CHRIS LOWDER, CRAIG DEFOREST, MARCUS HUGHES, SARAH KOVAC, DEREK LAMB,
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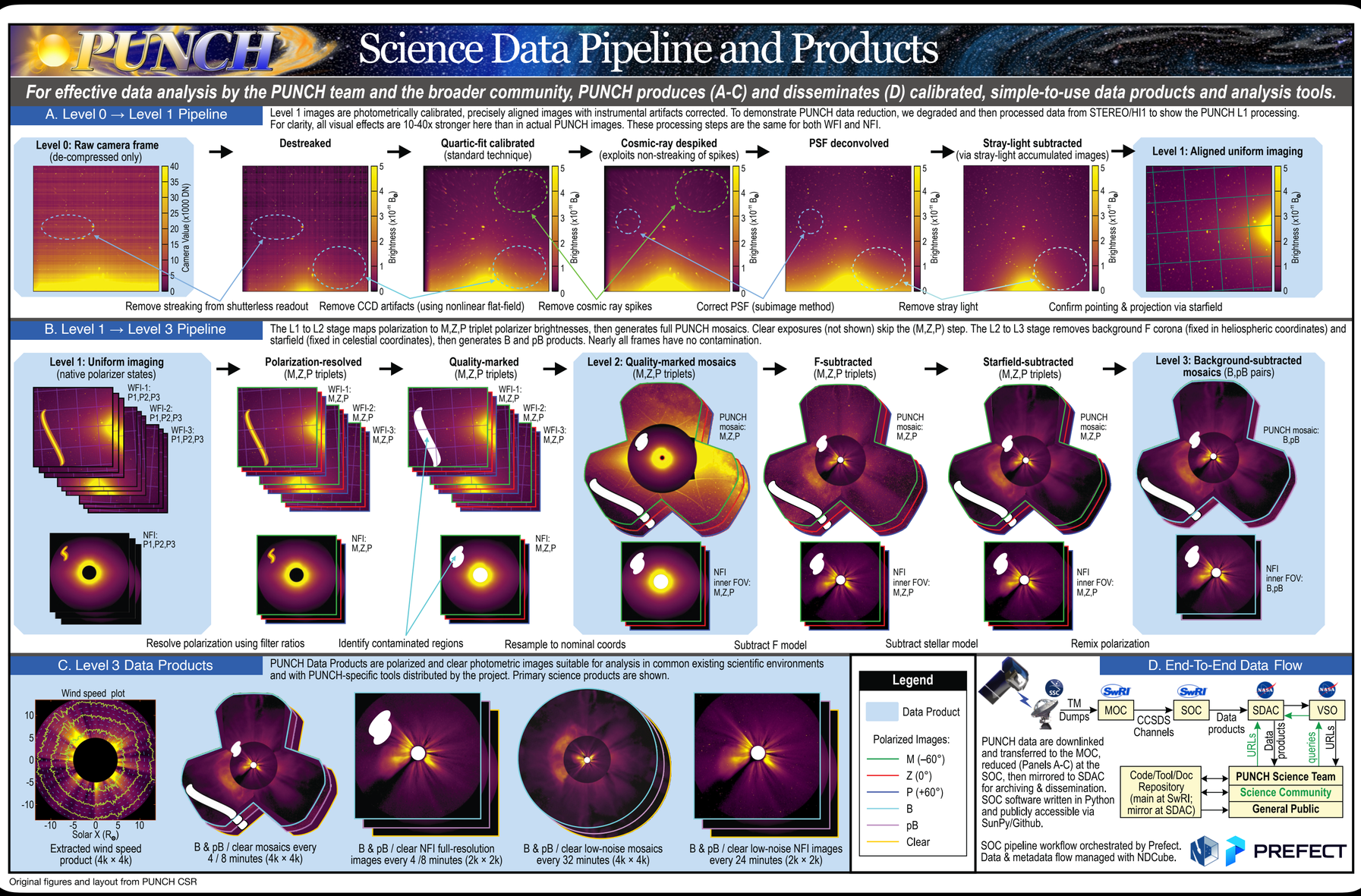
SOUTHWEST RESEARCH INSTITUTE

PUNCH DATA - A GUIDED TOUR

SwRI
SOUTHWEST RESEARCH INSTITUTE

WHAT DATA ARE WE MAKING?



Original figures and layout from PUNCH CSR

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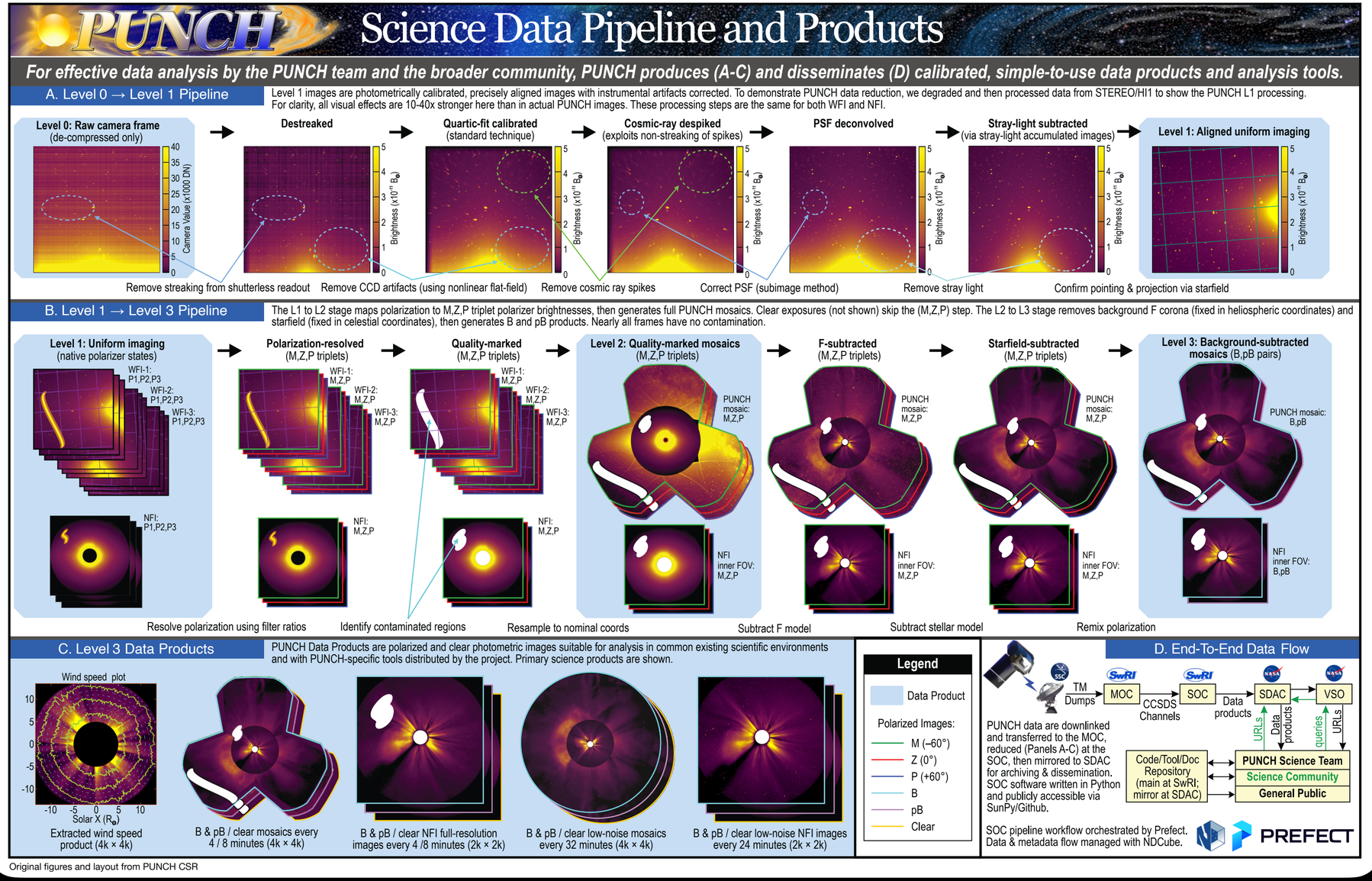
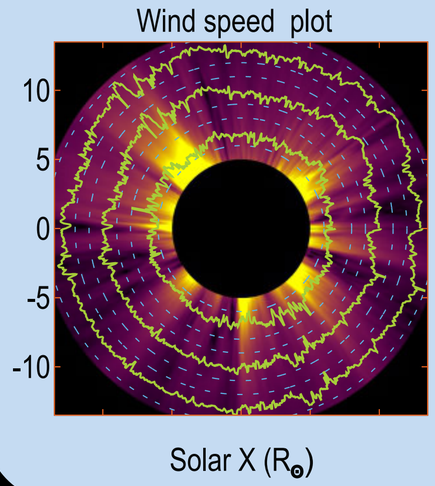
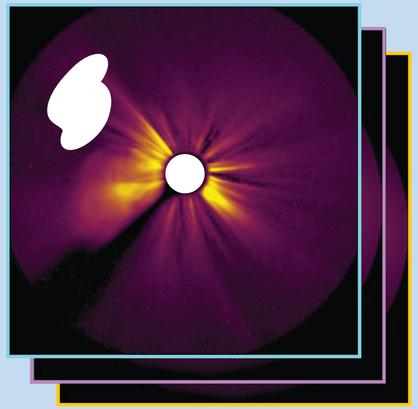


