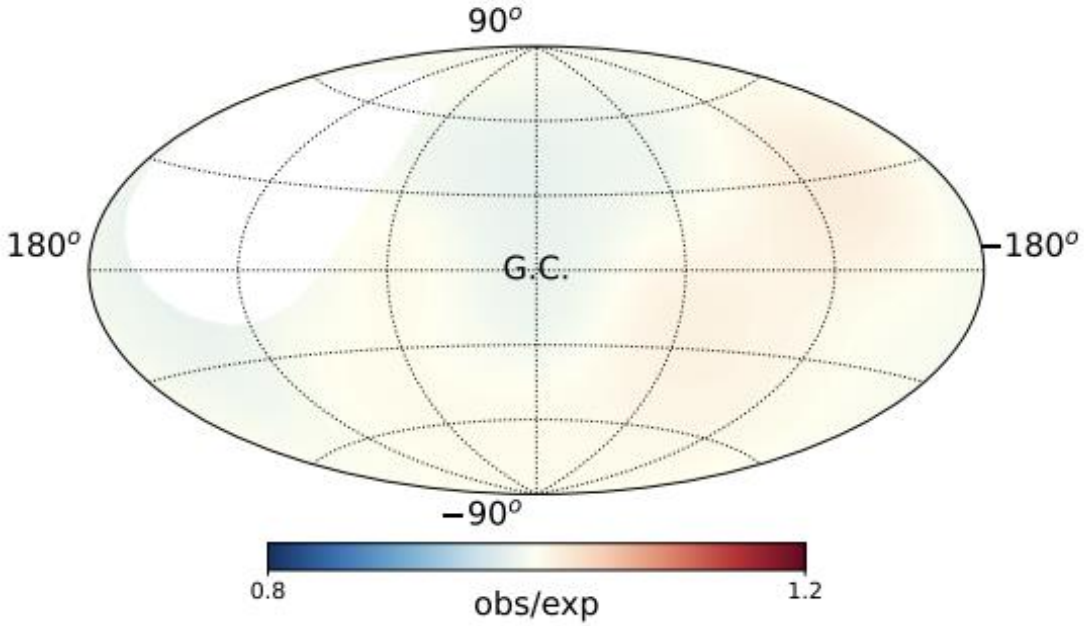
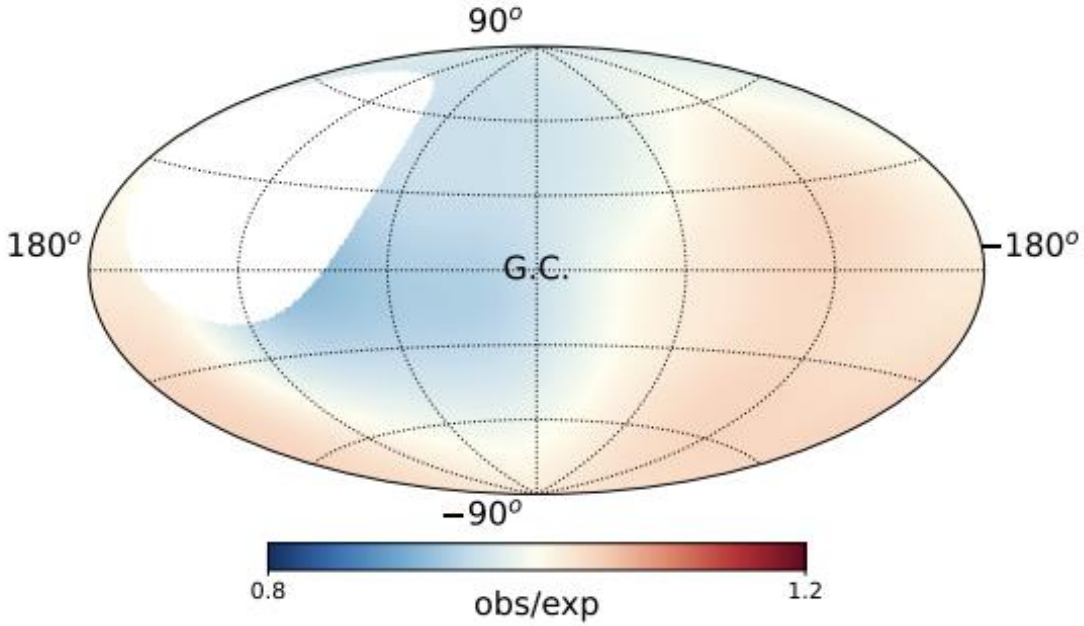


Anisotropy

(4-8) EeV



(8-16) EeV



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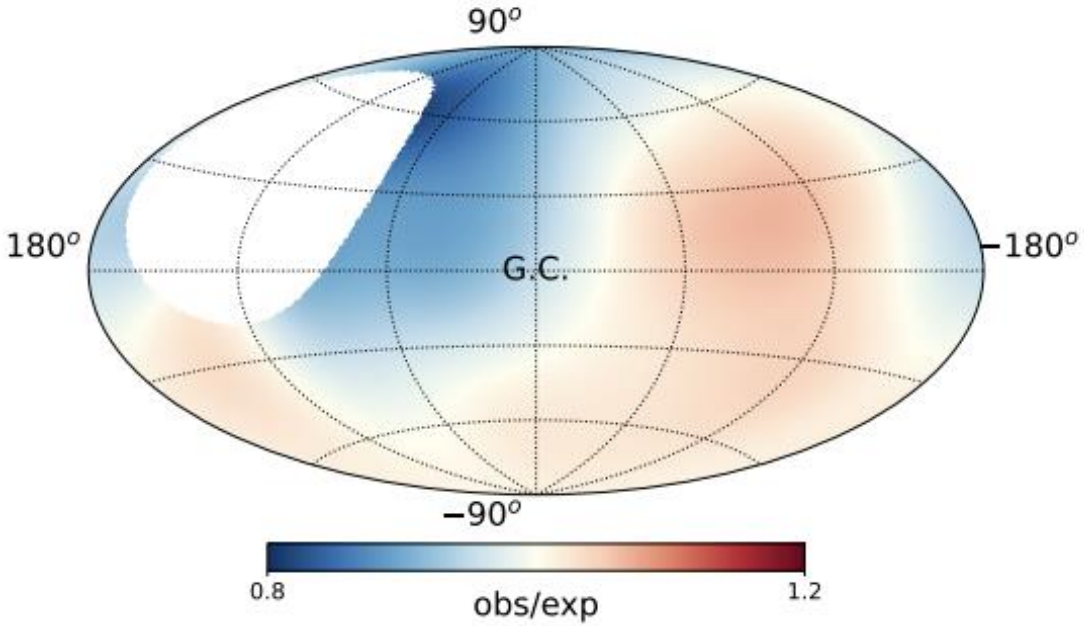
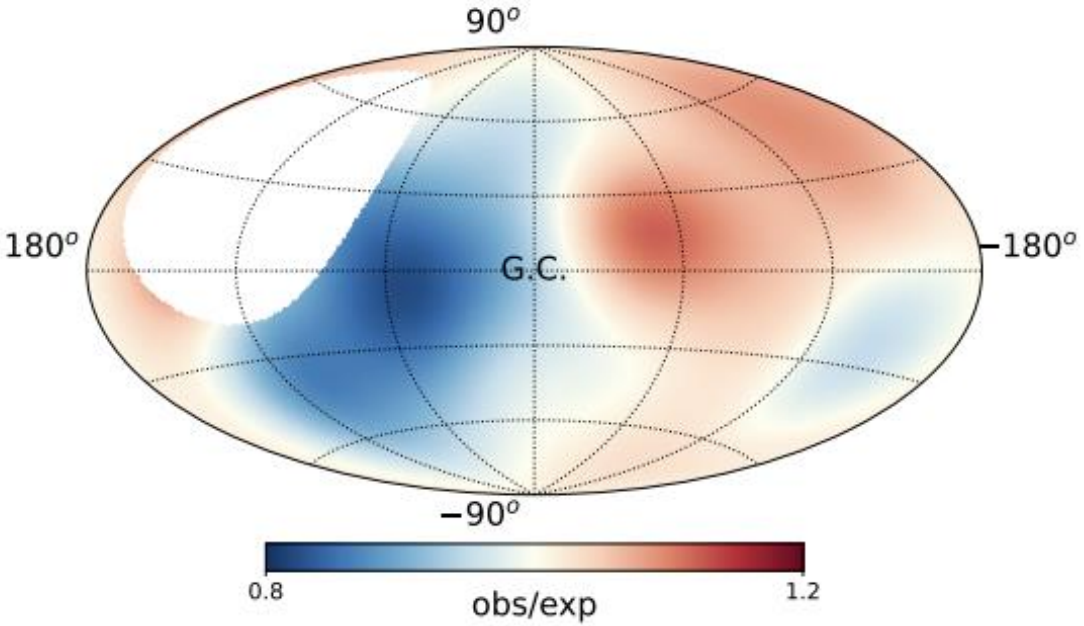
Anisotropy

