Critical aspects of identifying and analyzing optical EVPA rotations

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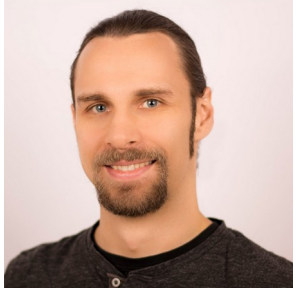
(on behalf of the RoboPol collaboration)



robopol

erc
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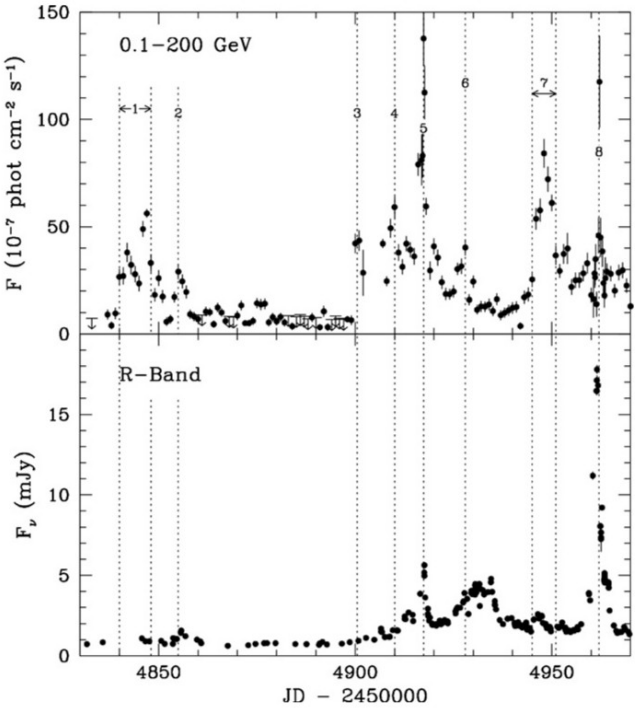
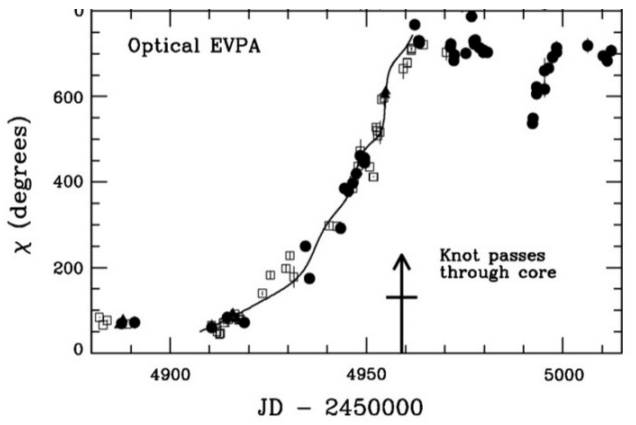