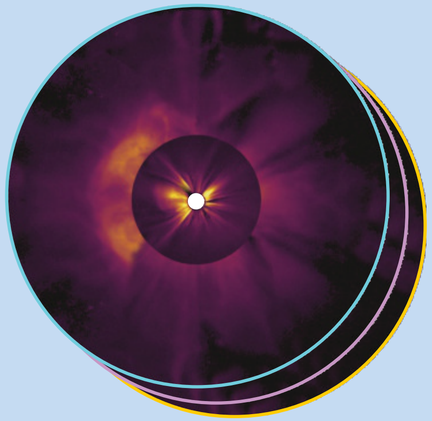
Original figures and layout from PUNCH CSR

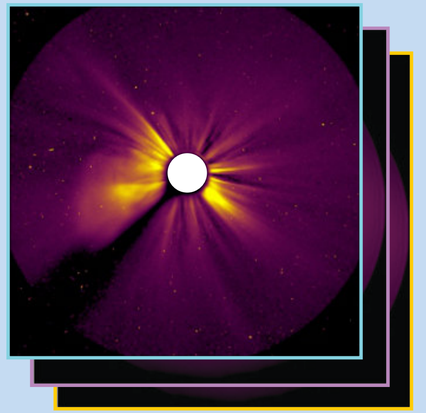
WHAT DATA DO YOU WANT?

Level 3 Data Products









Extracted wind speed product
4K x 4K

VAM

B & pB / clear mosaics
4 / 8 minutes
4K x 4K

PTM

B & pB / clear NFI full-resolution images
4 / 8 minutes
2K x 2K

PNN

B & pB / clear low-noise mosaics
32 minutes
4K x 4K

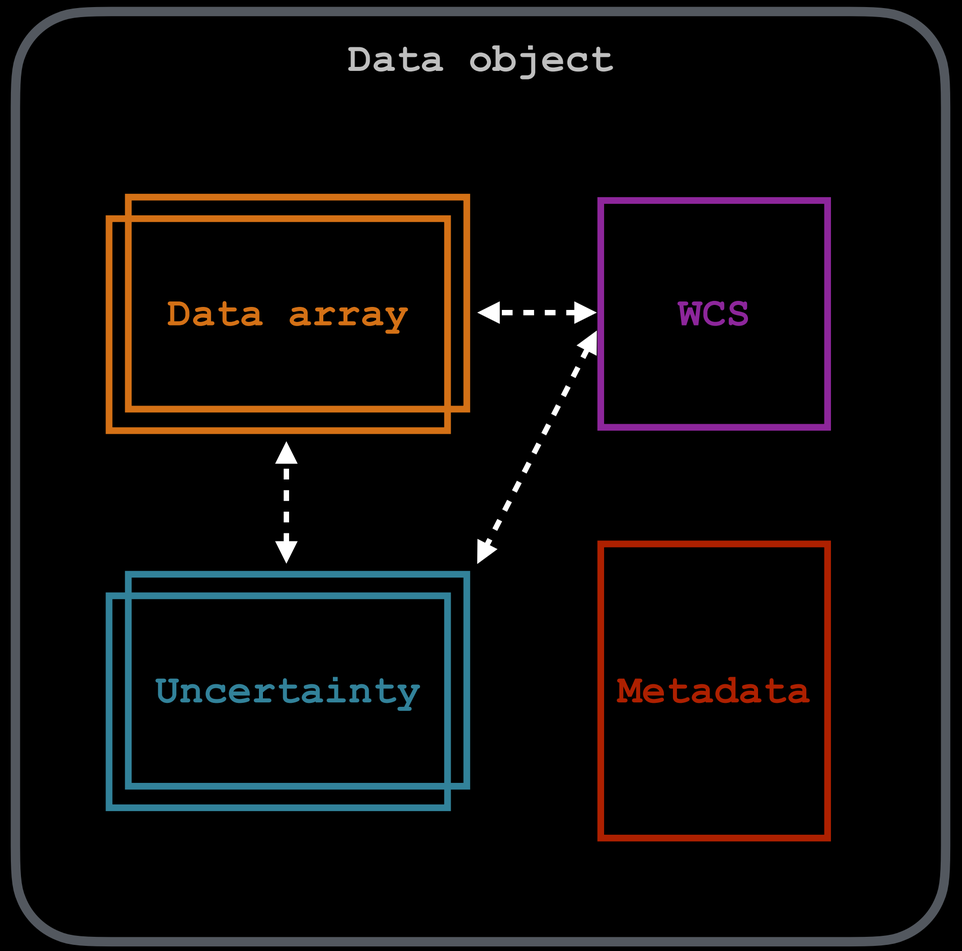
PAM

B & pB / clear low-noise NFI images
24 minutes
2K x 2K

PAN

HOW IS THE DATA STRUCTURED?

- Data pipeline built with NDCube compatibility
- Bundles data with associated uncertainties, world coordinate system (WCS), and metadata
- Transparent & self-describing metadata
- Fully standards (FITS 4.0) compliant
- Human *enjoyably* readable
- Uses FITS's multidimensional data capabilities to represent polarization, uncertainty, etc.



WHAT'S IN A NAME?