(16-32) EeV



(>32) EeV



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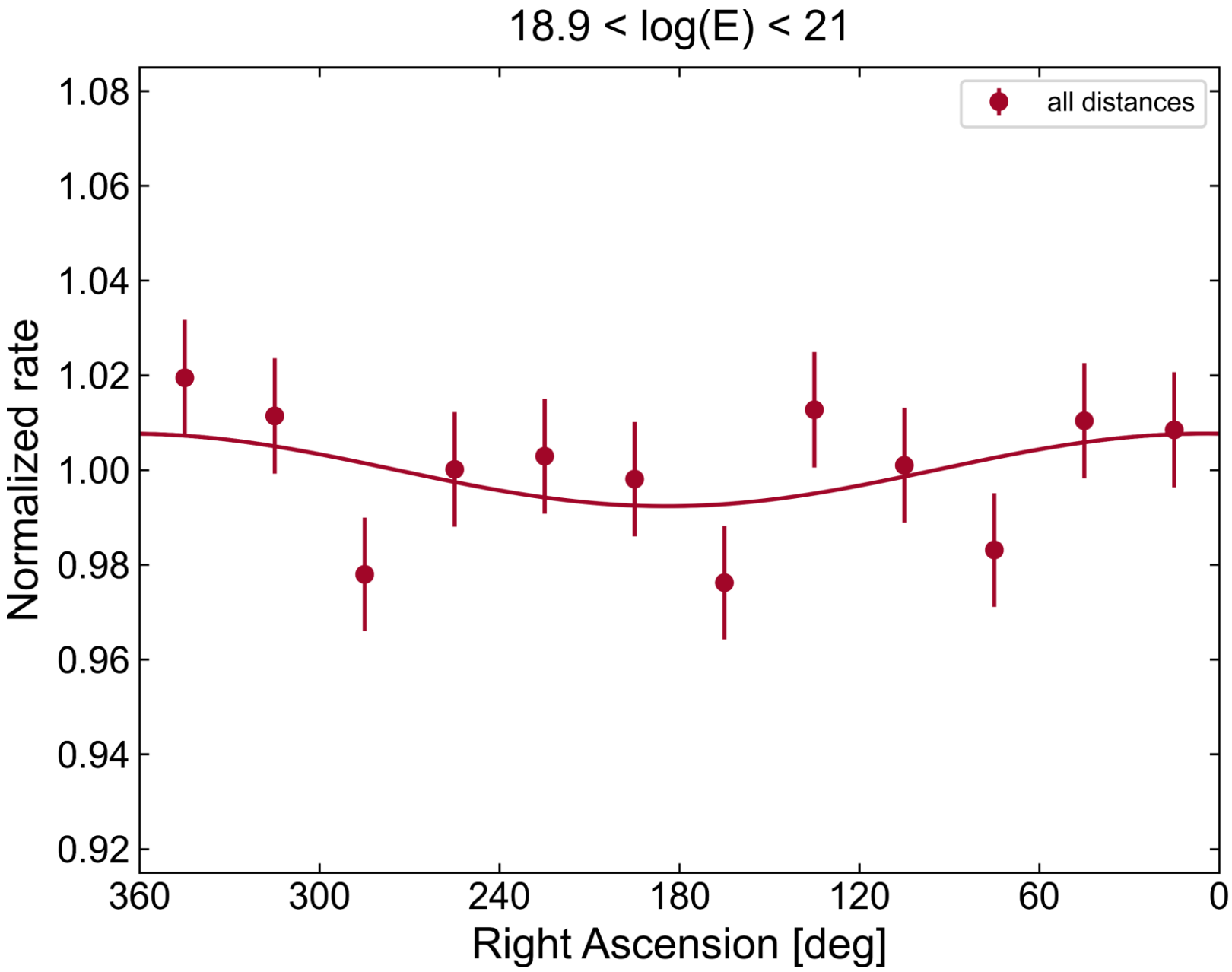
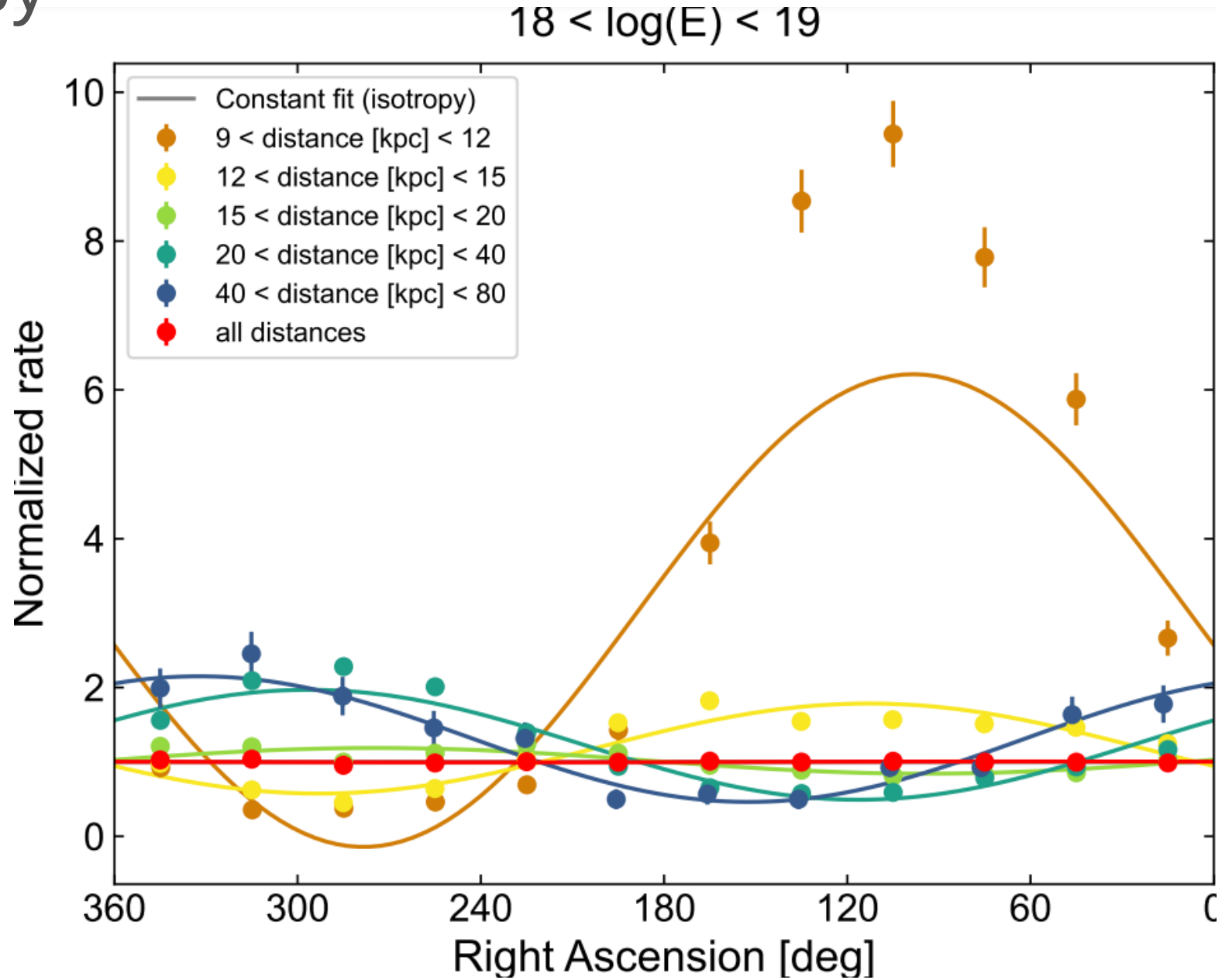
Isotropy


18.9 < log(E) < 21
all distances
Normalized rate
1.08
1.06
1.04
1.02
1.00
0.98
0.96
0.94
0.92
360
300
240
180
120
60
0
Right Ascension [deg]

