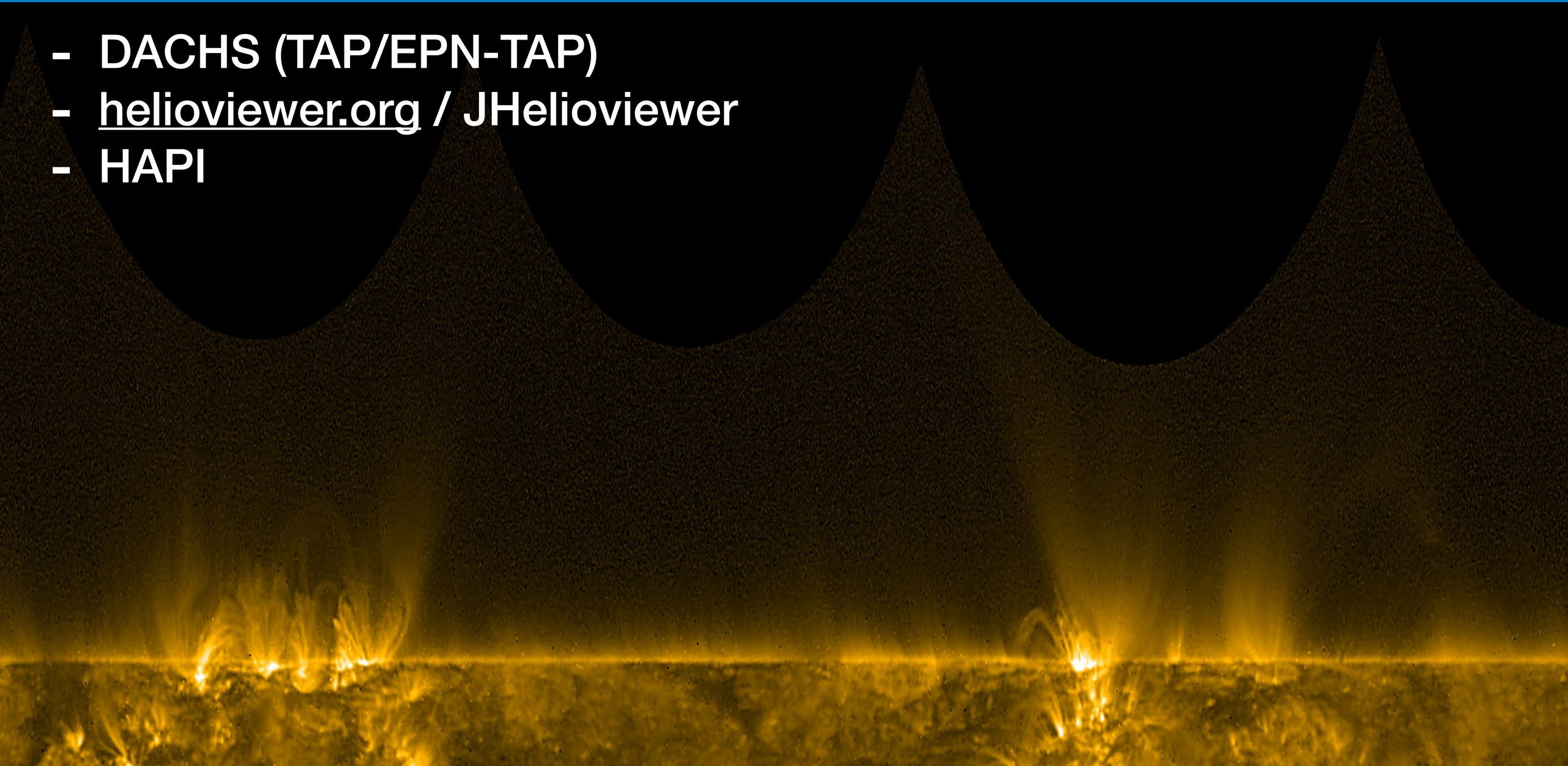
Solar & Heliospheric Data at ROB

F. Verstringe (representing the SWOP team)

Motivation and context

- DACHS (TAP/EPN-TAP)
- helioviewer.org / JHelioviewer
- HAPI

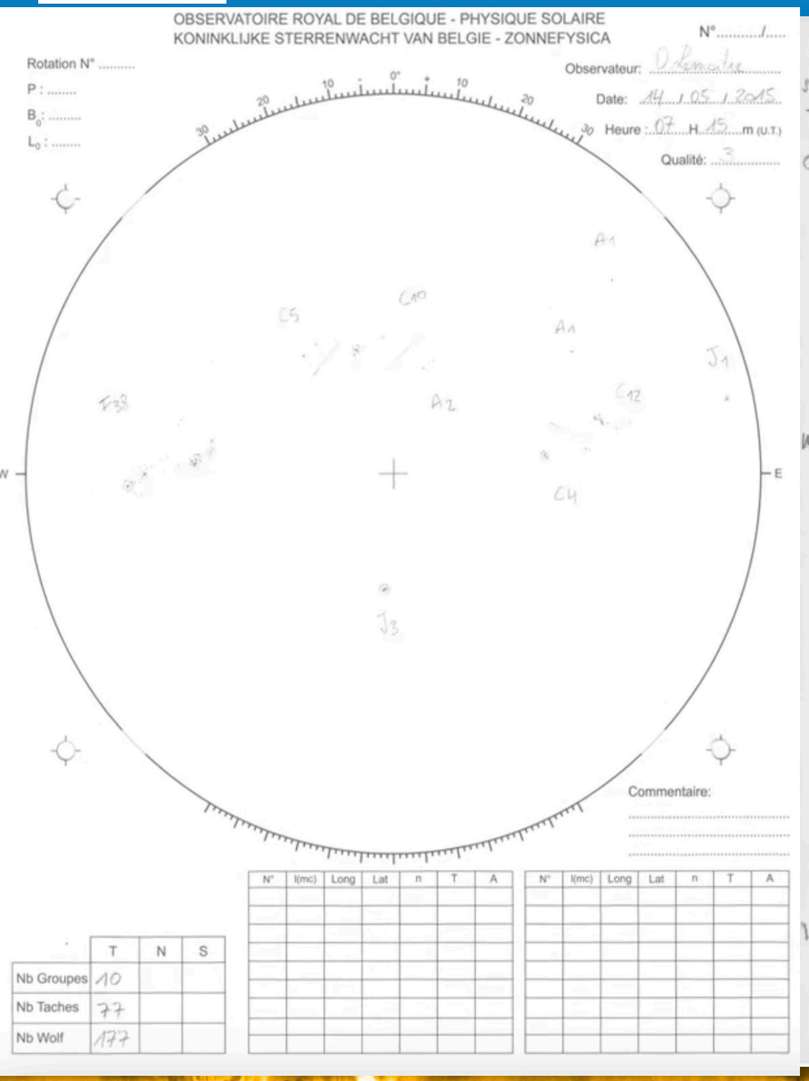


‘Normal’ datasets

- Solar images (USET telescope)
- White light CaII, H-alpha filters
- Already in local DACHS system
- Also old glass plate pictures (not yet digitized)

- ‘Problem’ in DACHS =>
  how to deal usually with updates e.g. the fits keywords (occasionally happens)

‘Historical’ observations


OBSERVATOIRE ROYAL DE BELGIQUE - PHYSIQUE SOLAIRE
KONINKLIJKE STERRENWACHT VAN BELGIE - ZONNEFYSICA

N°...../.....

Rotation N° .....
P : .....
B_0 : .....
L_0 : .....