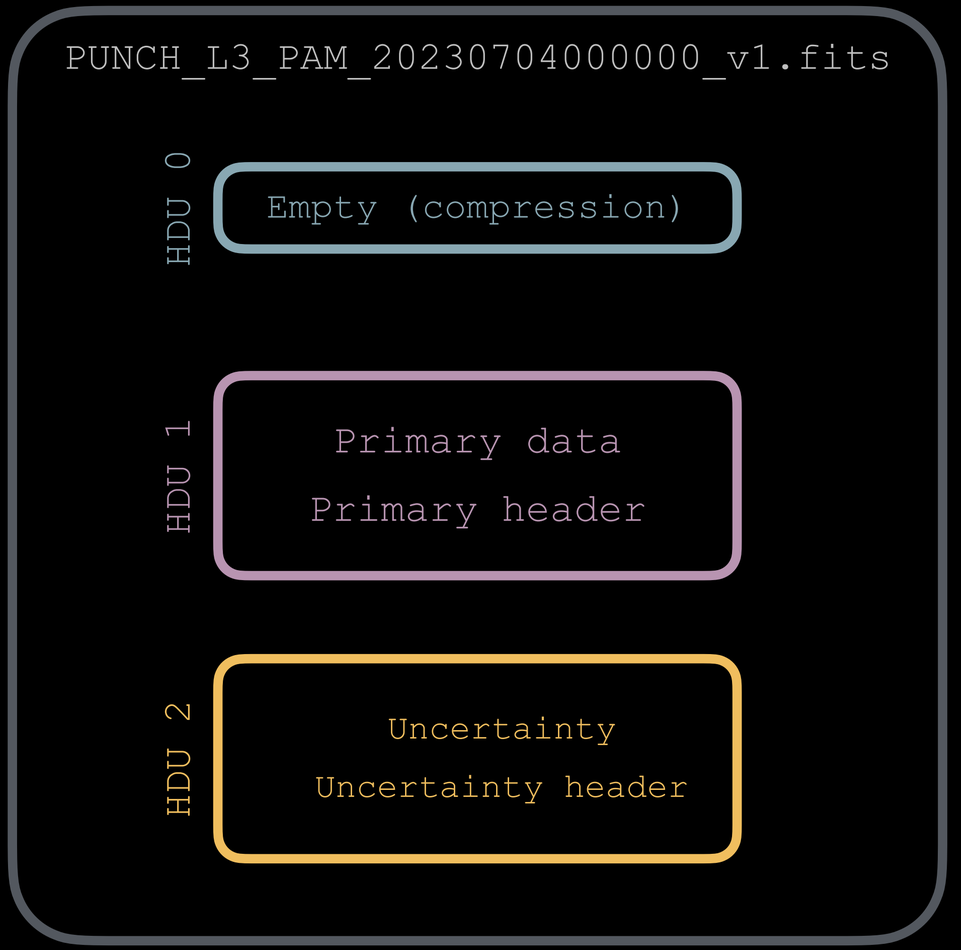
yyyy mm dd hh mm ss

PUNCH_L3_PAM_20230704000000_v1.fits

- Mission
- Data level
- Product code
- Timestamp
- Version number for reprocessing

WHAT'S IN THE DATA?

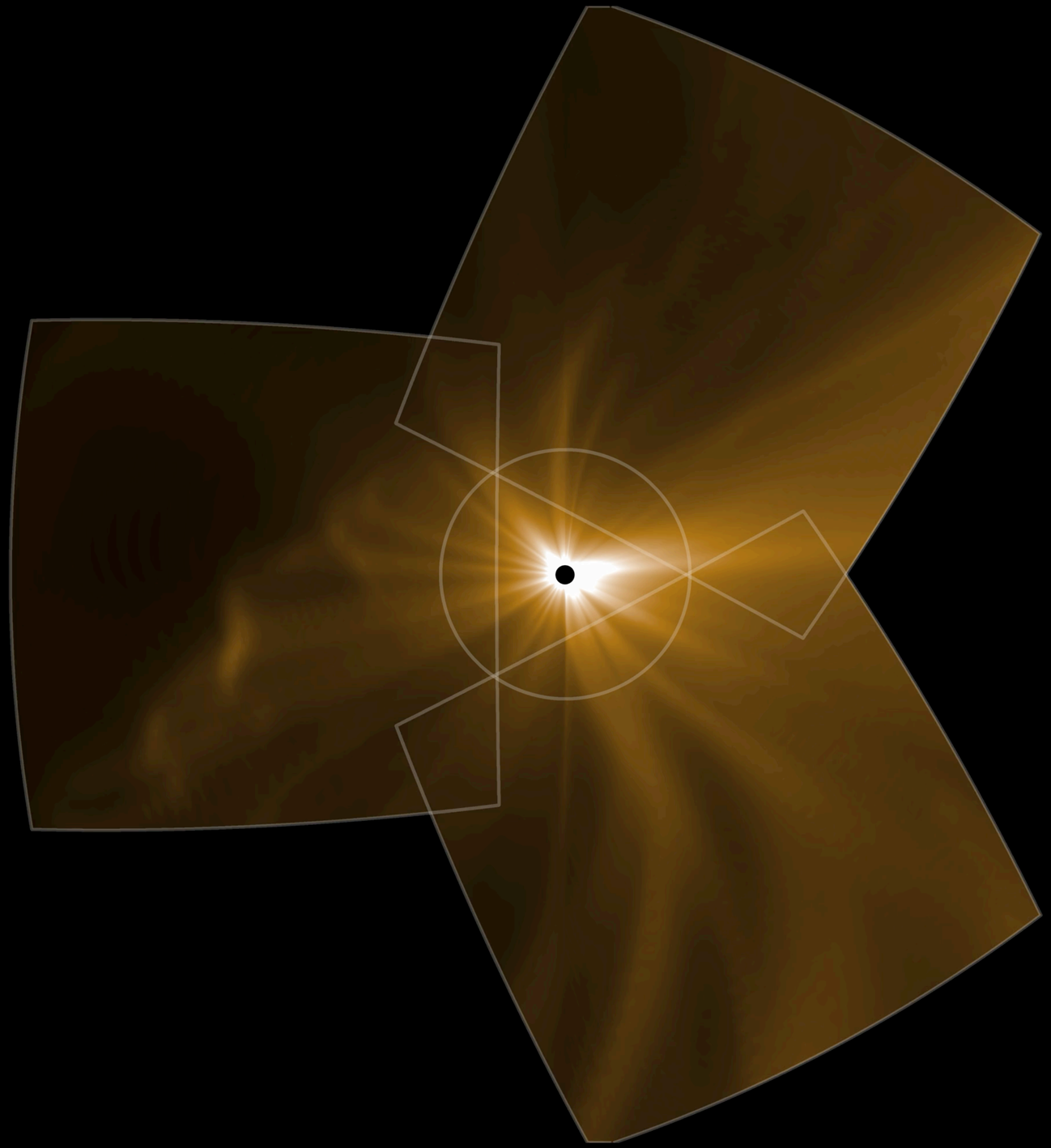
- Data is RICE compressed, with primary data / header in the second HDU and uncertainty in the third HDU
- Data is readable with astropy FITS frameworks / NDCube
- NDCube data handler capable of reading PUNCH data and bundling the data and WCS information exists within *punchbowl*
- A sample IDL script for reading PUNCH data is under development at: https://github.com/punch-mission/PUNCH_IDL_Tools



The PUNCH FOV is big.

The PUNCH FOV is big.

You just won’t believe how vastly,
hugely, mind-bogglingly big it is.



LET’S TALK ABOUT COORDINATE FRAMES

Not to scale. Obviously.