Anisotropy



>= 9 kpc

>= 12 kpc

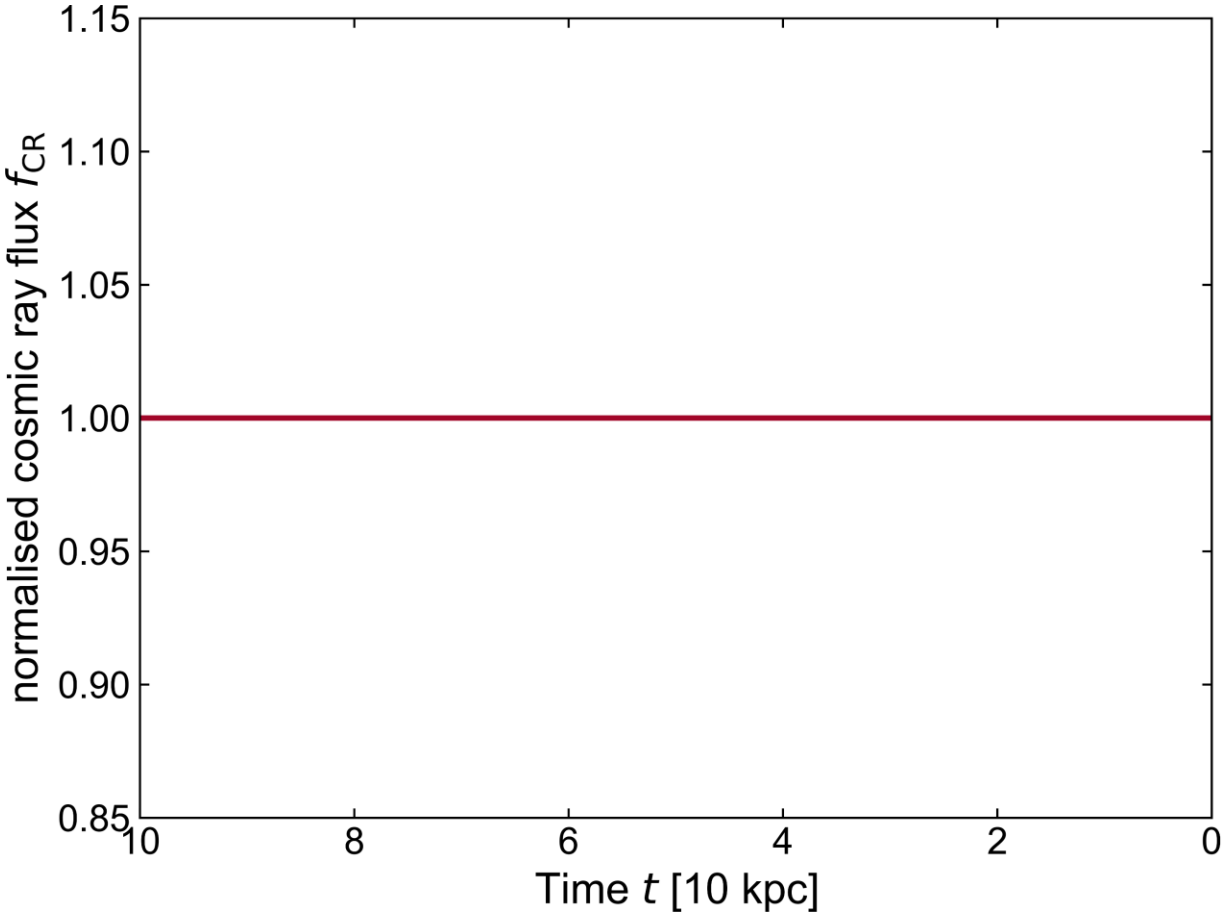
>= 15 kpc

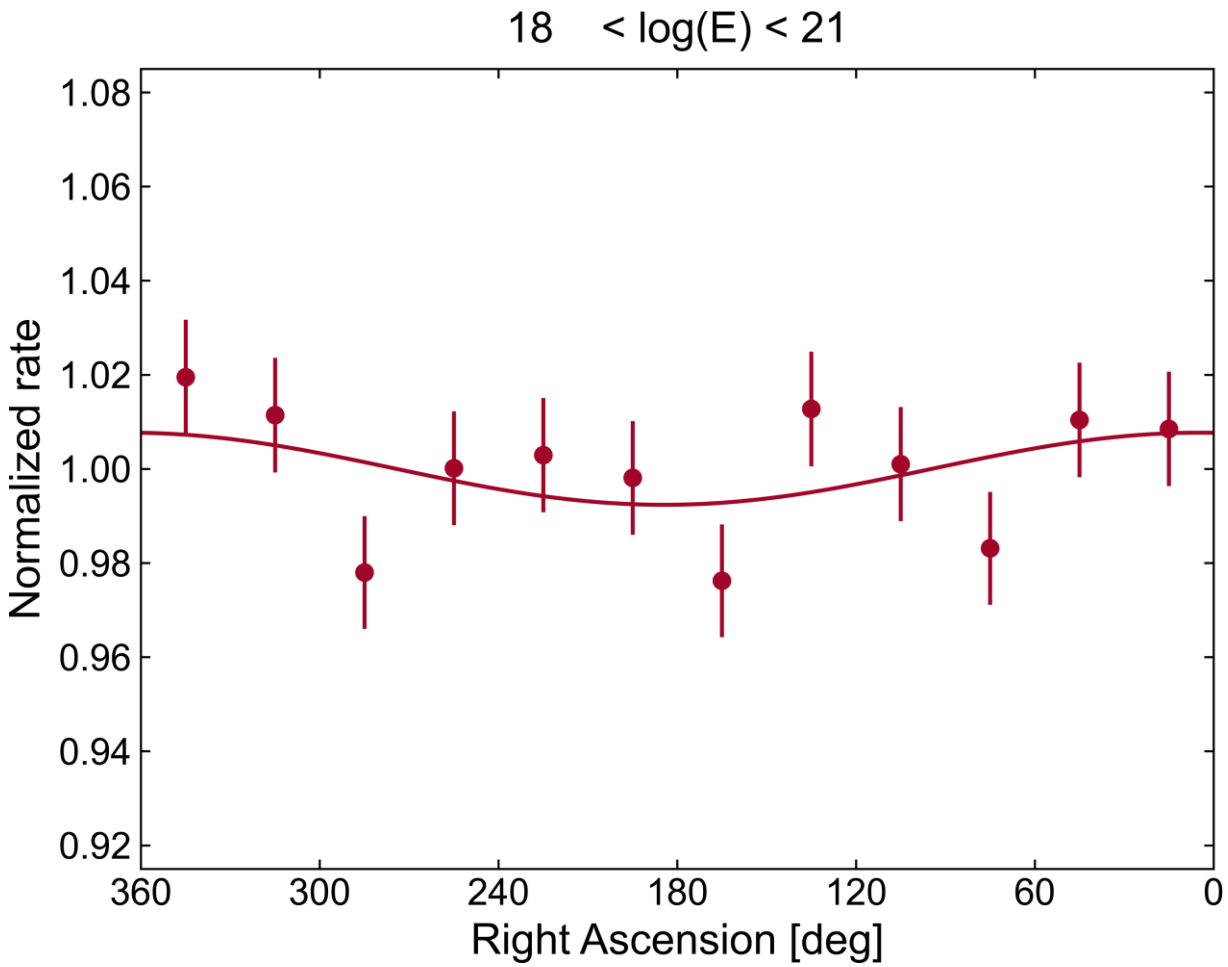
>= 20 kpc

>= 60 kpc

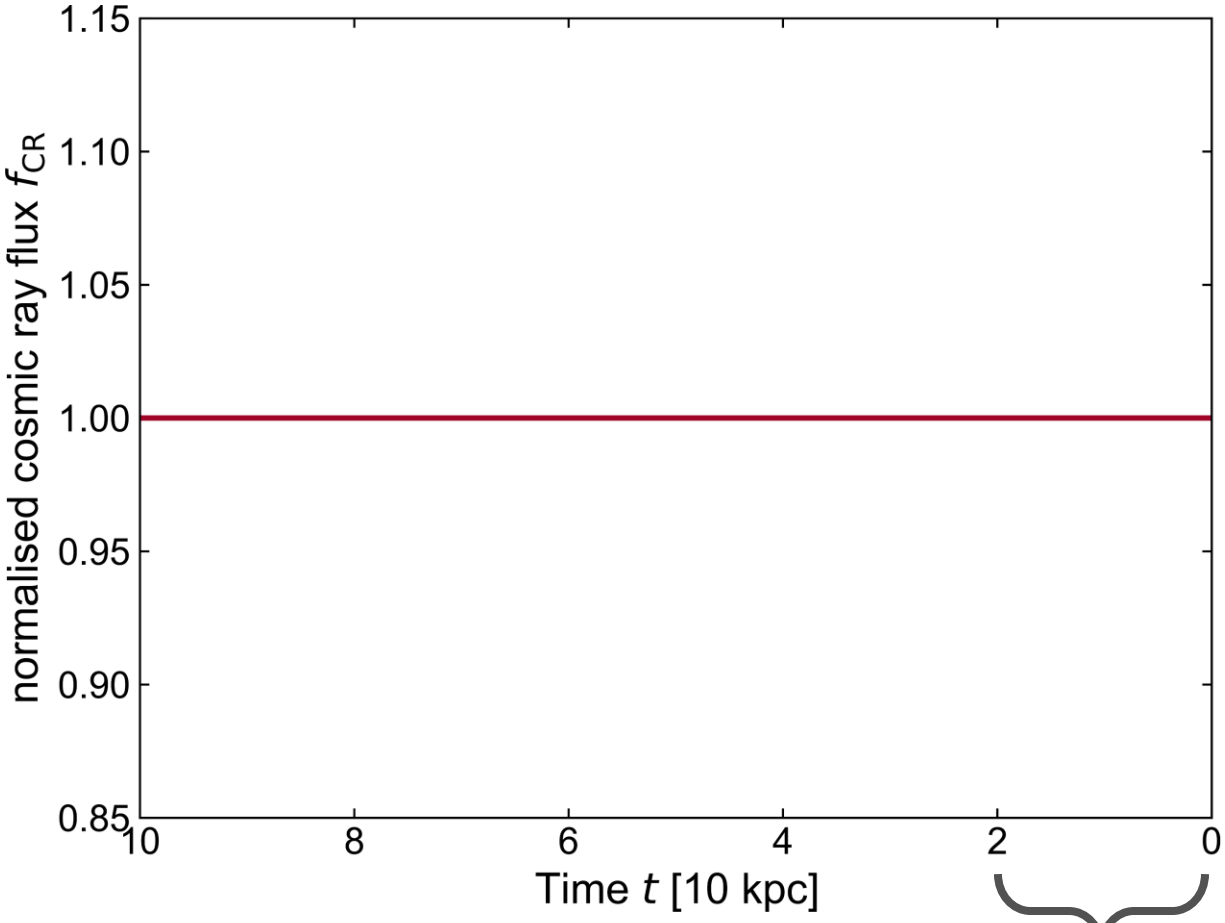
>= 80 kpc

Cosmic Ray Flux modulation

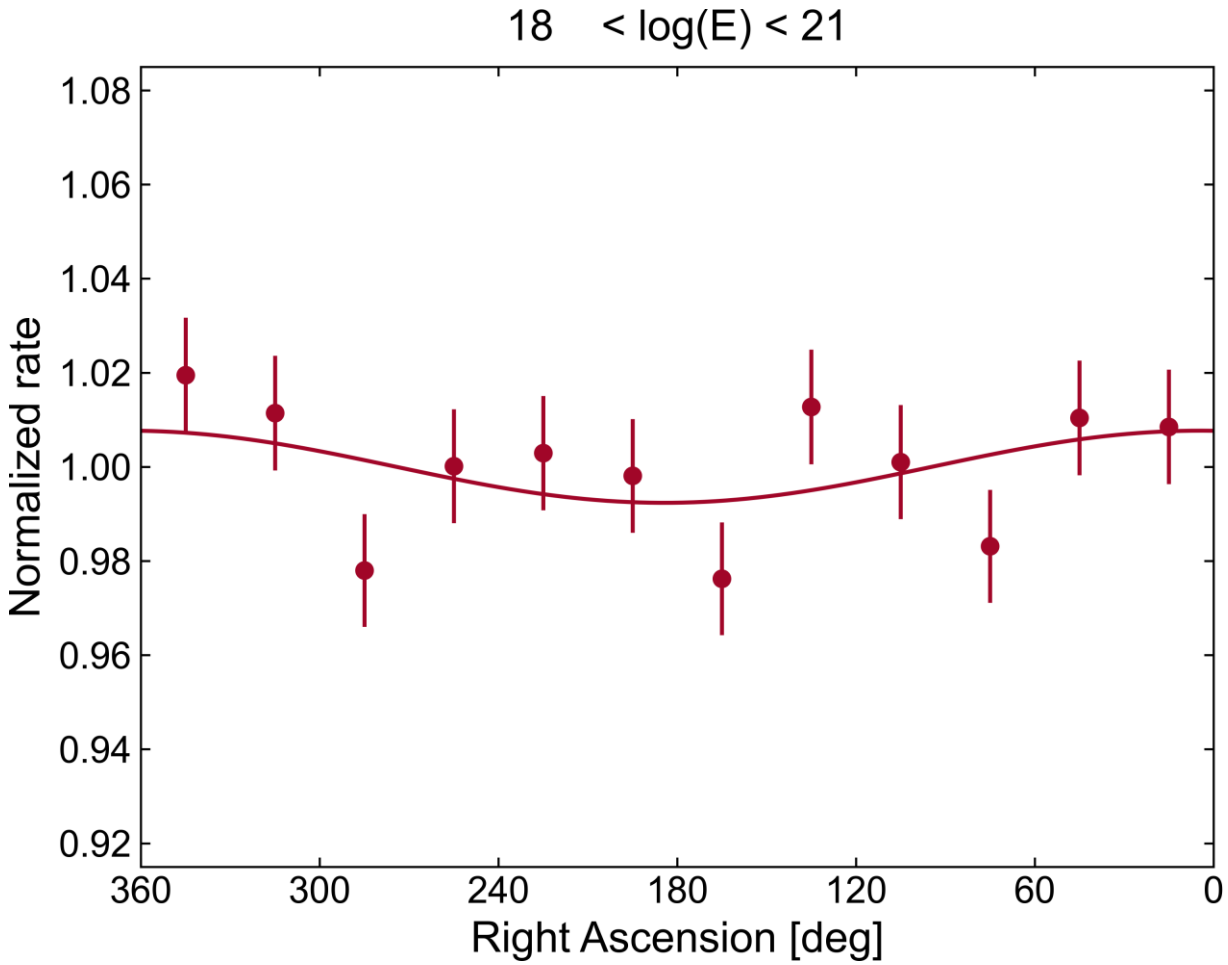