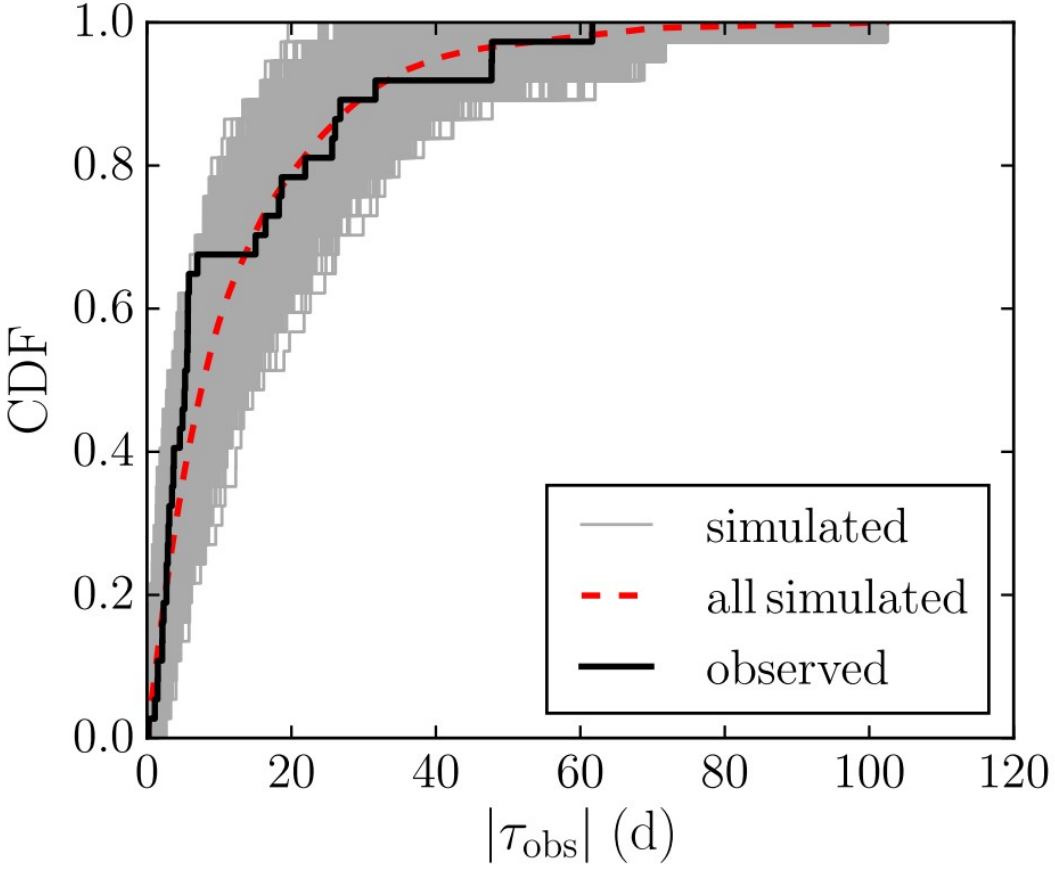
Marscher+, 2010, ApJL 710, Figs 2+4

Optical polarization monitoring:

~80 sources: gamma-ray loud and quiet

4 seasons (2013-1016)

Angelakis+, 2016
Blinov+, 2015, 2016a, 2016b, 2018
Kiehlmann+, 2017, 2021 *(submitted)*
Ramaprakash+, 2020
Blinov+, 2021 : Data release