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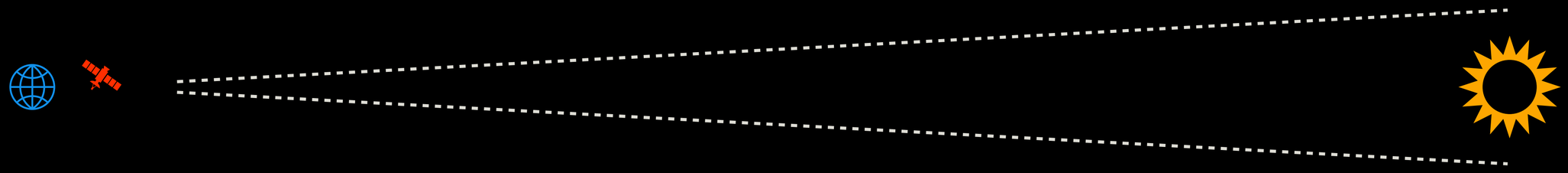

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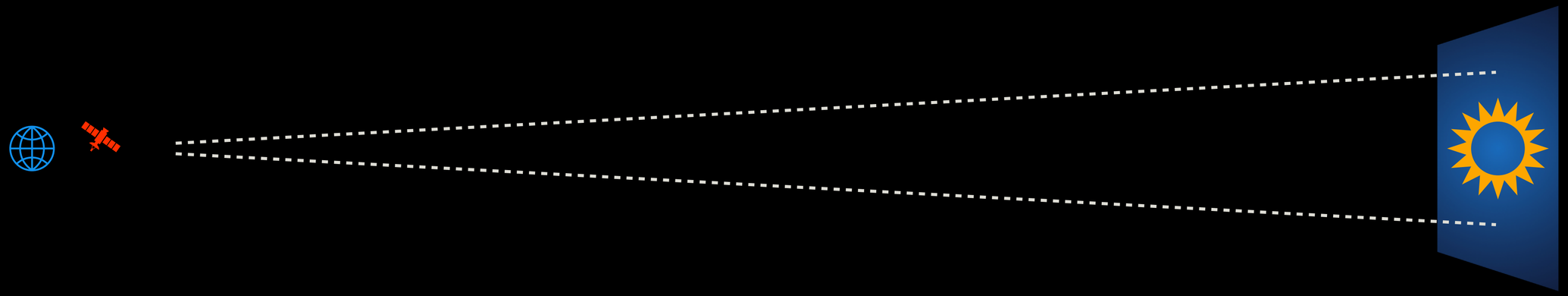

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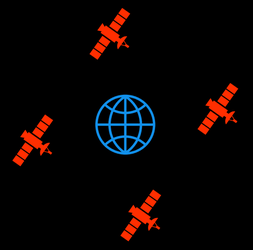

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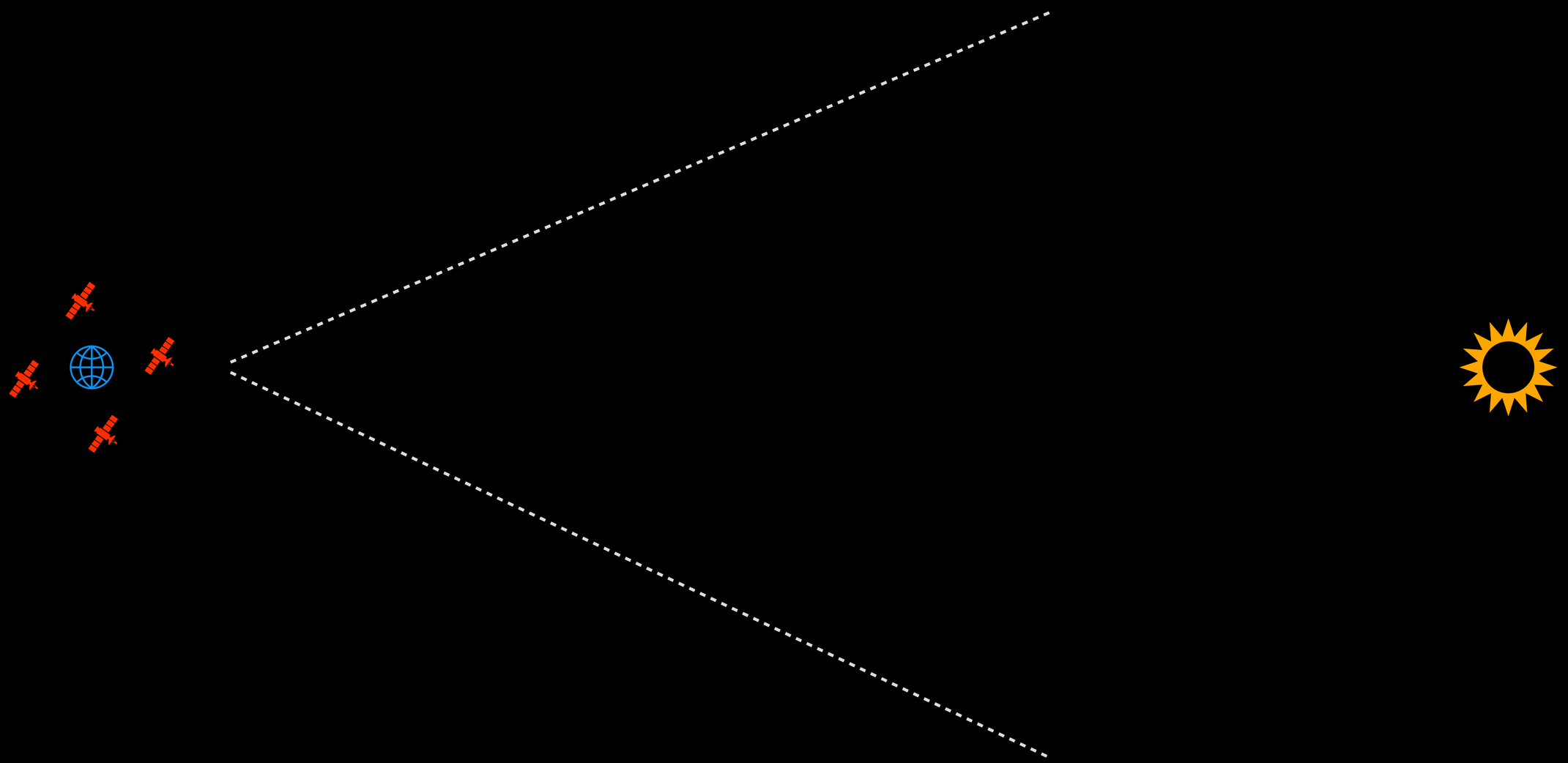

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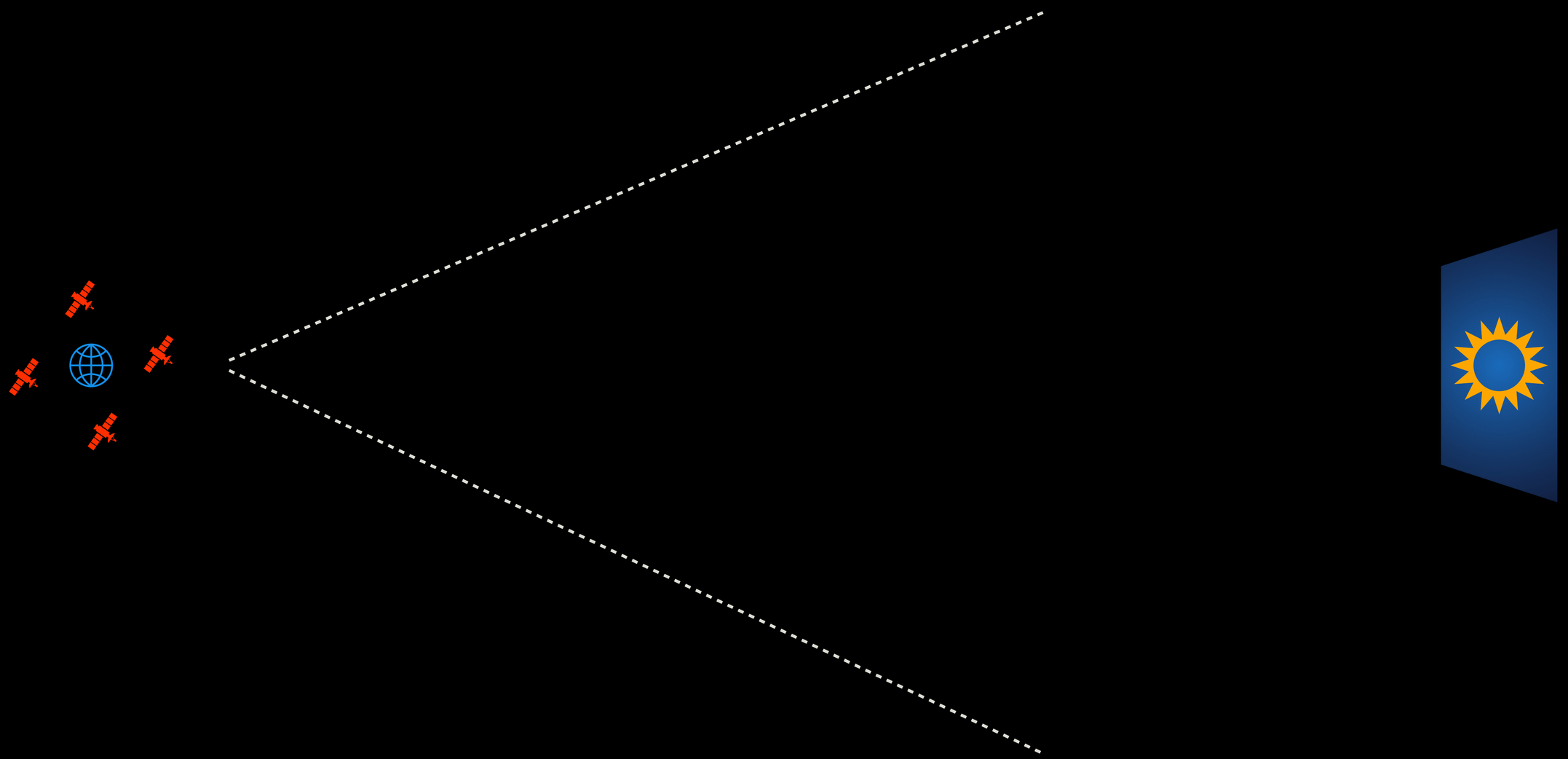