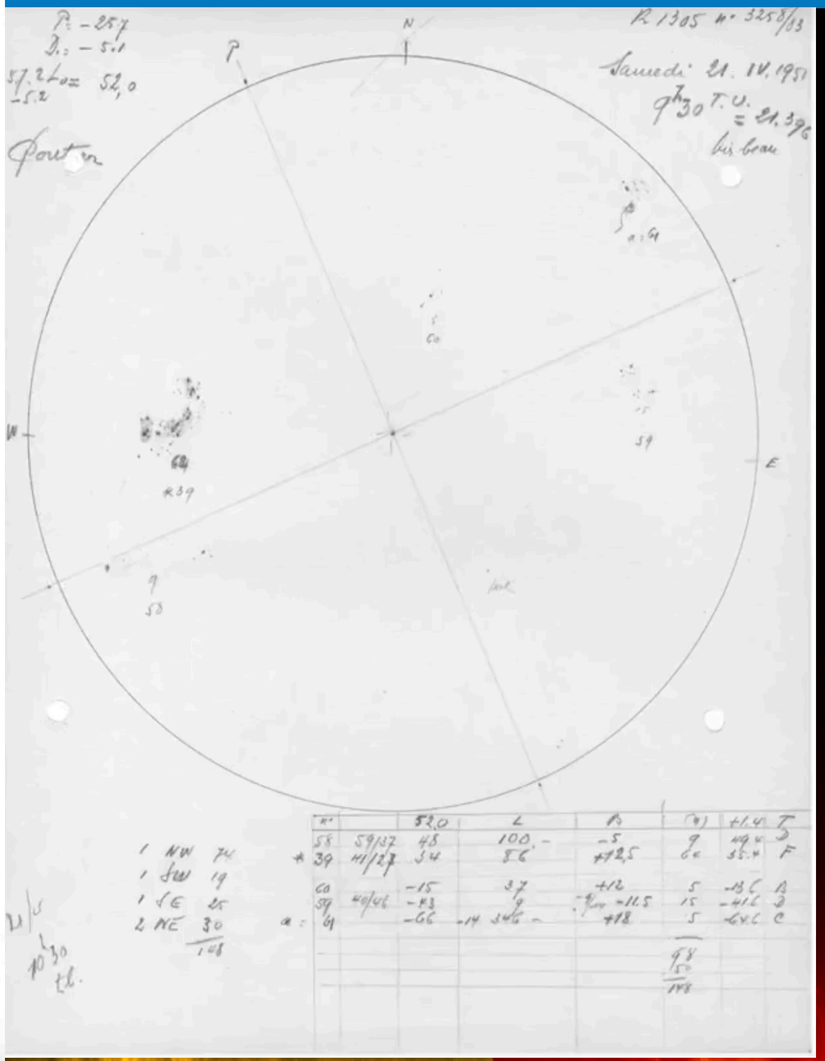
Observateur: D. Lemaître
Date: 14 / 05 / 2015
Heure : 07 H. 15 m (U.T.)
Qualité: 3

Commentaire:

	T	N	S
Nb Groupes	10		
Nb Taches	77		
Nb Wolf	177		

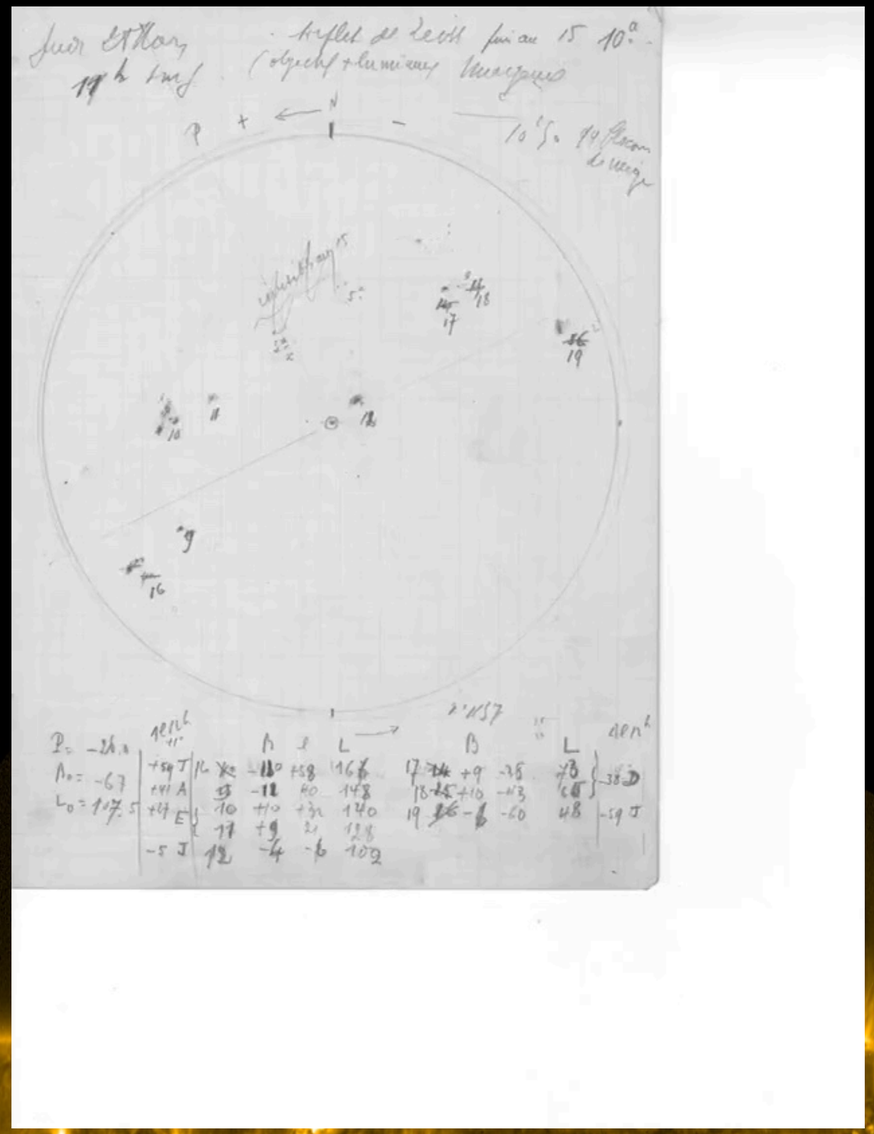
N°	l(mc)	Long	Lat	n	T	A

N°	l(mc)	Long	Lat	n	T	A


Samedi 21. IV. 1951

- Solar daily observation of sunspot groups
- Projected on paper
- Already in DACHS/ EPN-TAP system
- Also old glass plate pictures (not yet digitized)

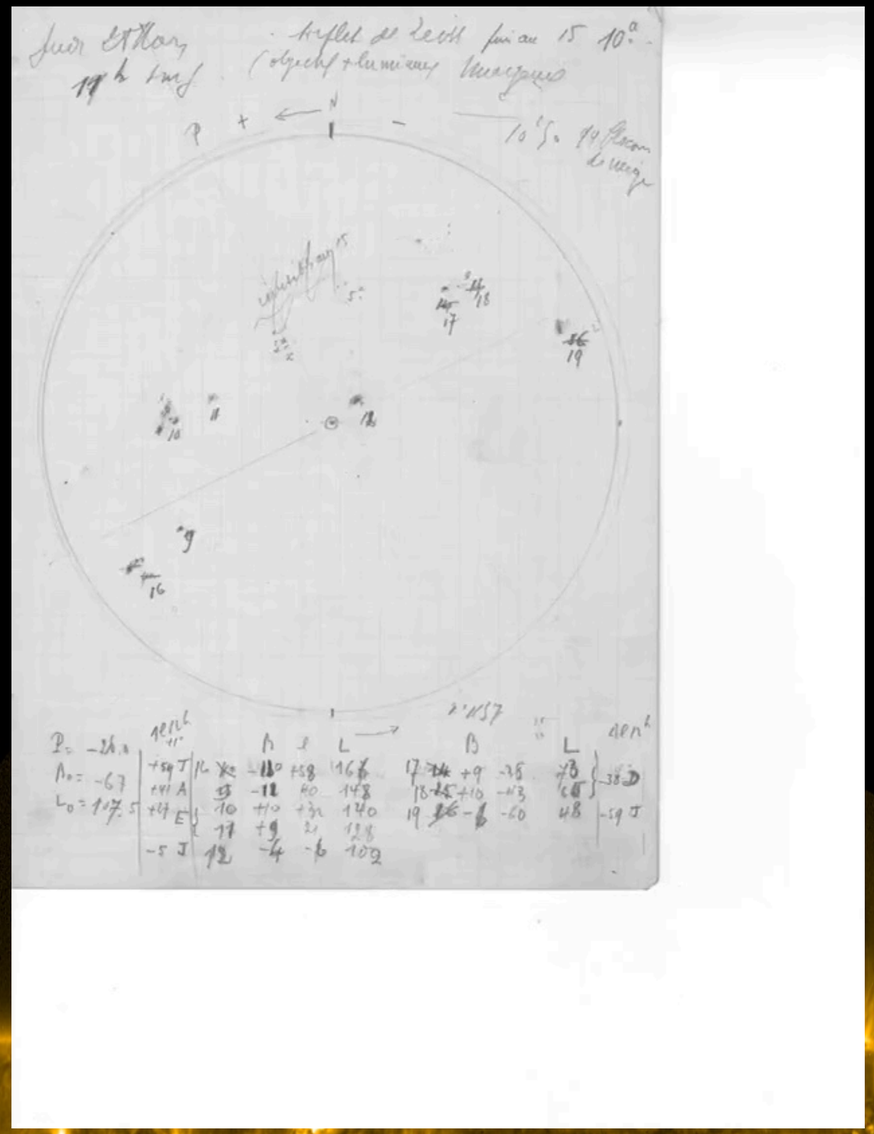
Historical observations



- Solar daily observation of sunspots
- Projected on paper
- Already in local DACHS system