Time lag between EVPA rotation and closest gamma-ray flare

Probability of random association: $\sim 5 \times 10^{-5}$

→ At least some, if not all, rotations are related to gamma-ray activity

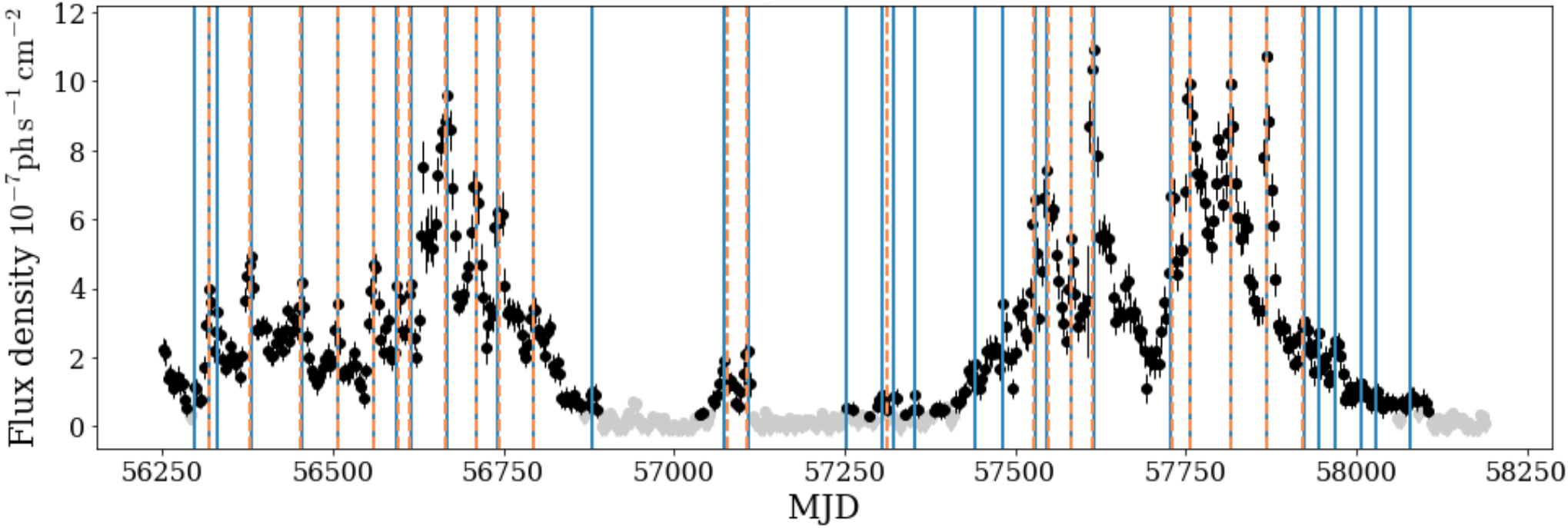
Blinov+, 2018, MNRAS 474

Critical aspects: analysis choices

Kiehlmann+, in prep