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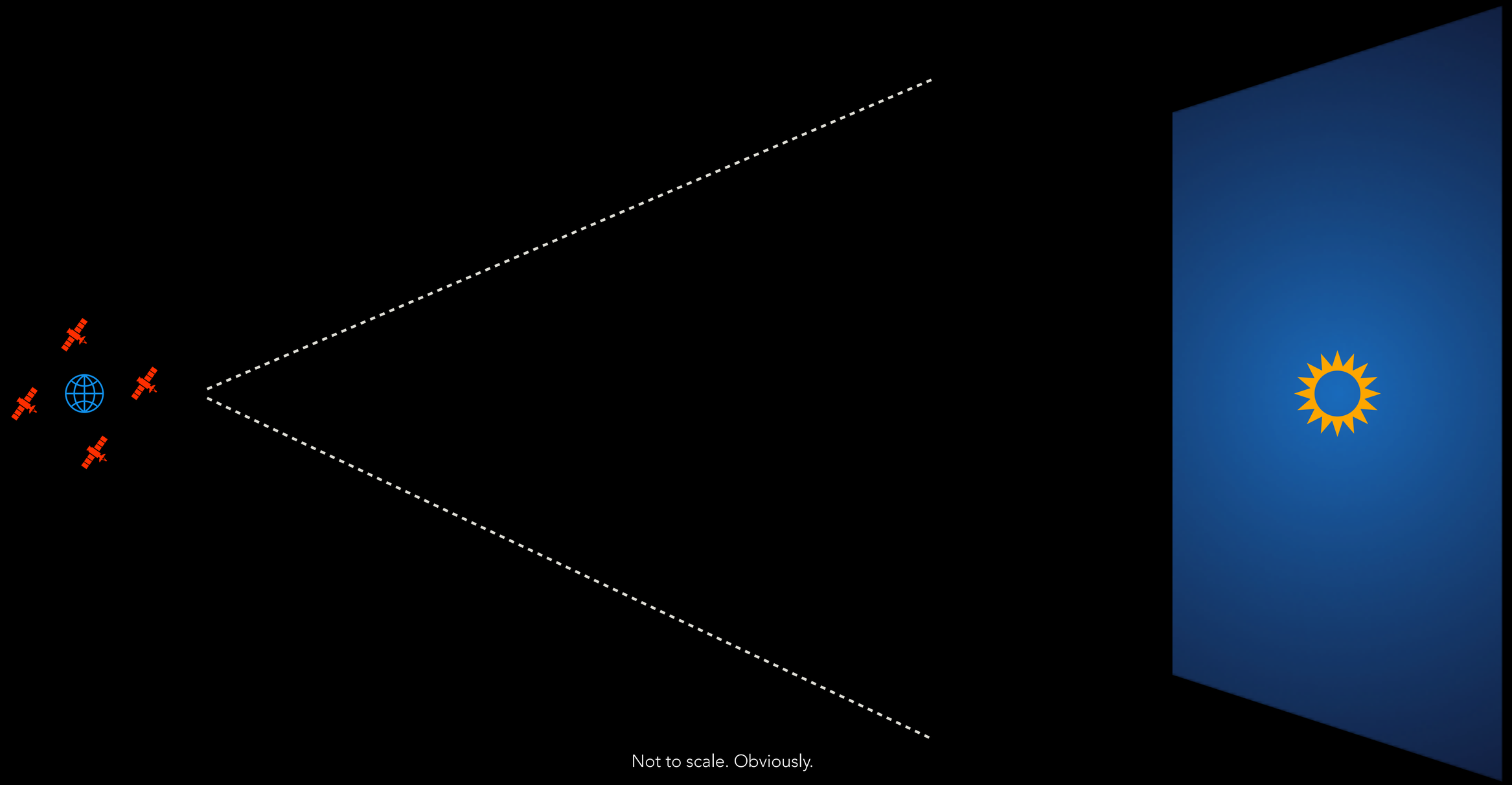

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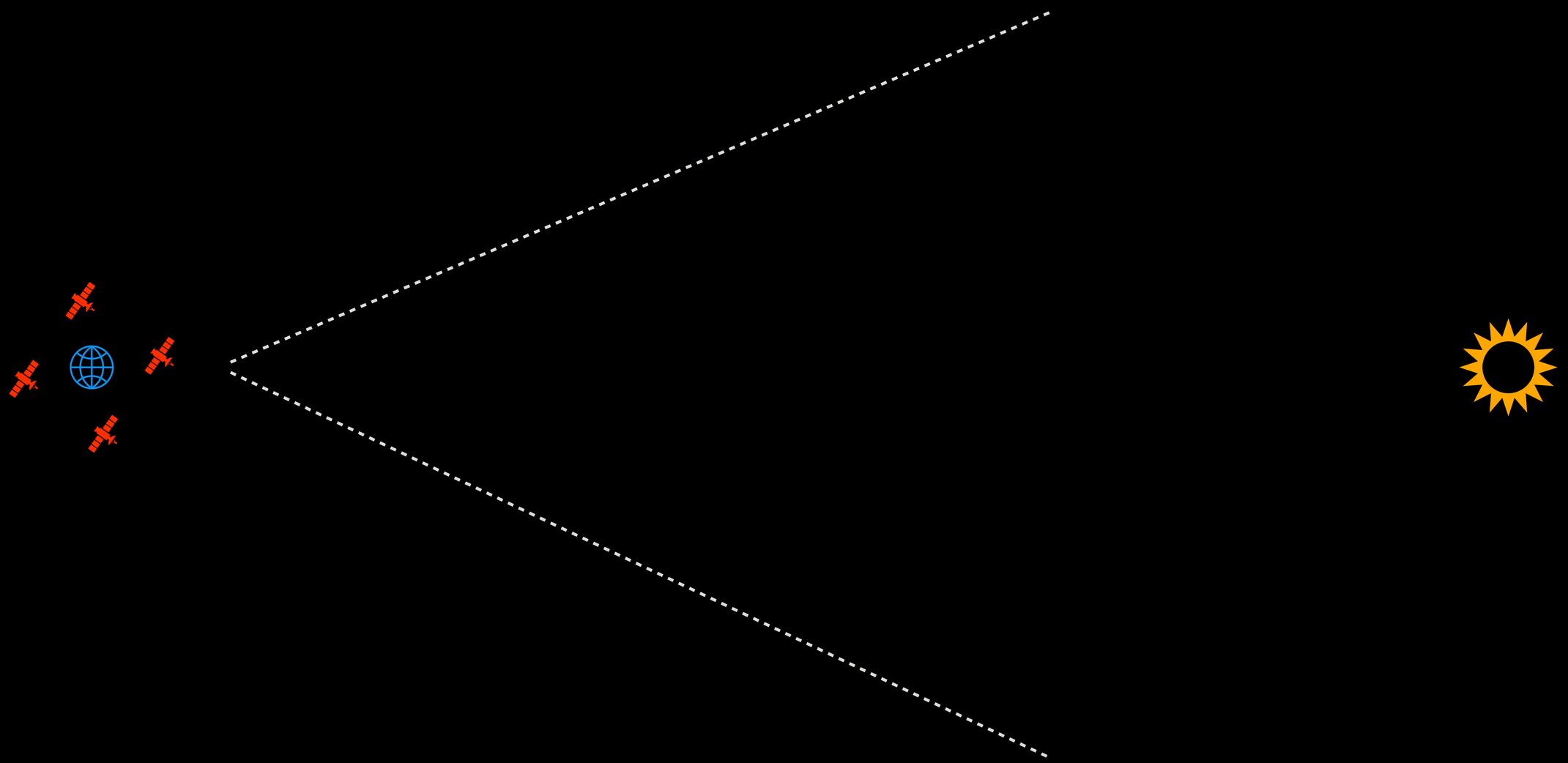