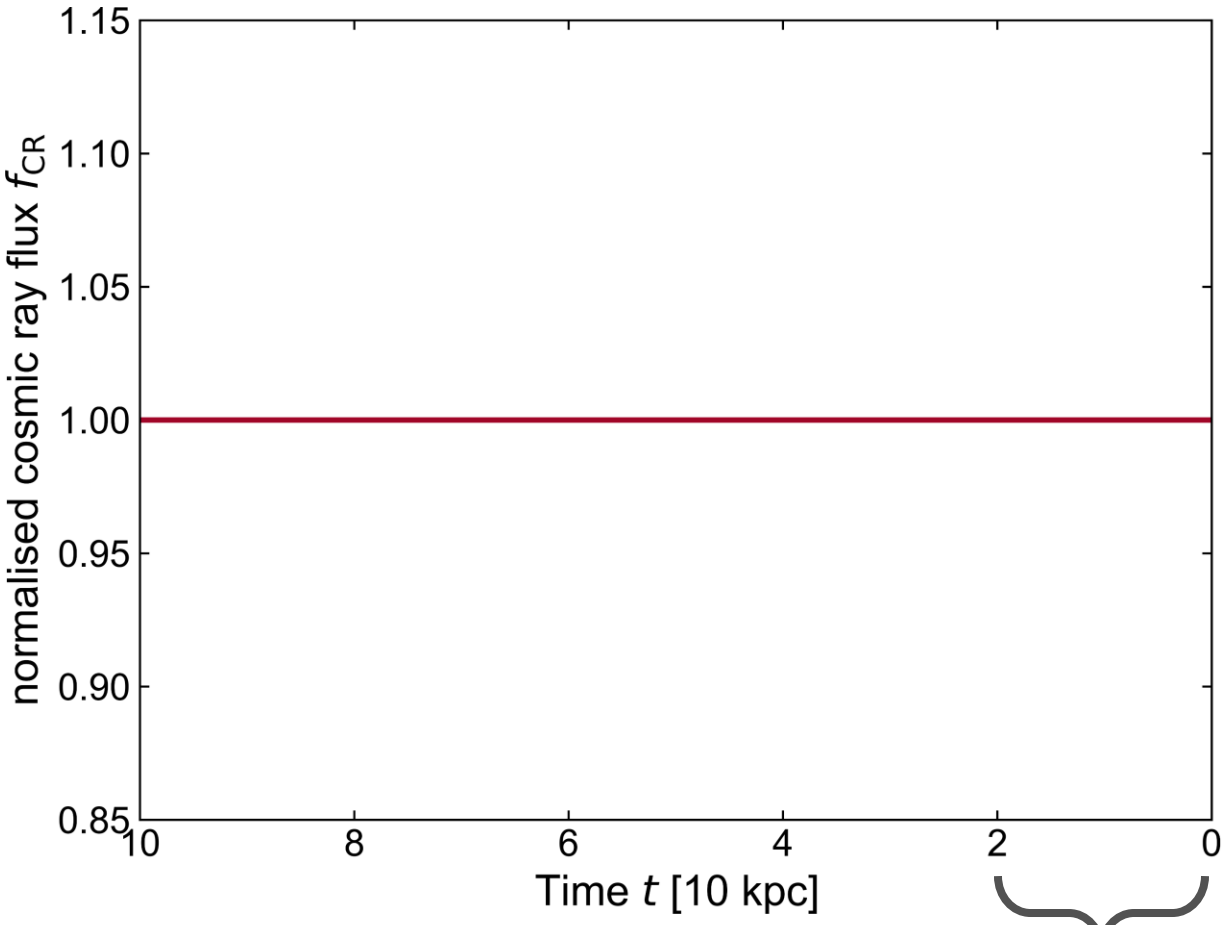
Cosmic Ray Flux modulation



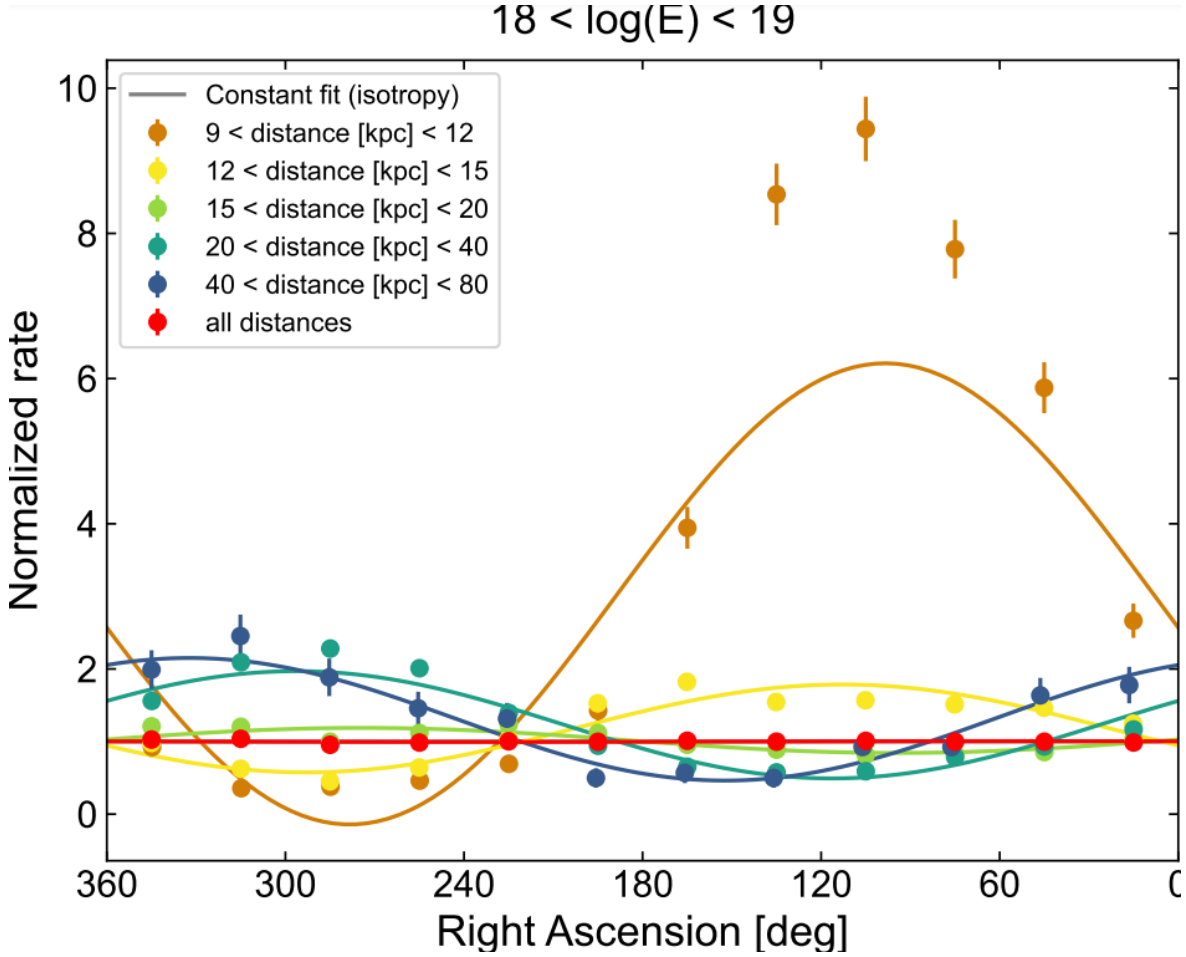
65 kiloyears



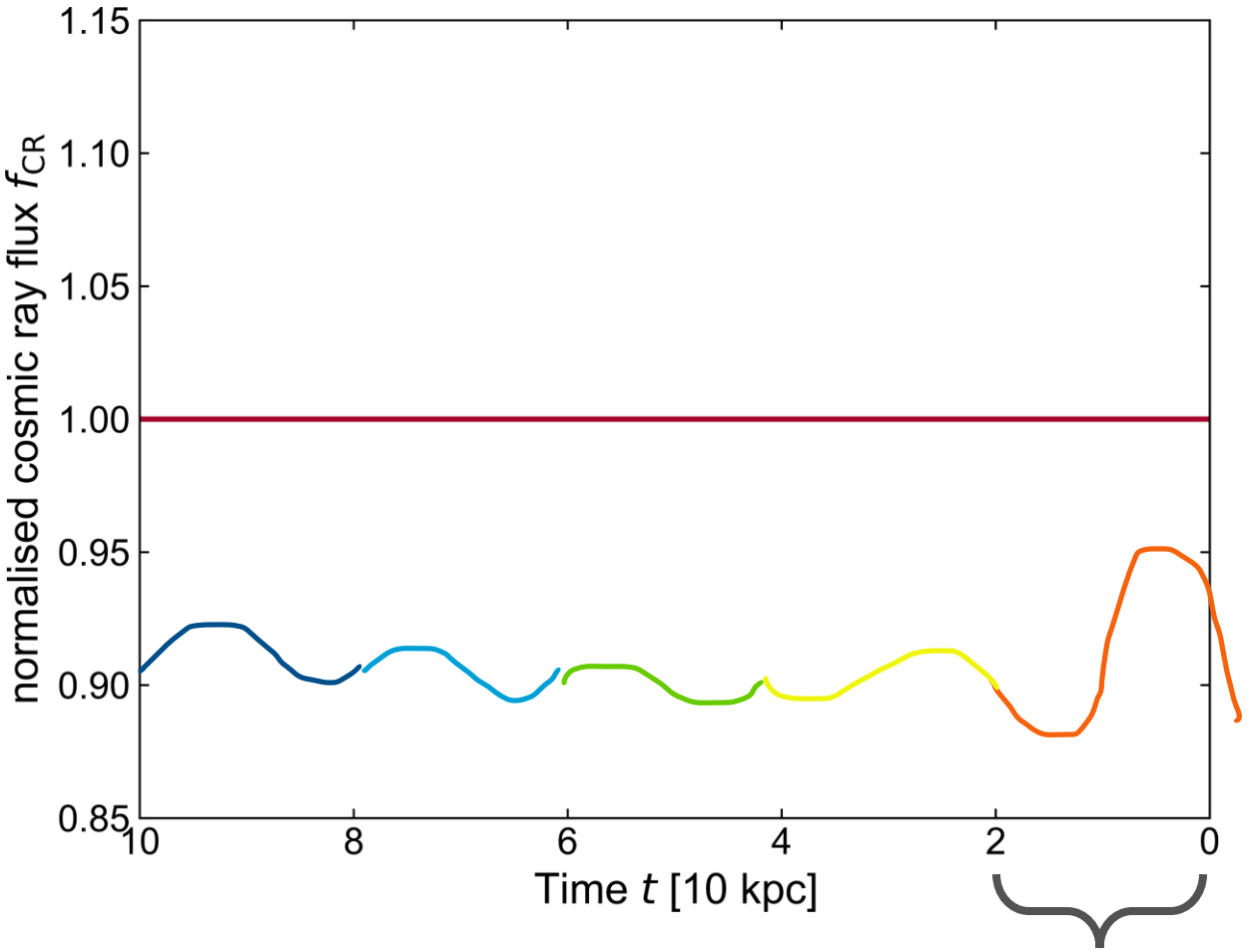
Cosmic Ray Flux modulation



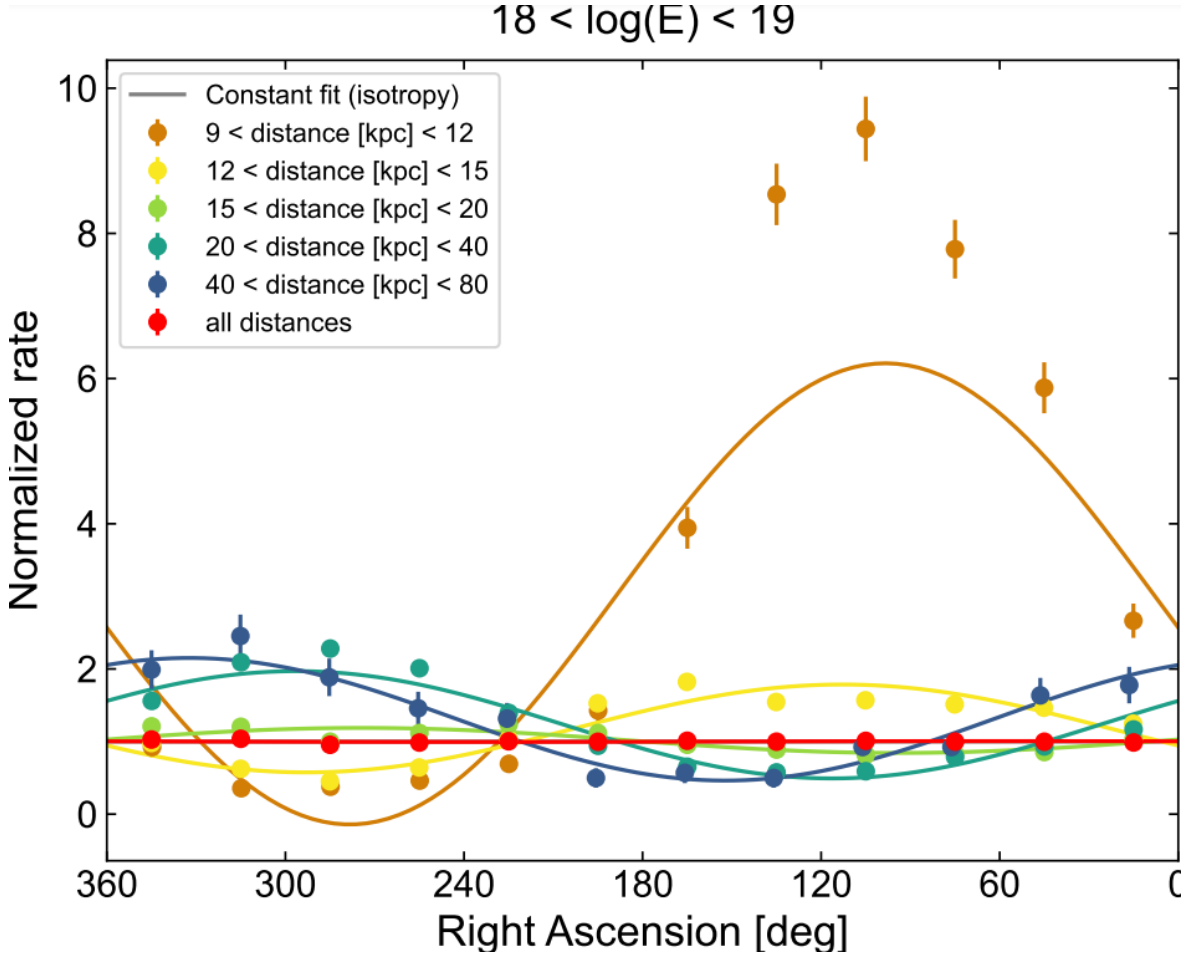
65 kiloyears