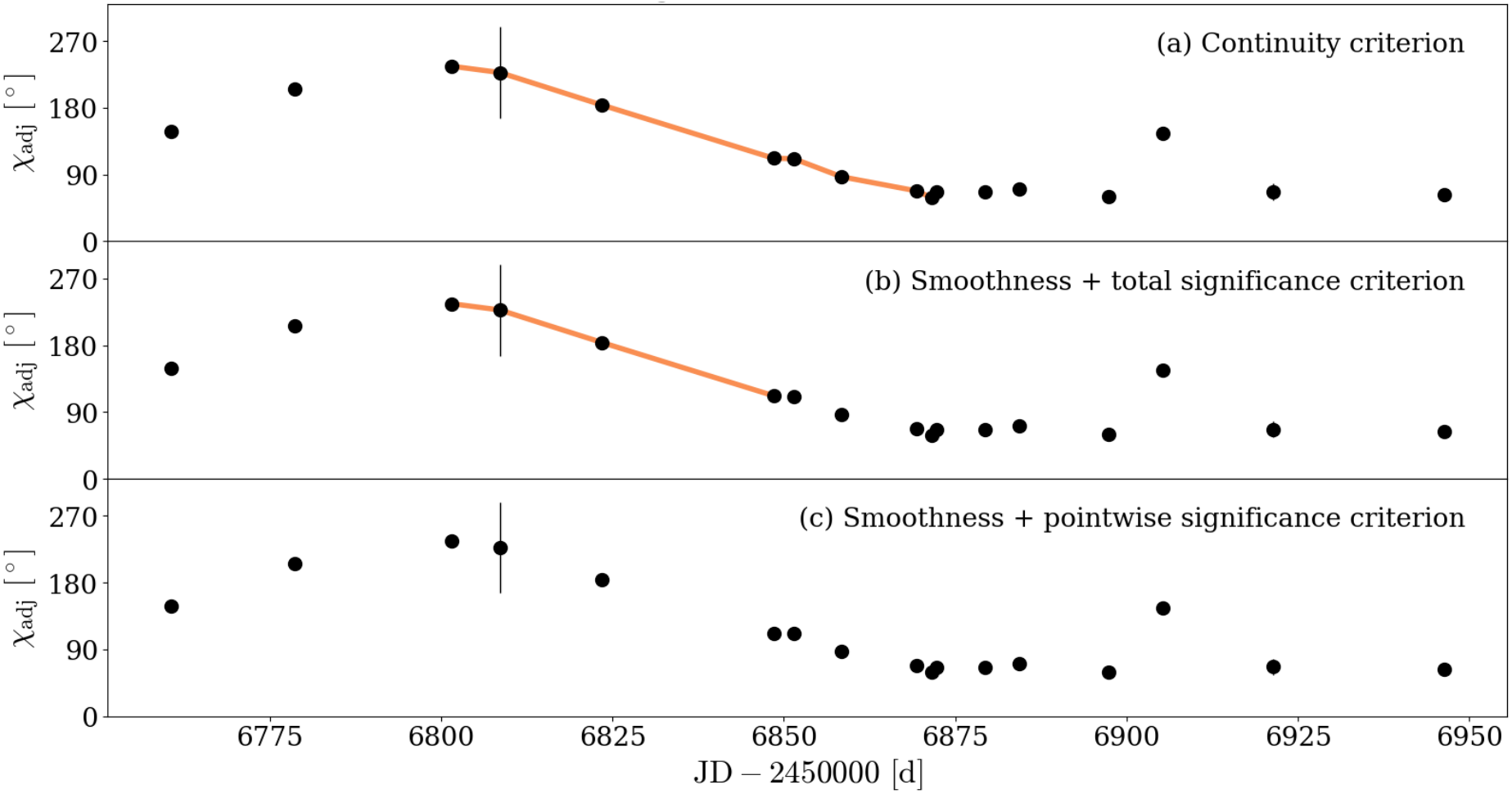
Flare identification

RBPLJ1048+7143



Rotation identification

RBPLJ1806+6949



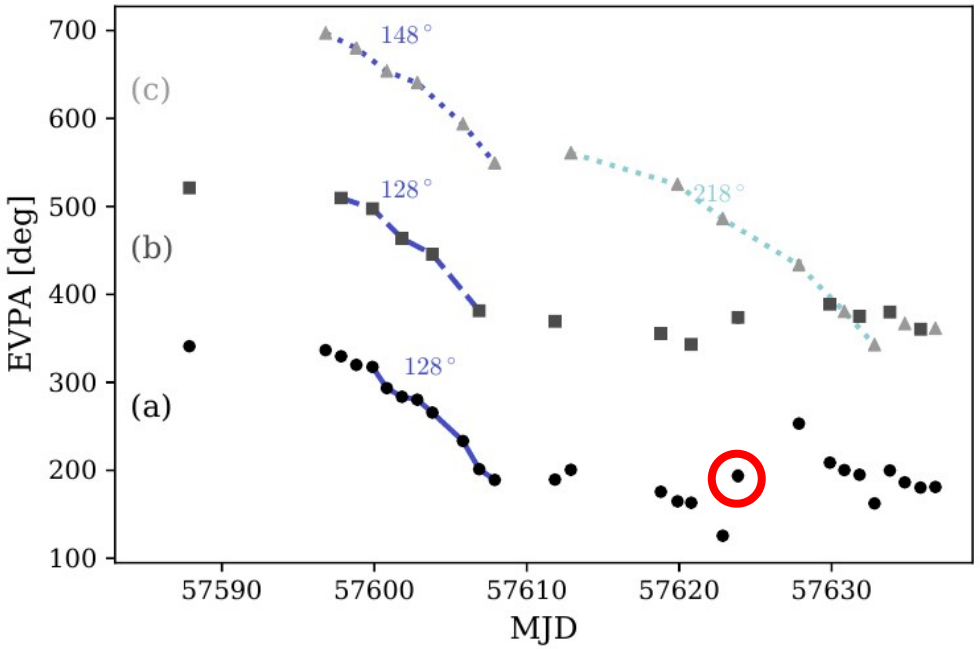
“At least some, if not all, rotations are related to gamma-ray activity” is a robust result, despite many analysis choices made.

(preliminary)