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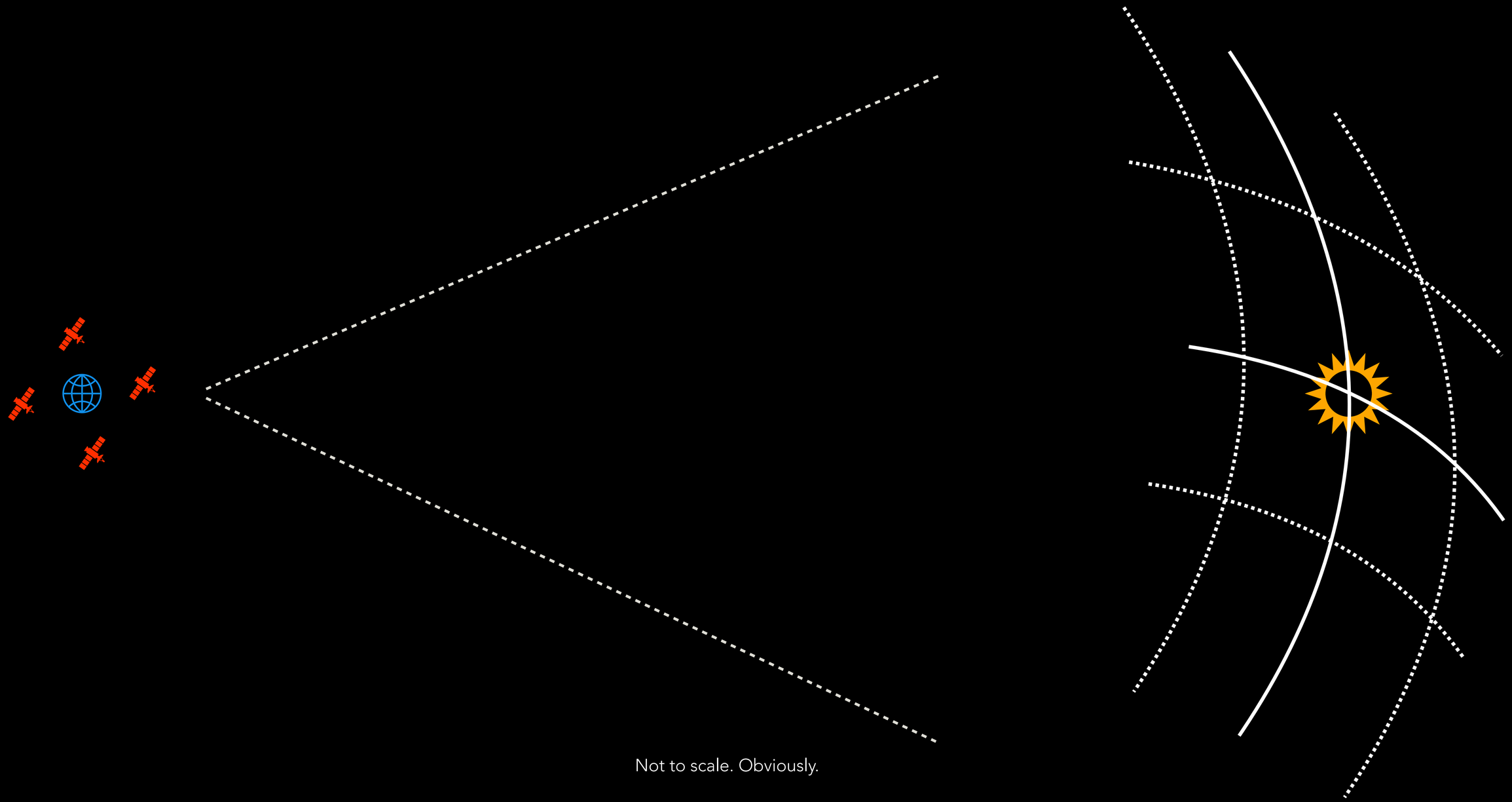

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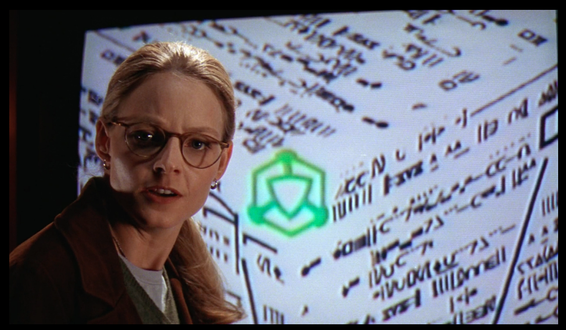