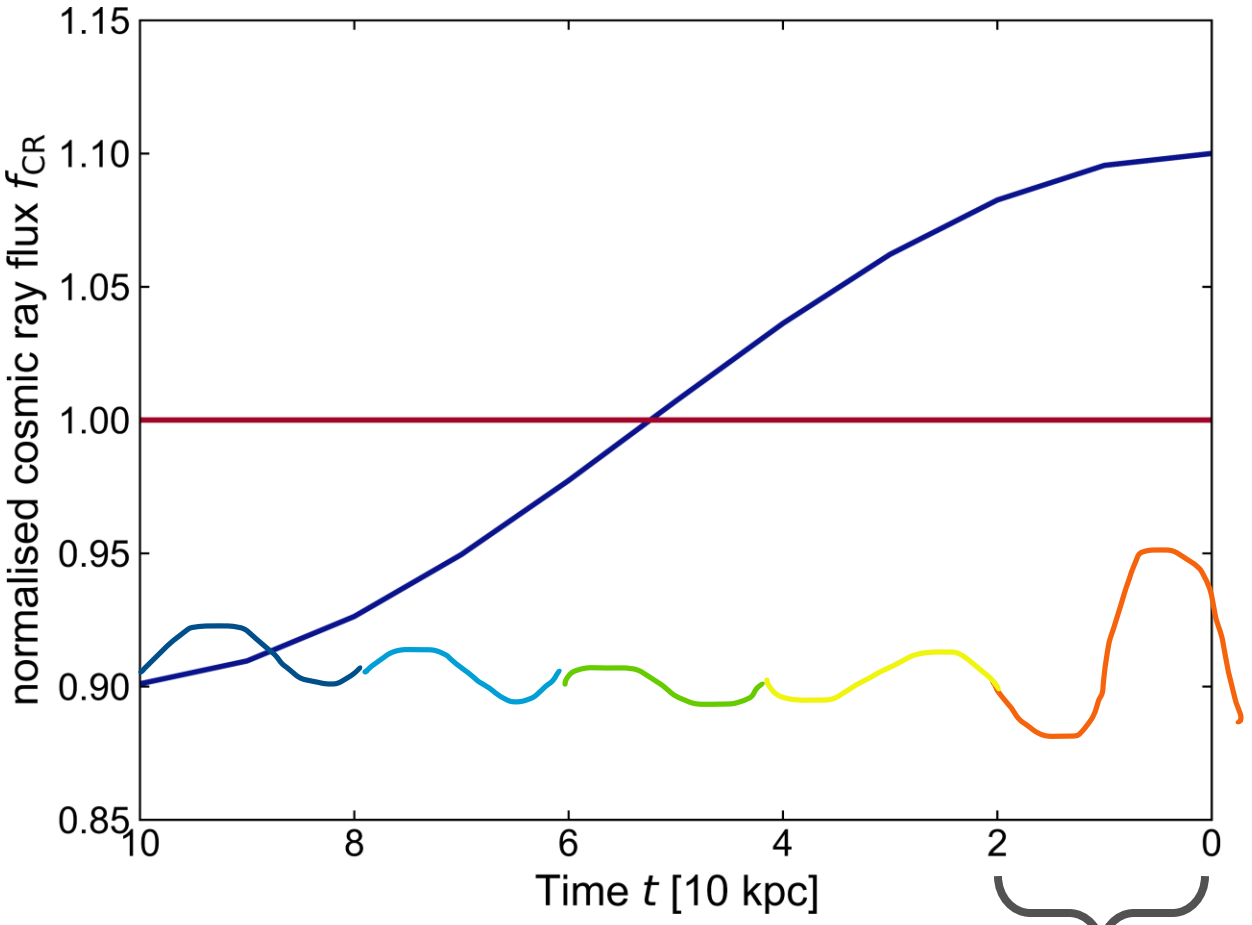
Cosmic Ray Flux modulation



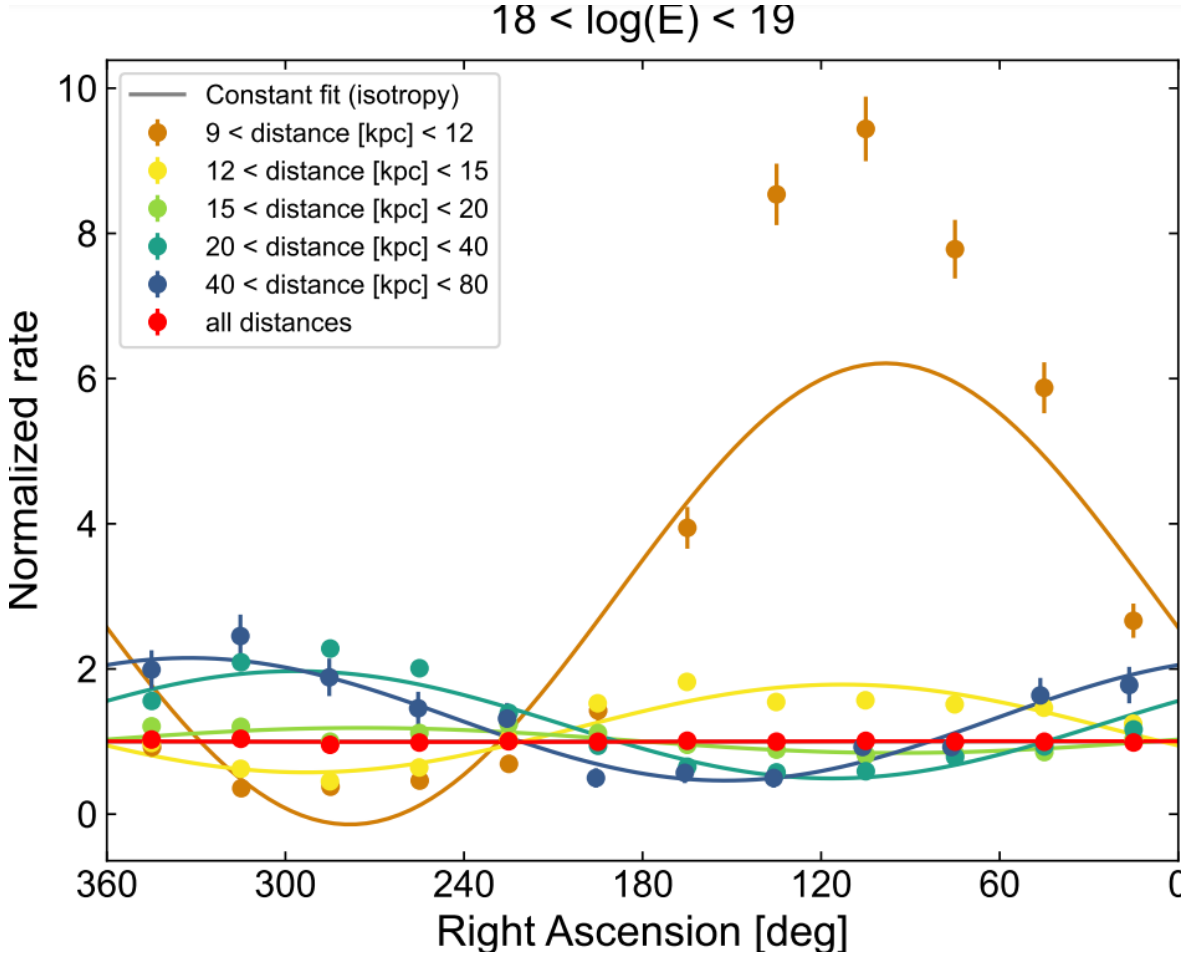
65 kiloyears



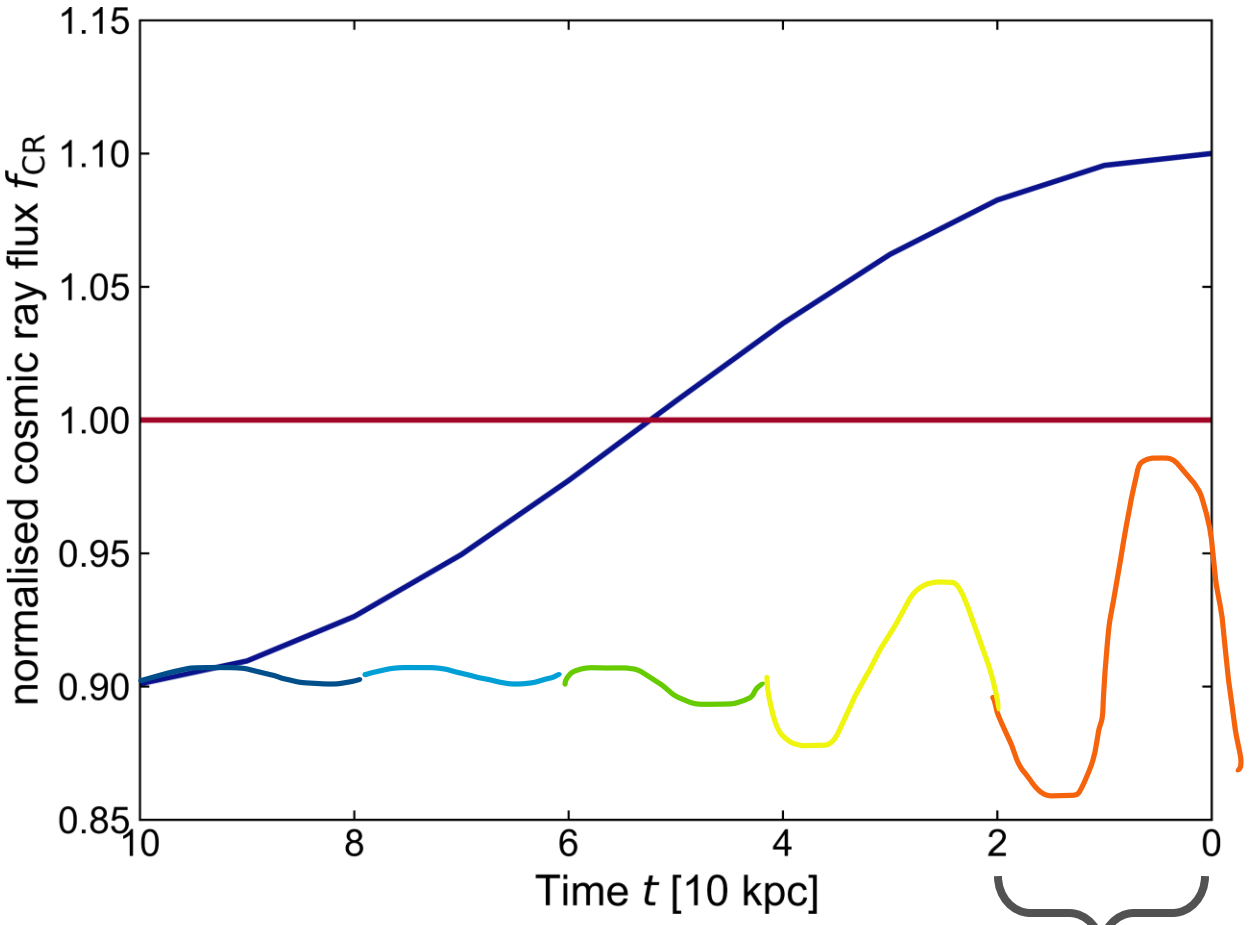
Cosmic Ray Flux modulation



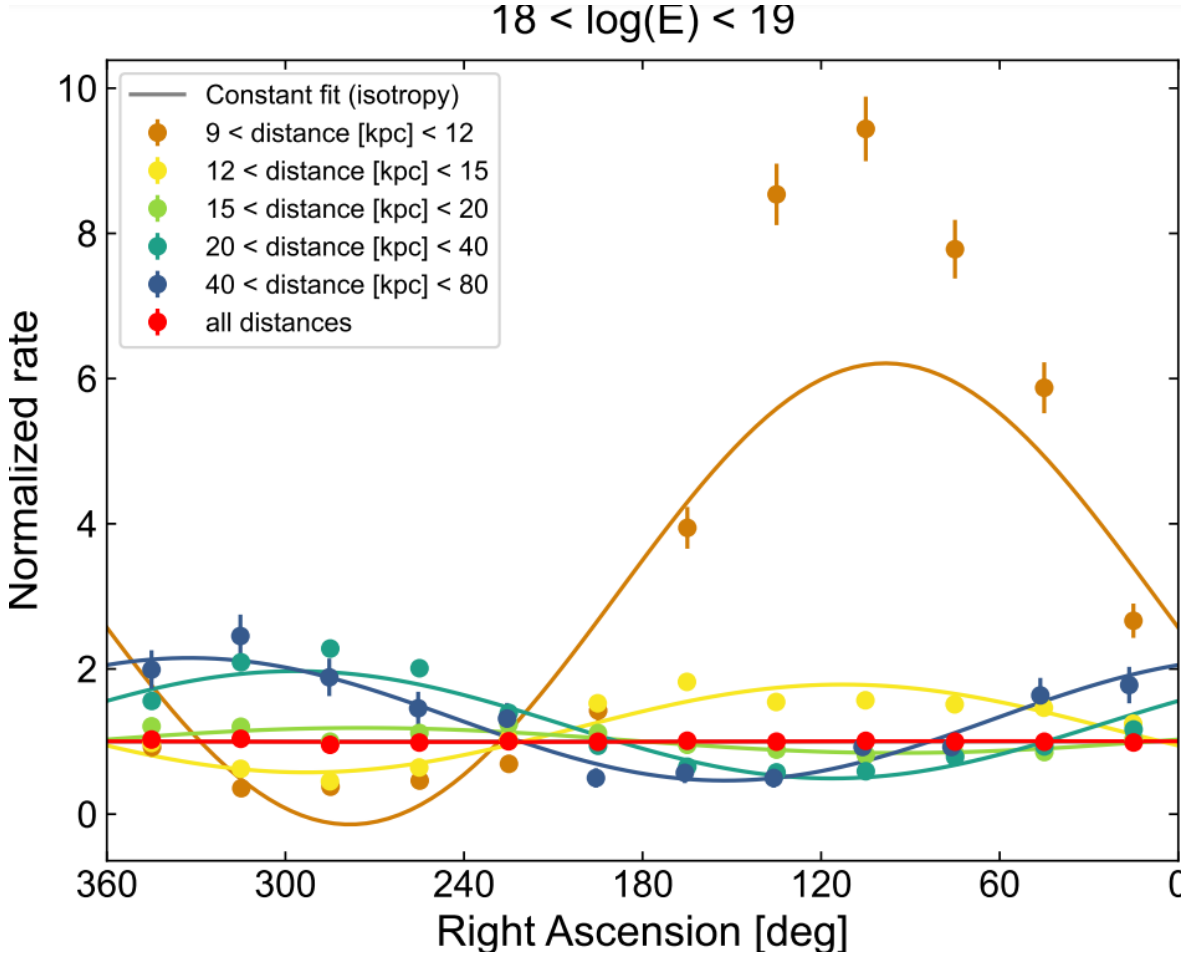
65 kiloyears