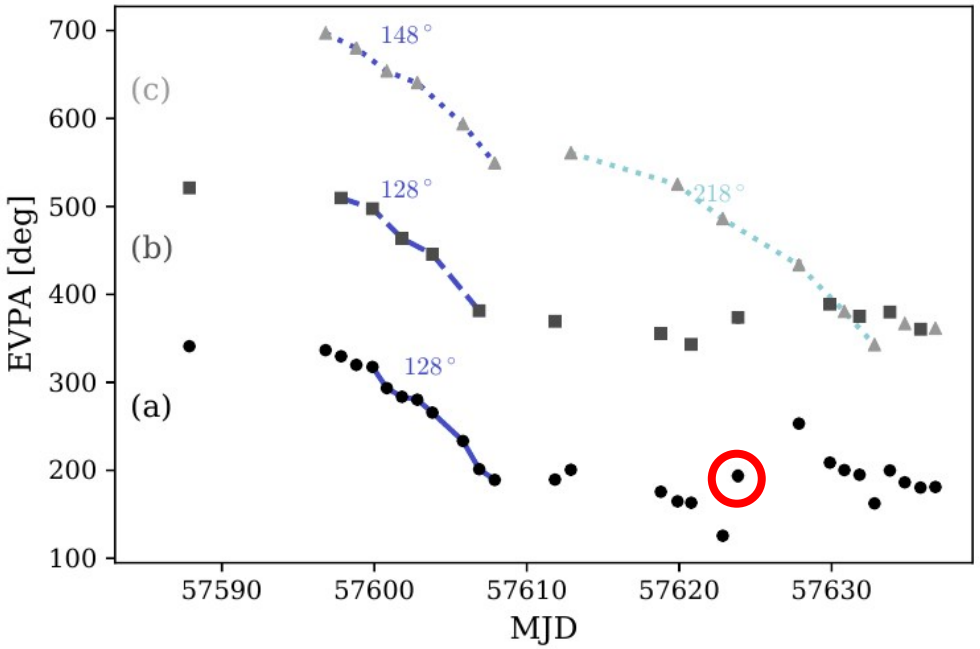
Kiehlmann+, in prep

Critical aspects: 180° ambiguity

Kiehlmann+, in prep



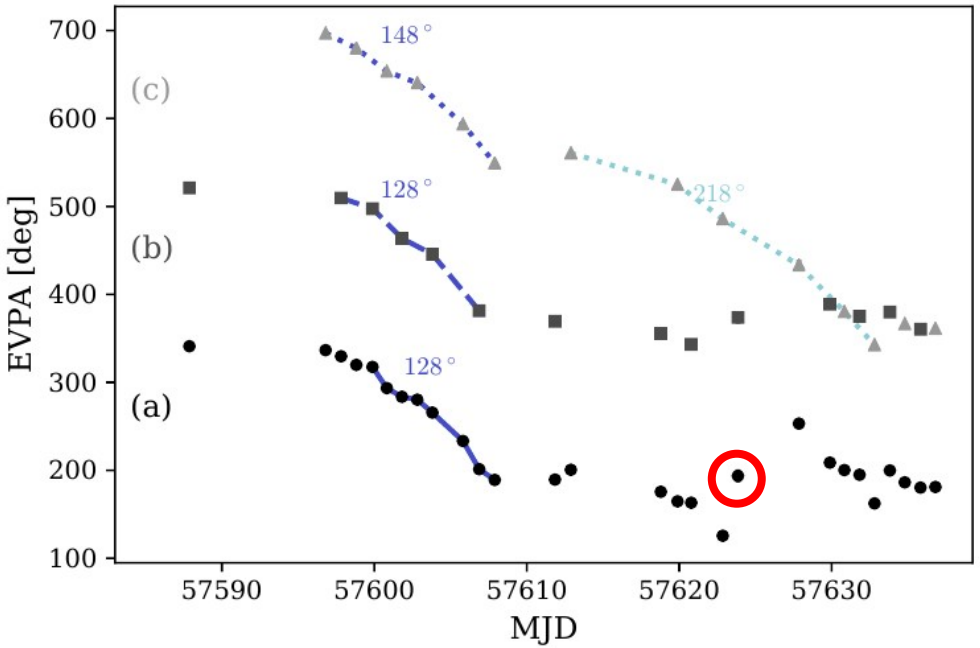
Kiehlmann+, 2021,
arXiv:2104.02622



→ How often do we miss rotations?

Expect 3x as many rotations in daily sampled data, compared to weekly sampled.