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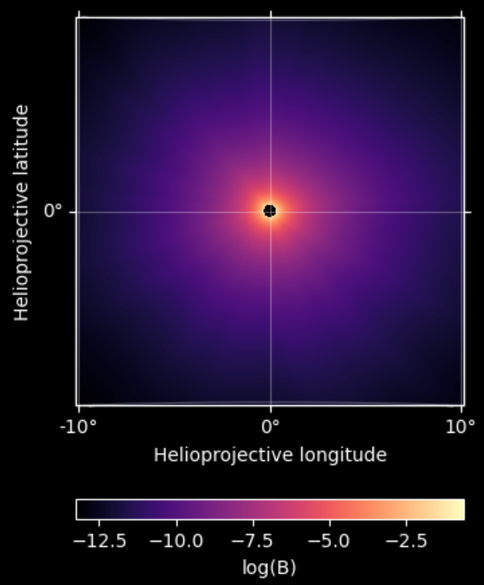
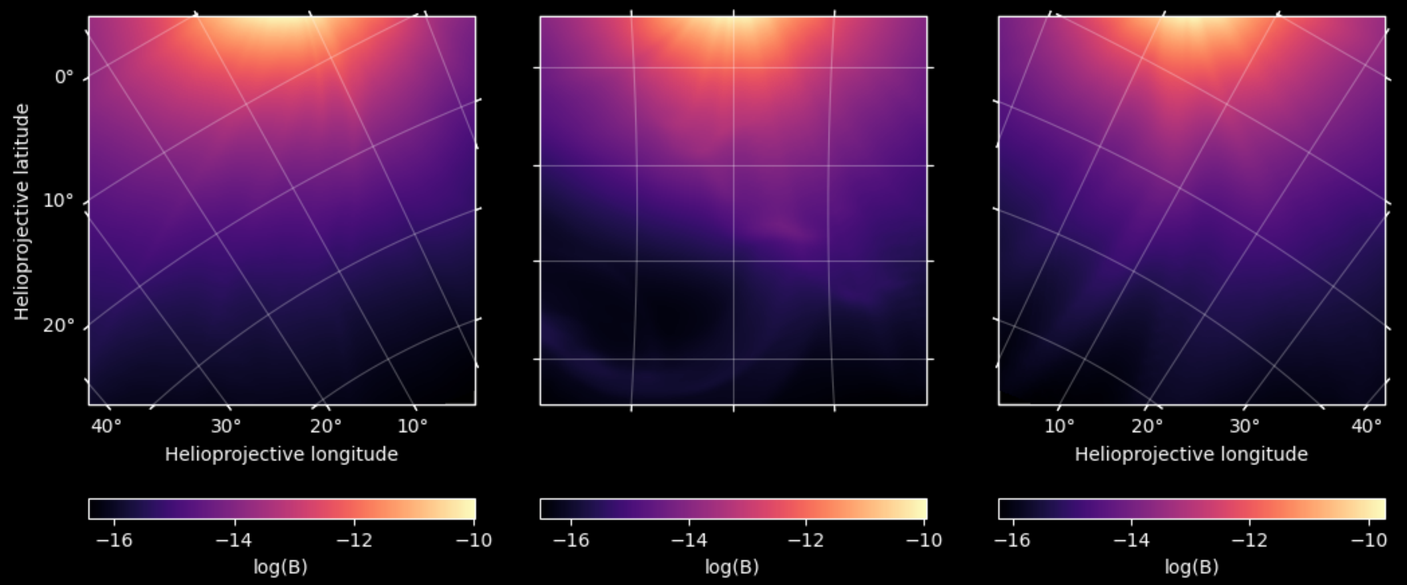
LET'S TALK ABOUT PUNCH COORDINATES



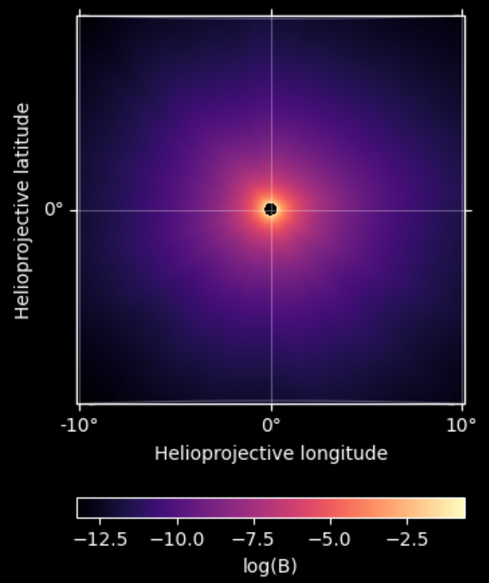
NFI
Gnomonic (TAN)
+ distortion



WFI
Azimuthal
perspective (AZP)
+ distortion

Level 0 + 1

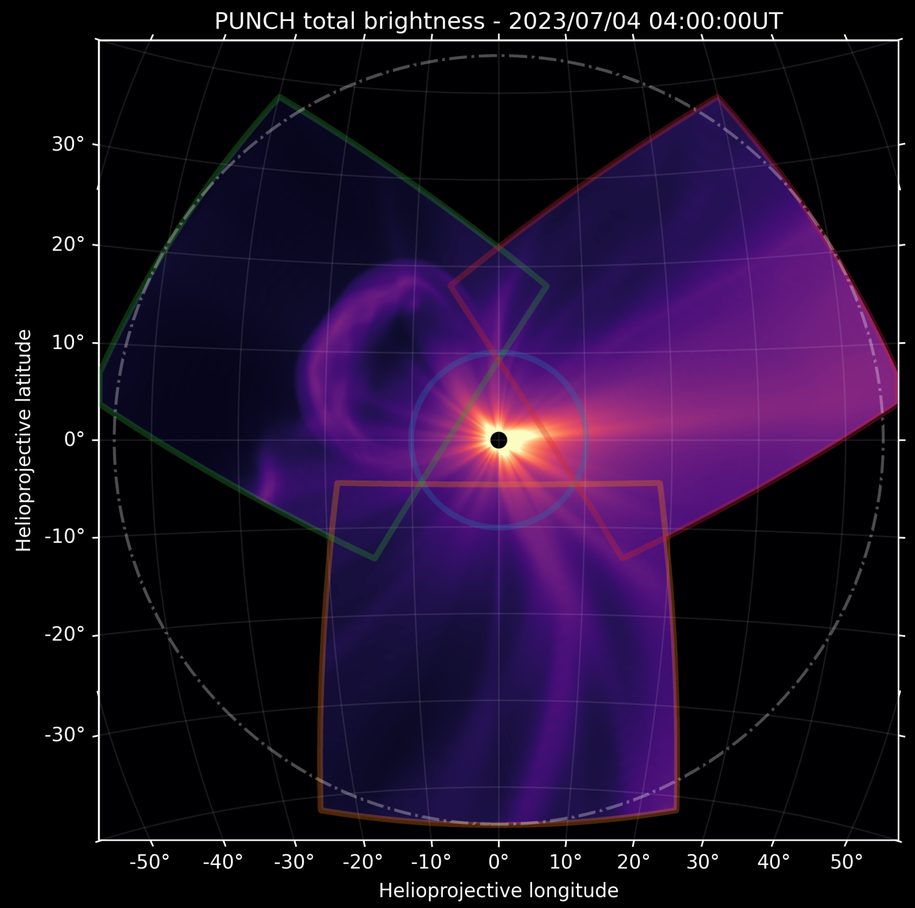
LET'S TALK ABOUT PUNCH COORDINATES



NFI

Gnomonic (TAN)