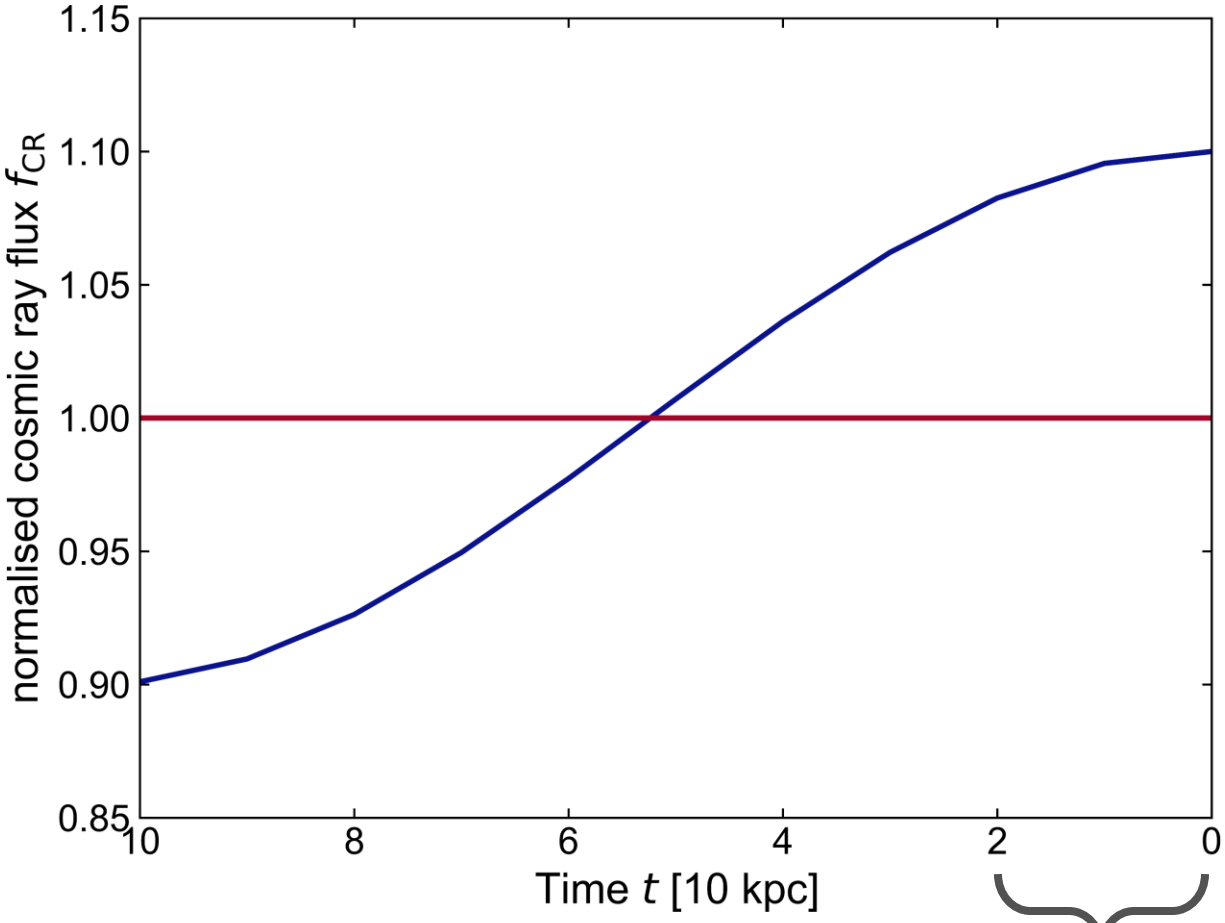
Cosmic Ray Flux modulation



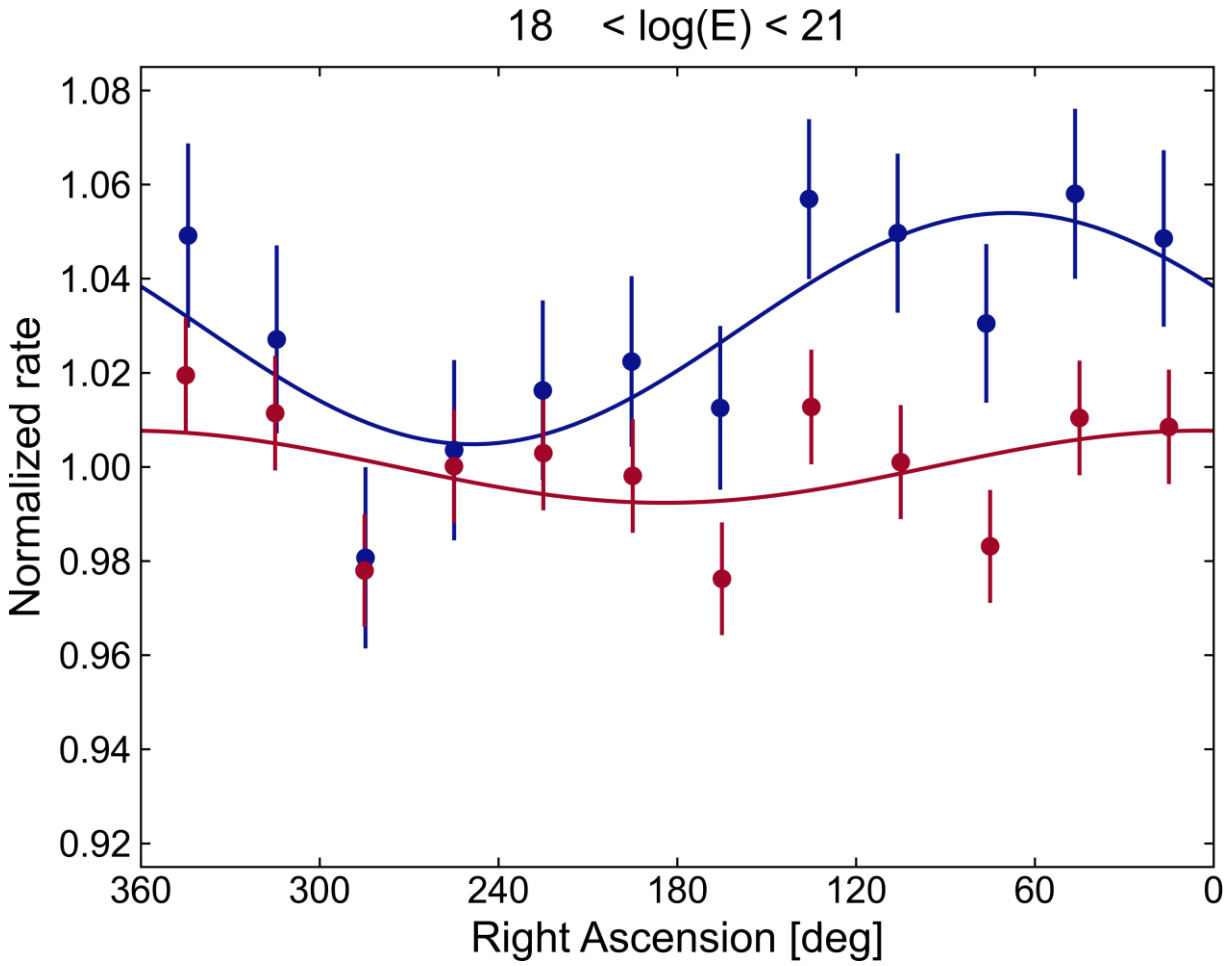
65 kiloyears



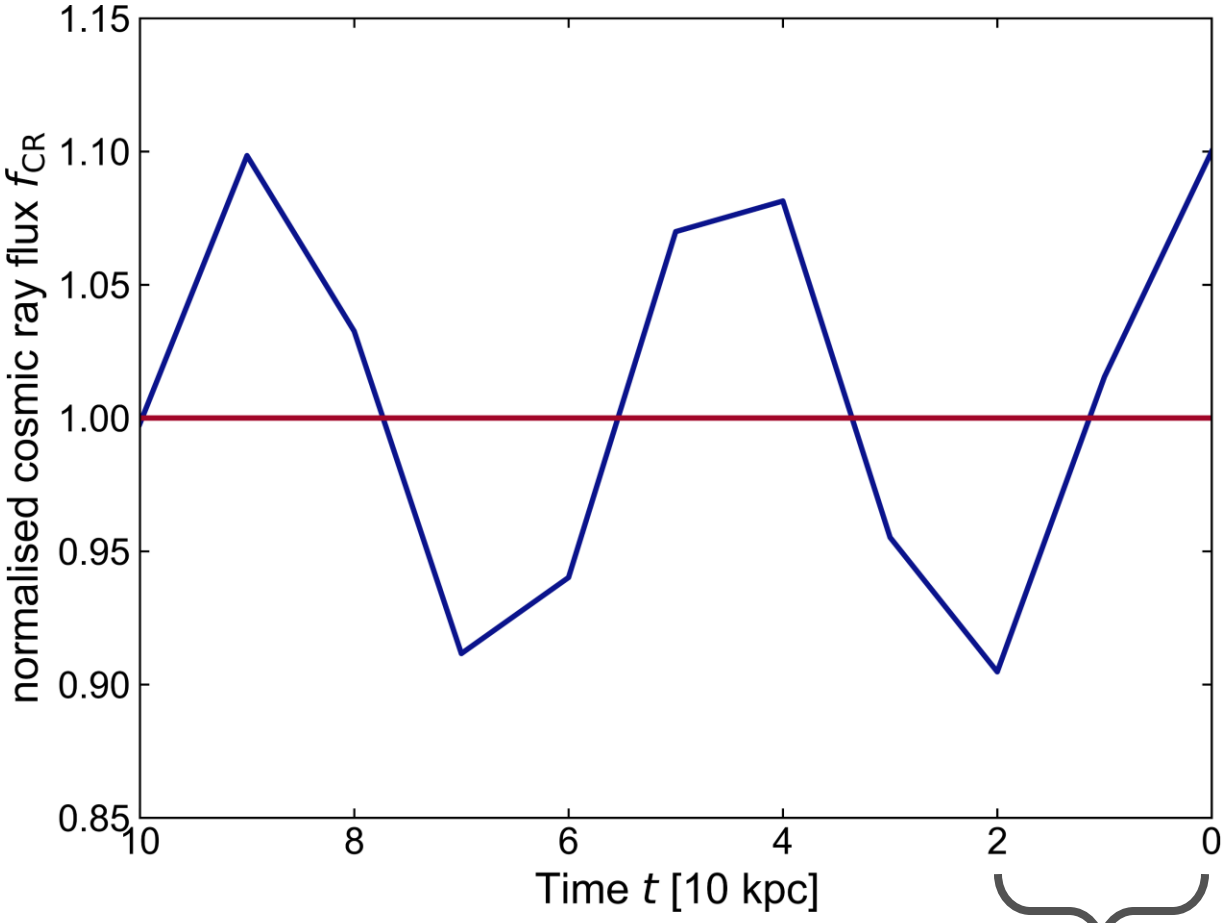
Cosmic Ray Flux modulation



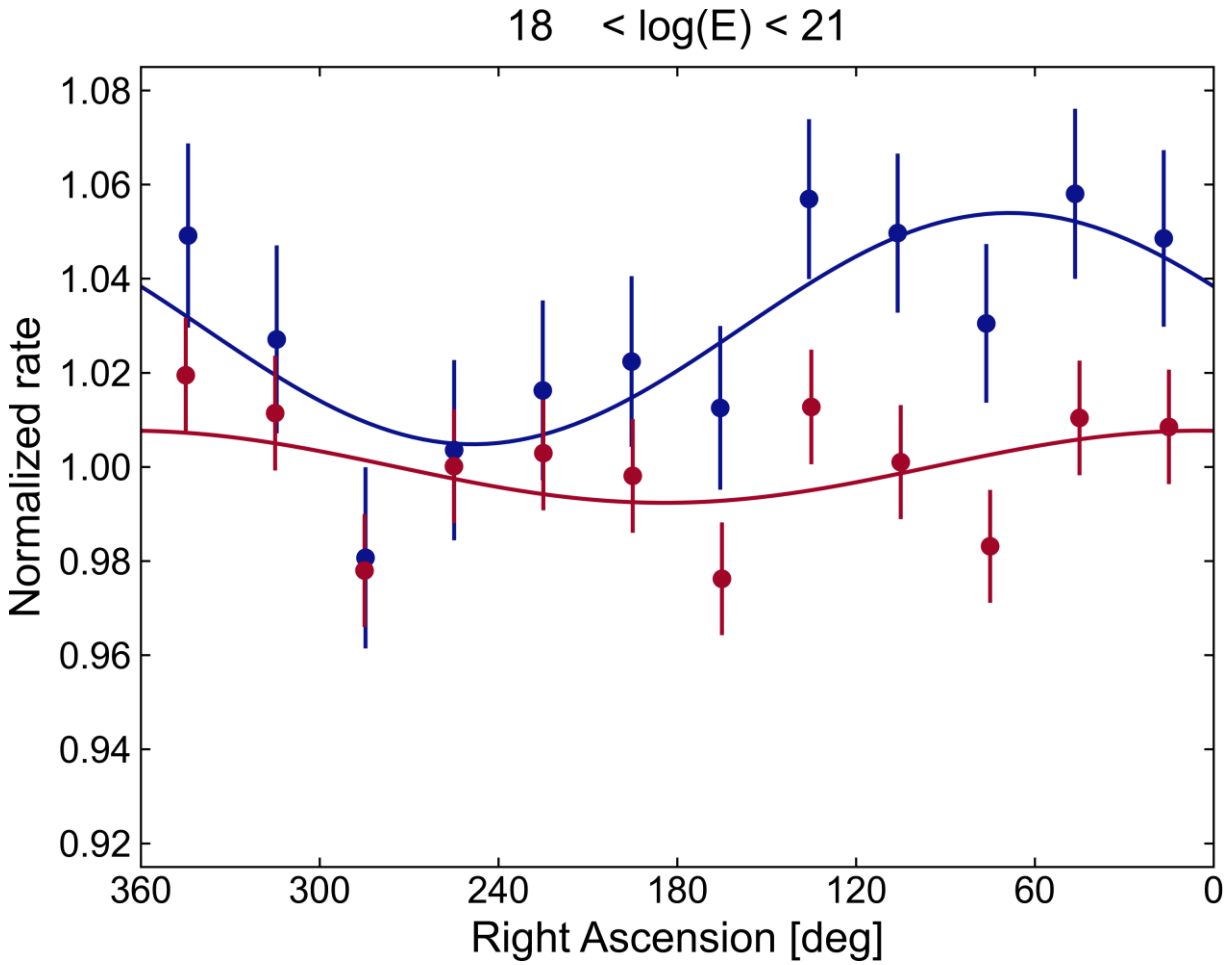
65 kiloyears