Kiehlmann+, 2021, arXiv:2104.02622



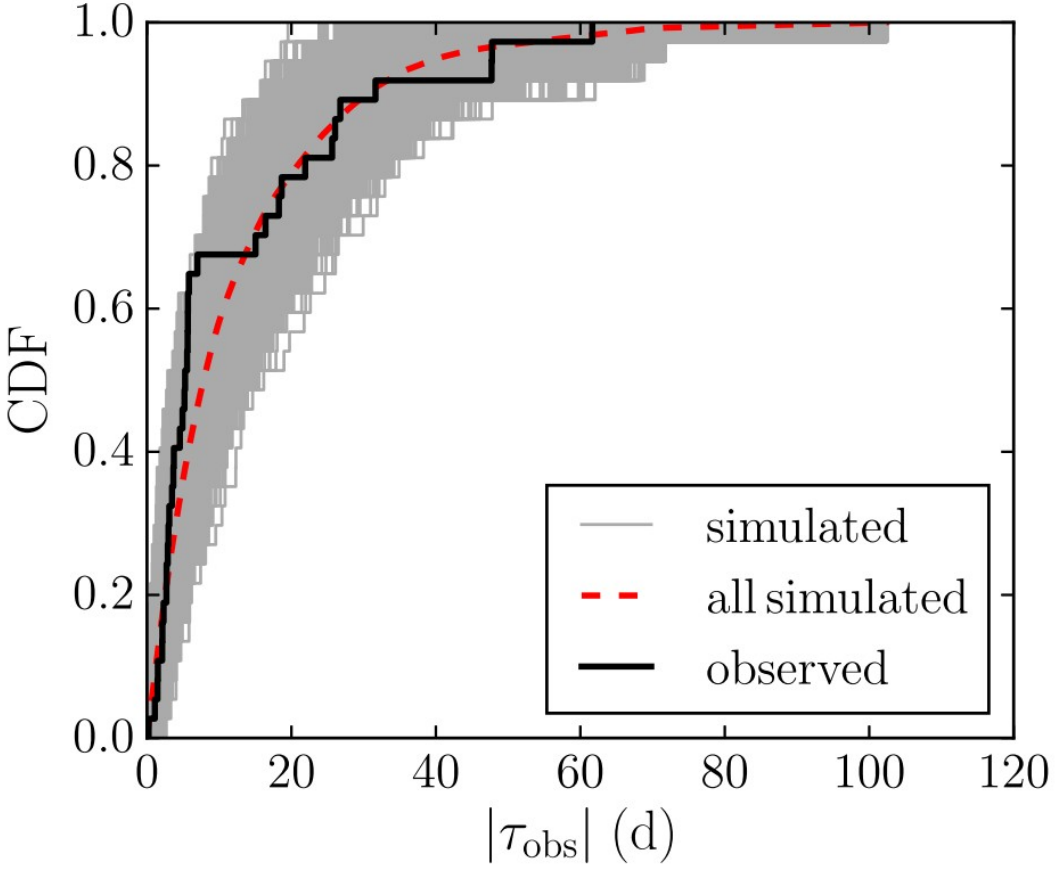
→ How often do we miss rotations?

Expect 3x as many rotations in daily sampled data, compared to weekly sampled.

→ How many rotations are affected by the ambiguity?

Estimate that more than half of weekly sampled rotations in RoboPol data are false detections.