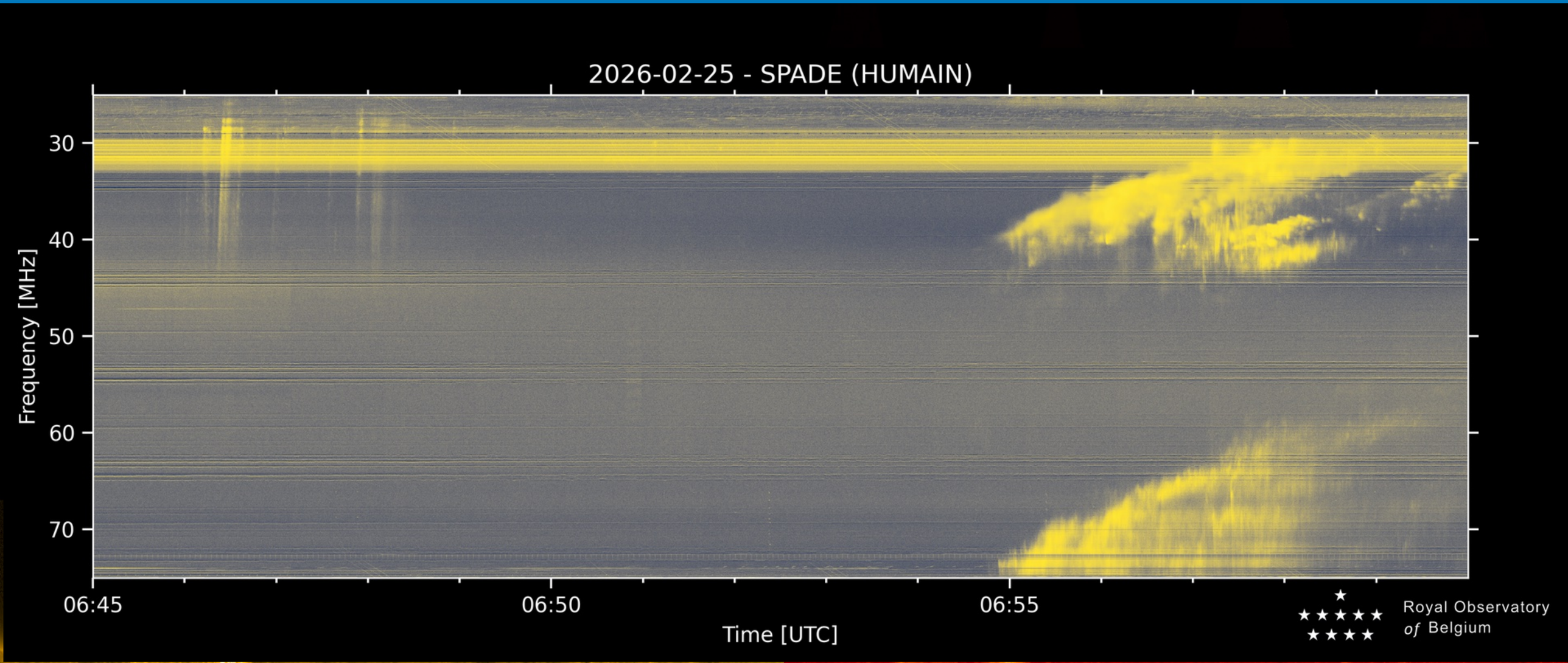
- ‘Problem’ in DACHS => mirrored images

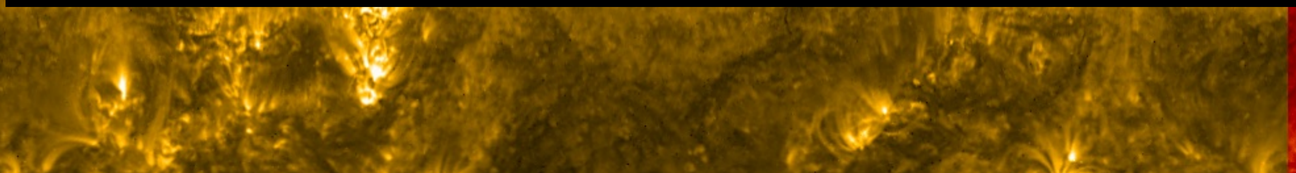
Annotations on observations