+ distortion

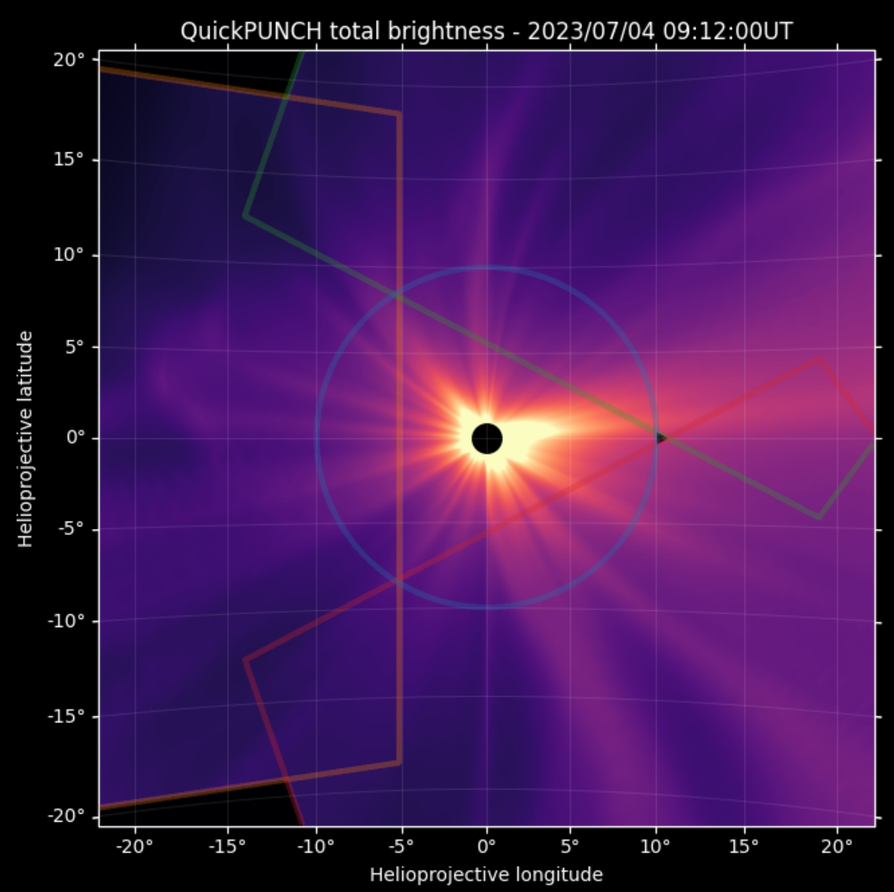


Mosaic

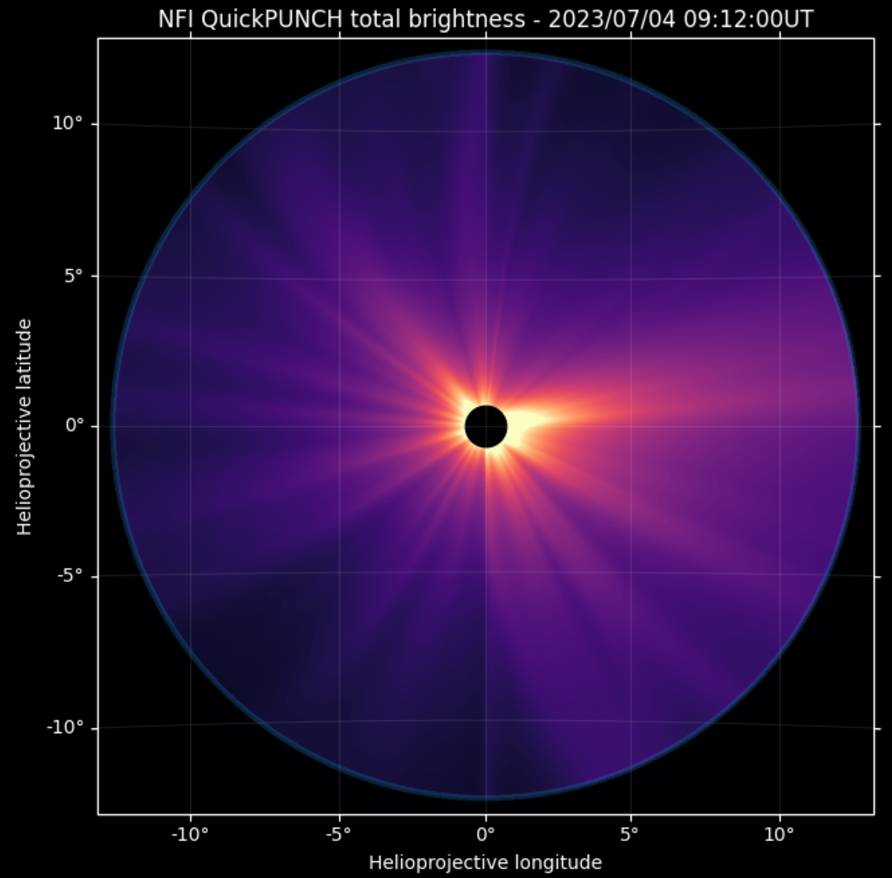
Azimuthal equidistant (ARC)

Level 2 + 3

LET'S TALK ABOUT PUNCH COORDINATES



QuickPUNCH
Azimuthal equidistant (ARC)



NFI QuickPUNCH
Gnomonic (TAN)

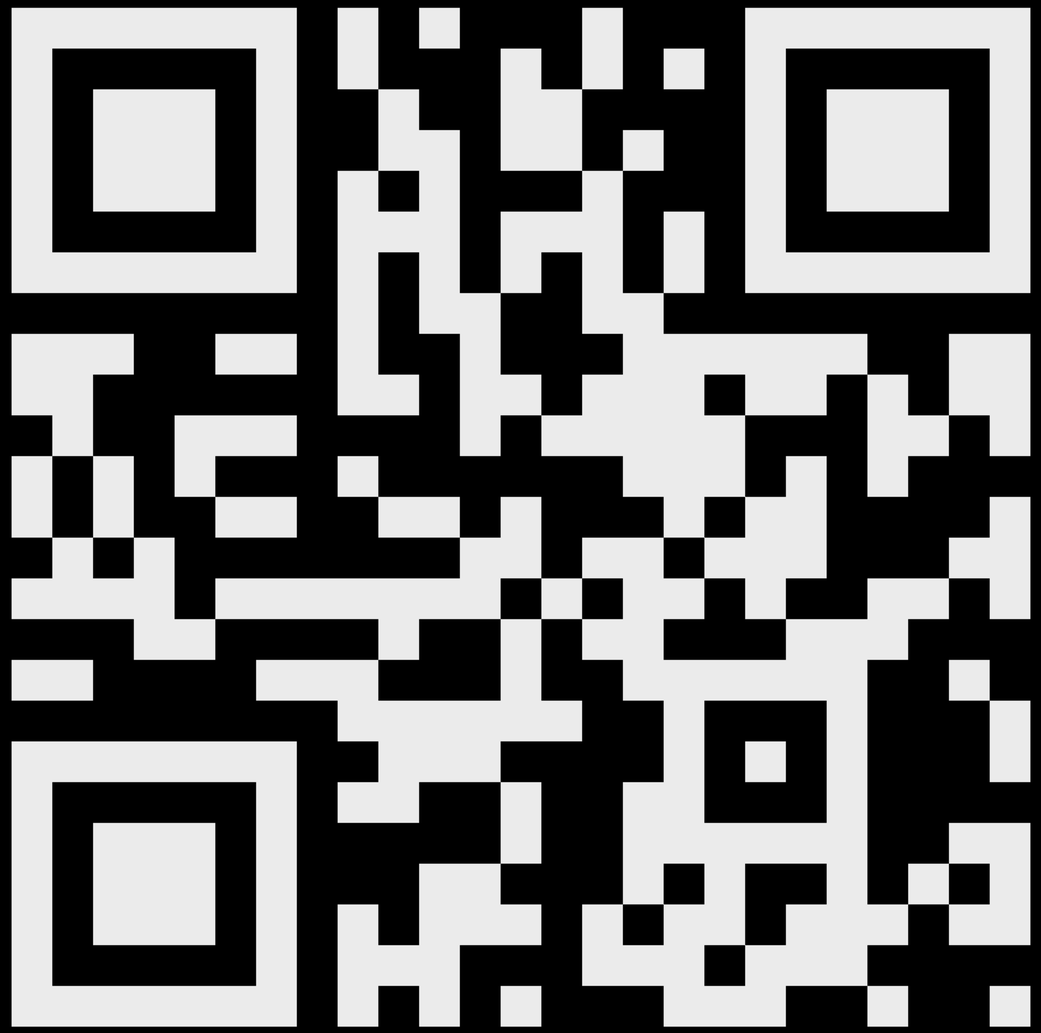
Level Q

HOW DO I PLOT PUNCH DATA?

- Live codebase demo
- Live notebook demo

WHAT DO YOU WANT?

- Github discussion forum for the *punch-mission* repository
- Send us your analysis Jupyter notebooks!
- Get your hands on the data + notebook and break things!
- Use and remix.



https://github.com/punch-mission