Kiehlmann+, 2021, arXiv:2104.02622



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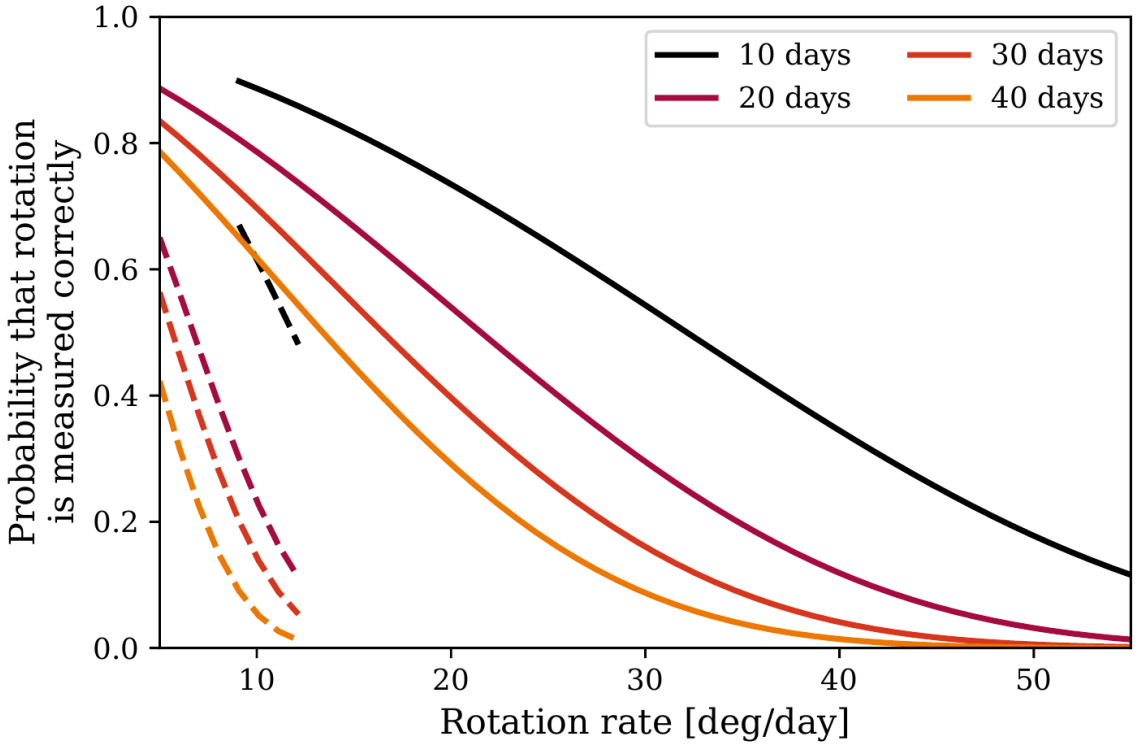
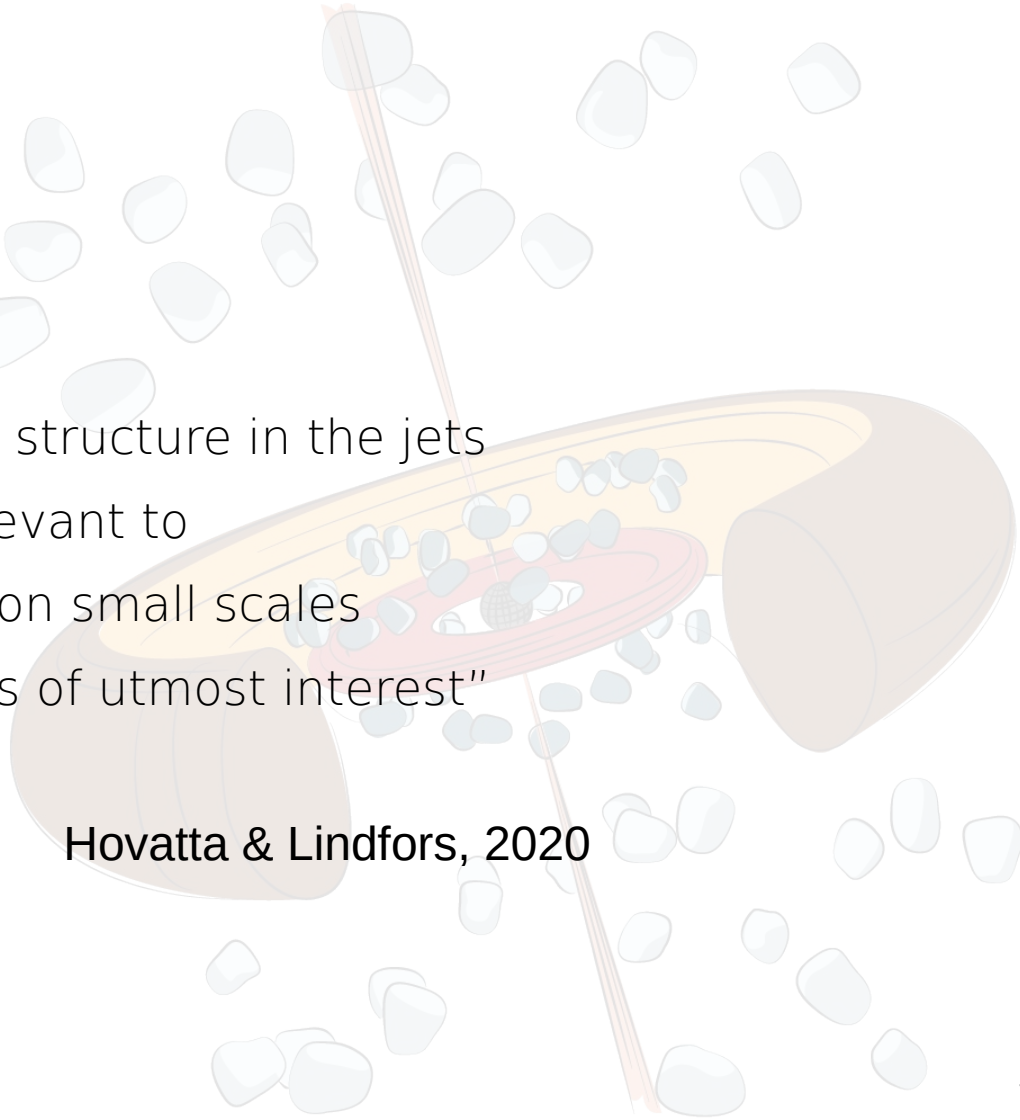
Blinov+, 2018, MNRAS 474



Kiehlmann+, 2021, arXiv:2104.02622



"understanding the magnetic field structure in the jets of blazars both on large scales (relevant to jet launching and collimation) and on small scales (relevant to particle acceleration) is of utmost interest"

Hovatta & Lindfors, 2020