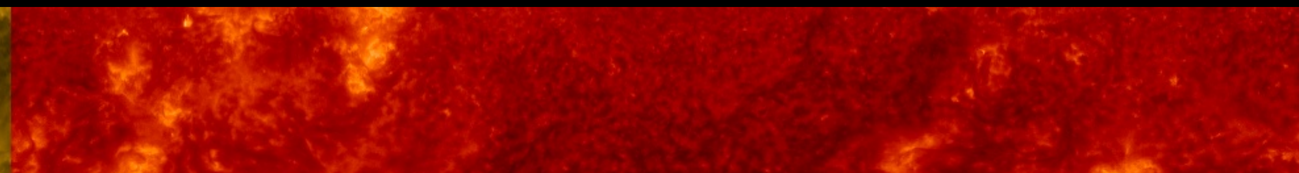


Sunspot observations in tabular format
EPN-TAP

Spectral data

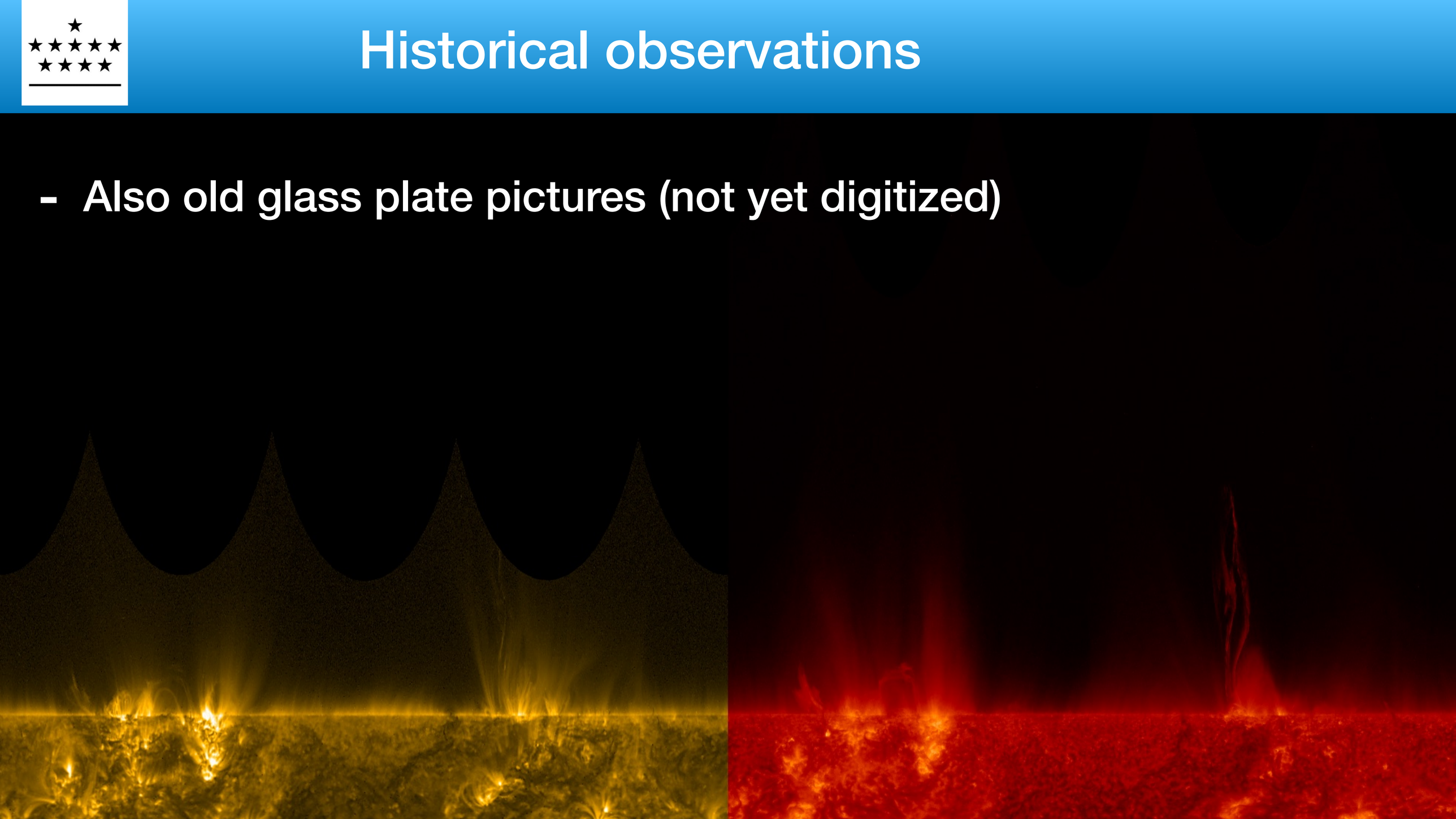