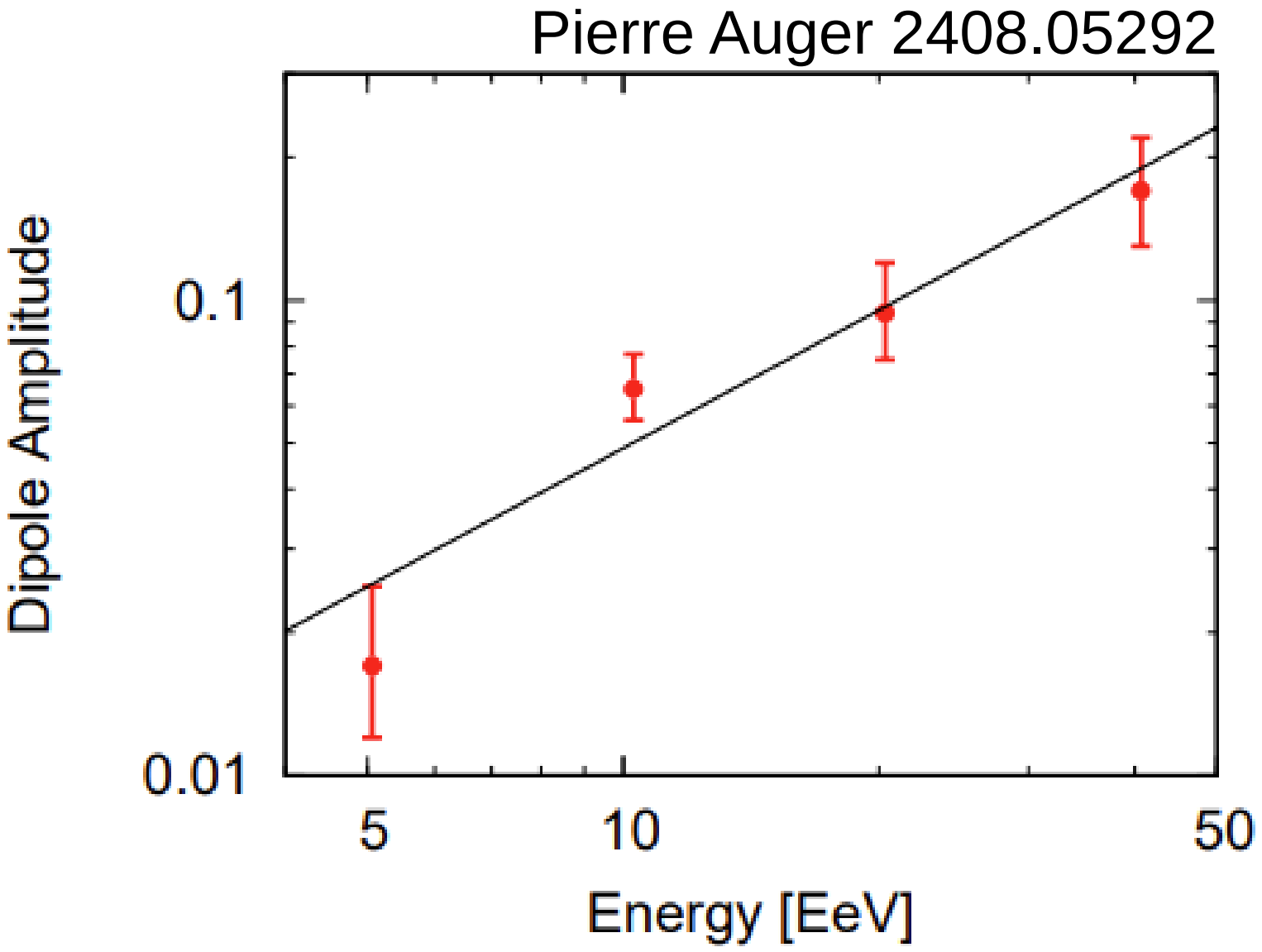
Cosmic Ray Flux modulation



65 kiloyears



Anisotropy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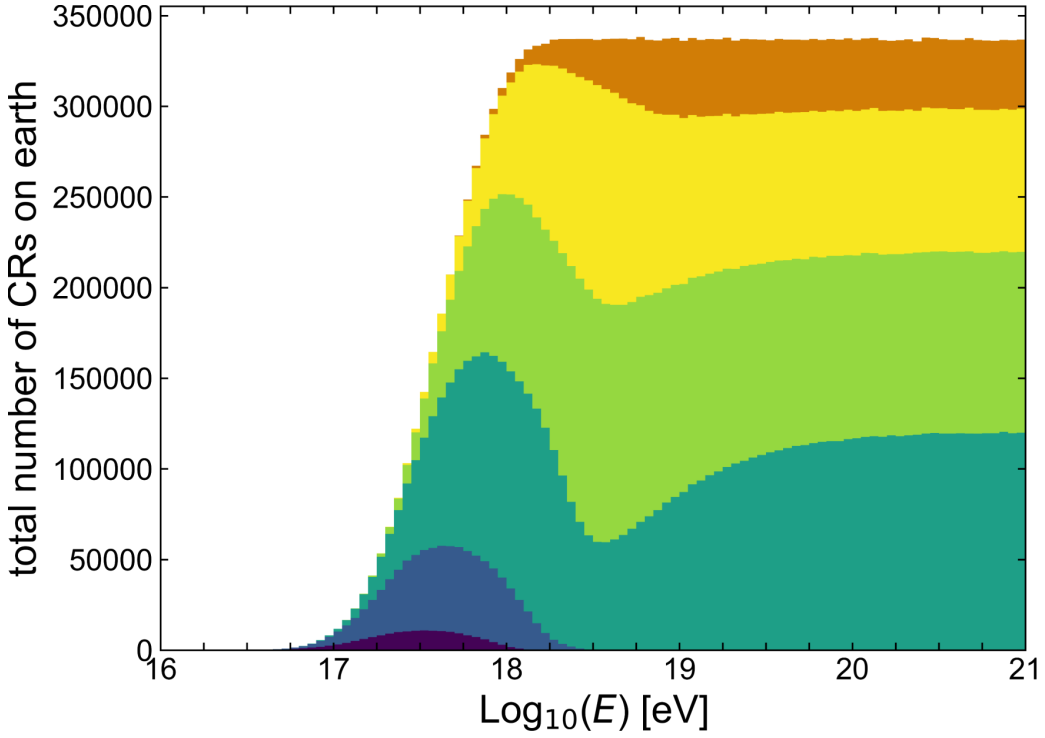
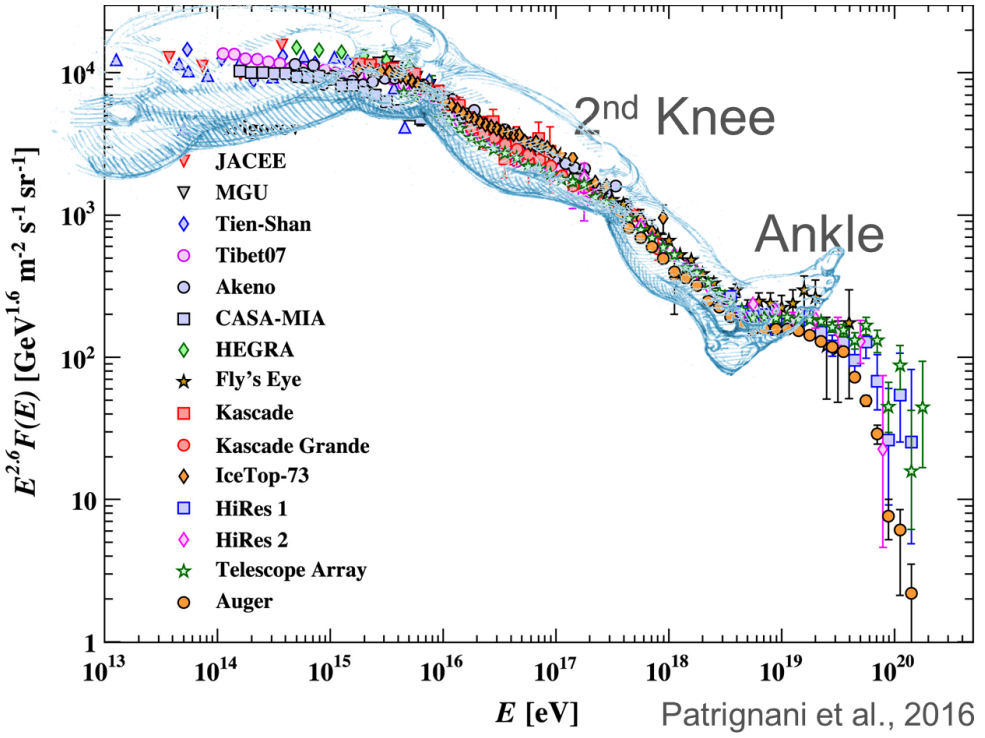
Dipole Amplitude
0.1
0.01
5
10
50
Energy [EeV]

Summary

Galactic magnetic fields → ankle features

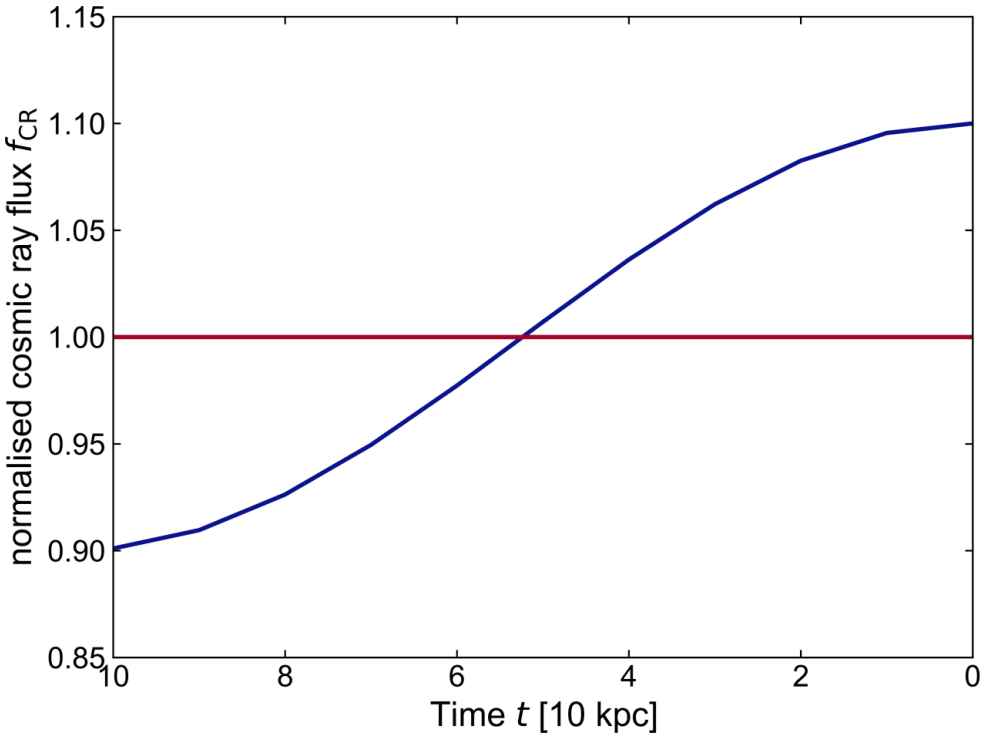


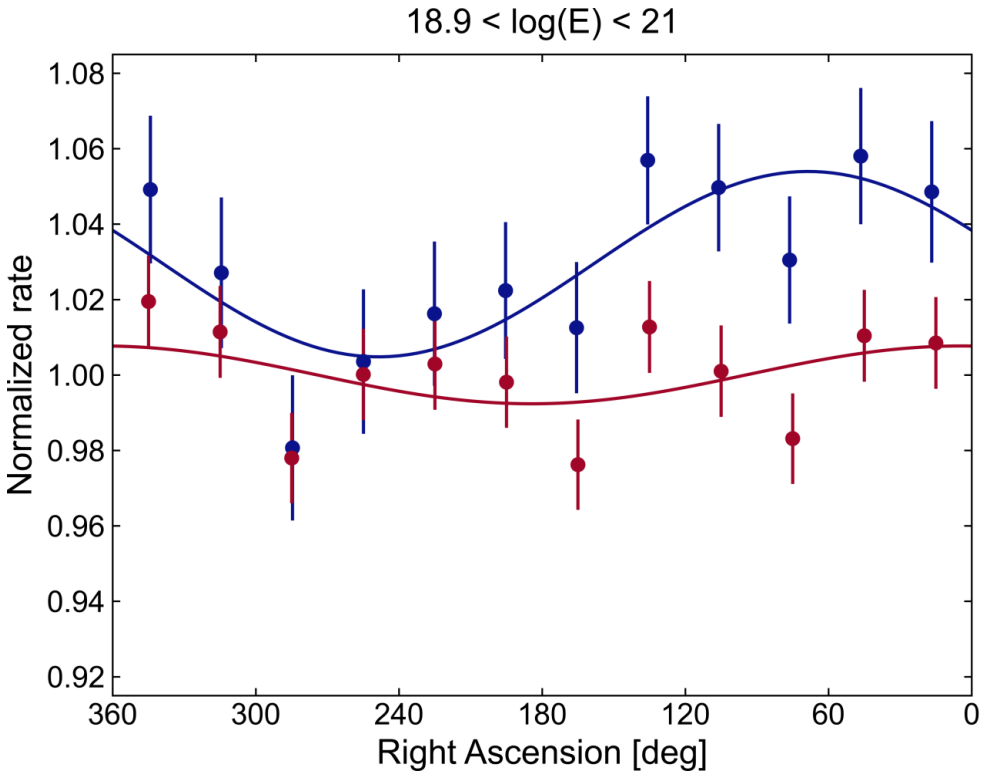


Patrignani et al., 2016

Summary

Injected cosmic ray flux → observed anisotropy





Thank you!

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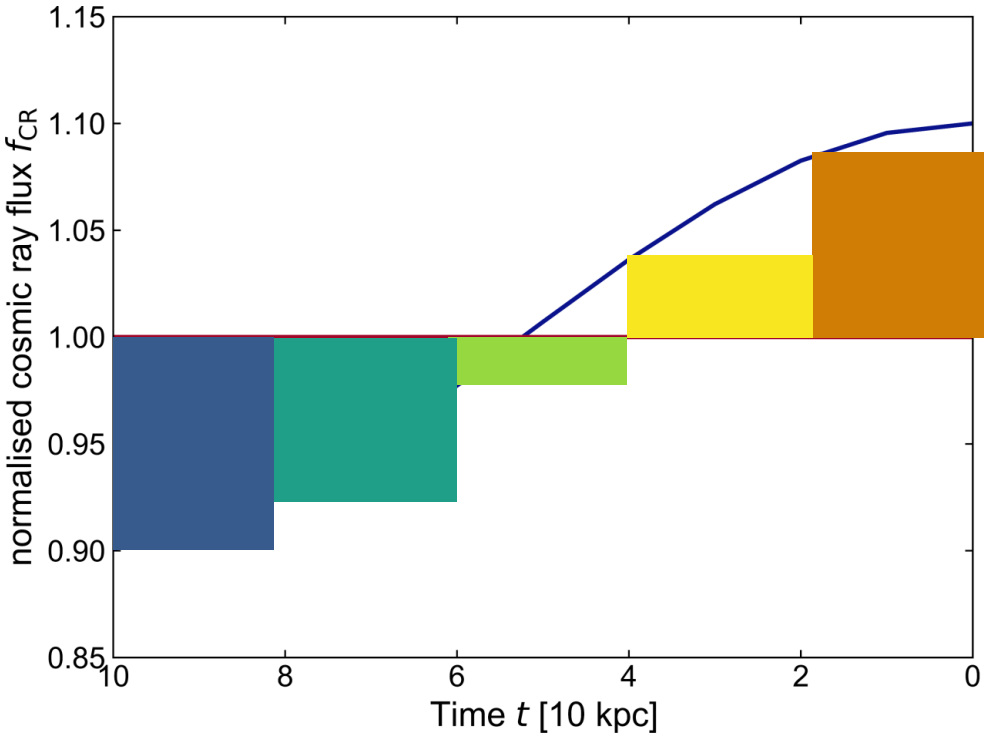
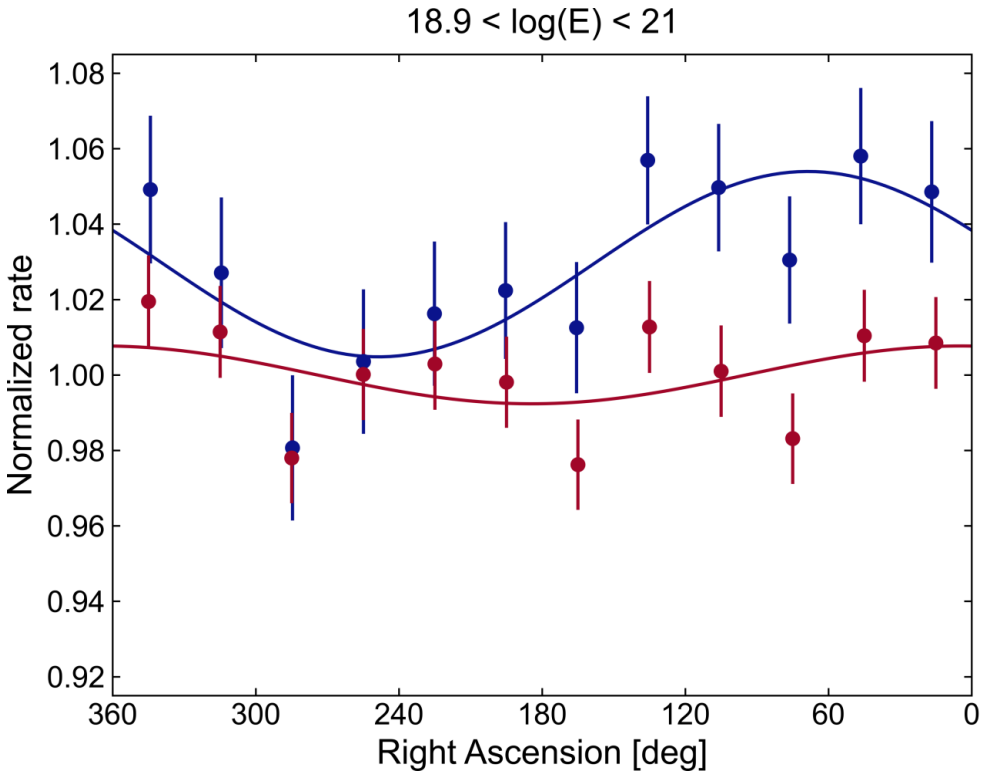
PIERRE AUGER OBSERVATORY

Summary

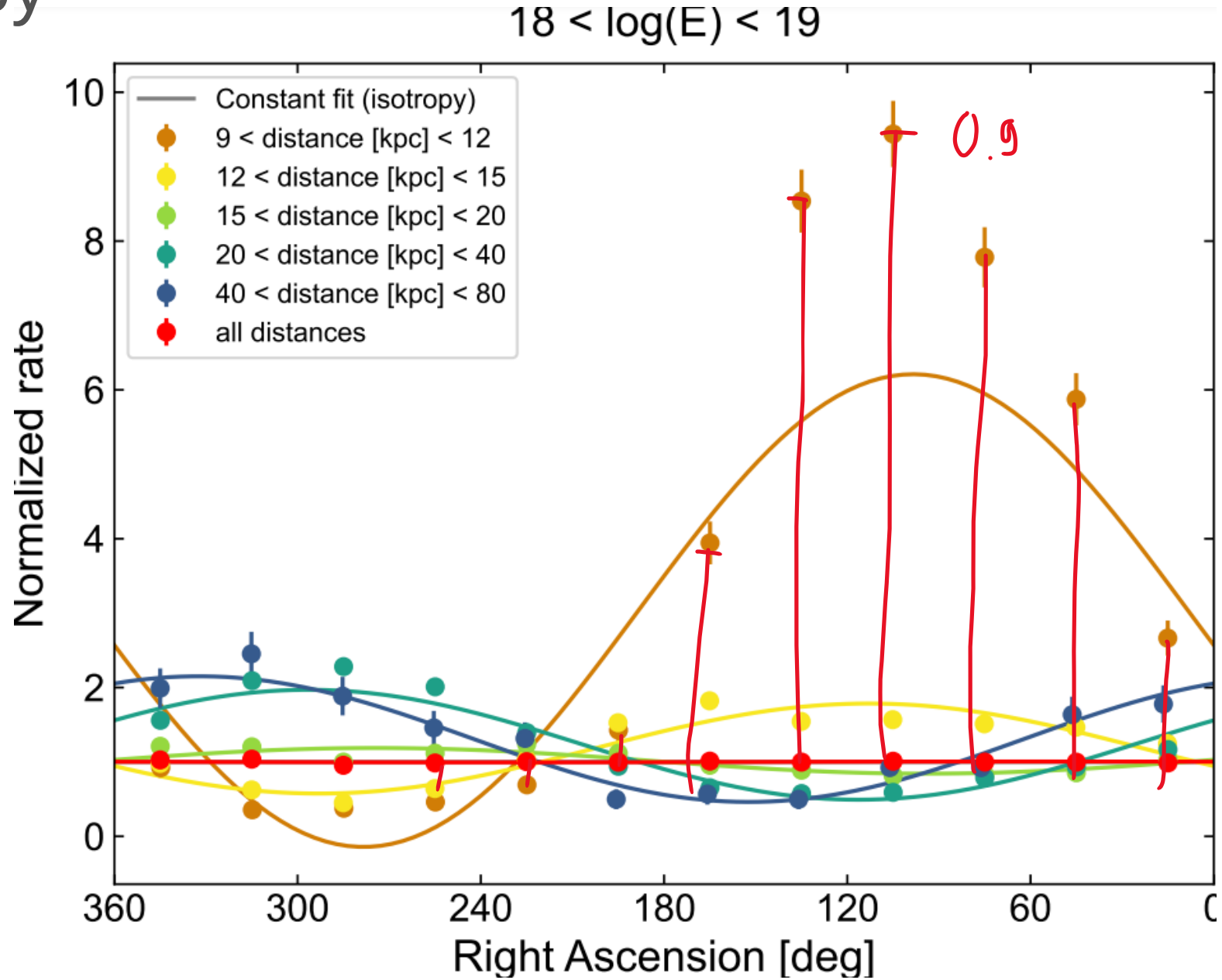
Injected cosmic ray flux → observed anisotropy





>= 15 kpc

Anisotropy


18 < log(E) < 19
Constant fit (isotropy)
9 < distance [kpc] < 12
12 < distance [kpc] < 15
15 < distance [kpc] < 20
20 < distance [kpc] < 40
40 < distance [kpc] < 80
all distances
0.9
Normalized rate
Right Ascension [deg]
0
2
4
6
8
10
360
300
240
180
120
60

Impact of location