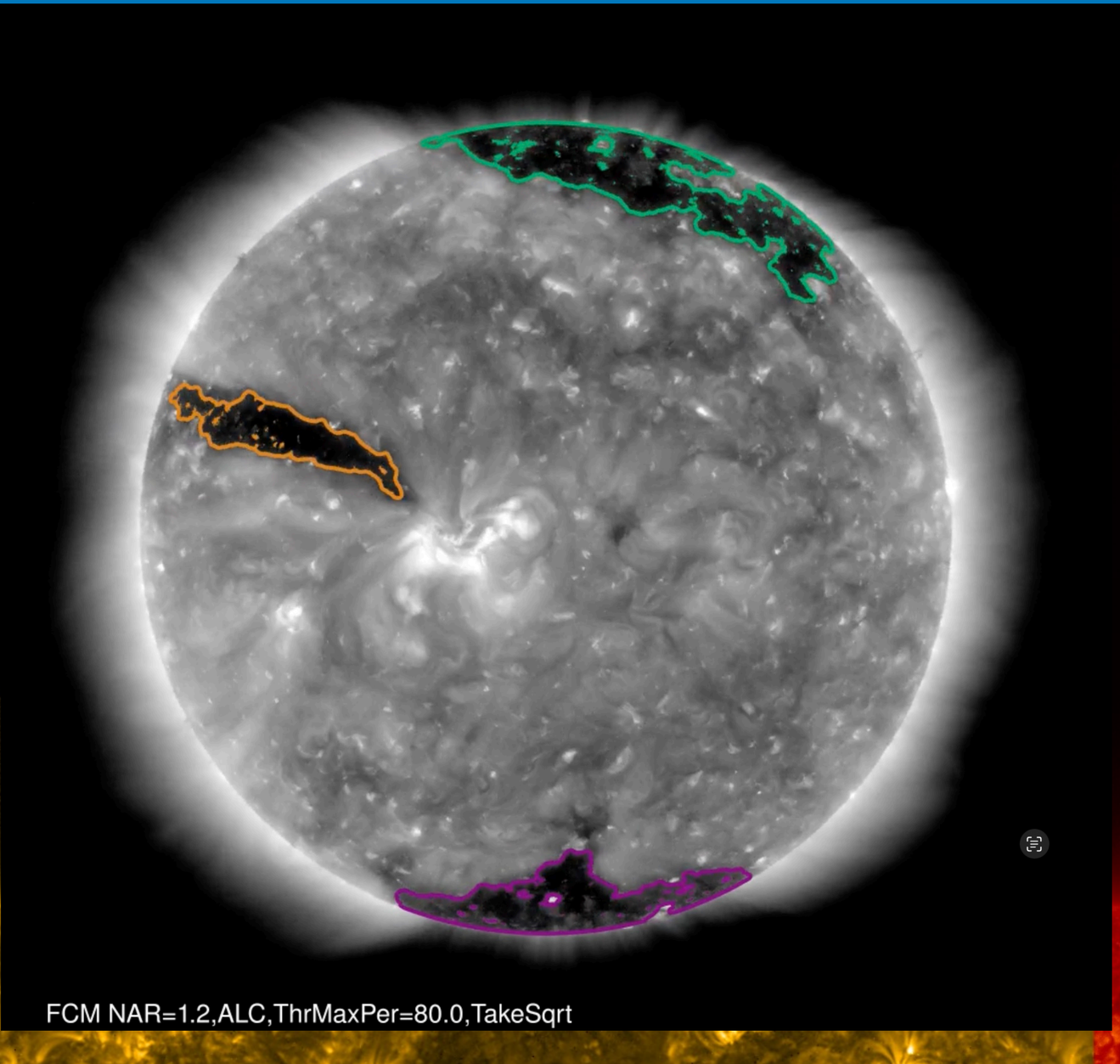


Historical observations

- Also old glass plate pictures (not yet digitized)

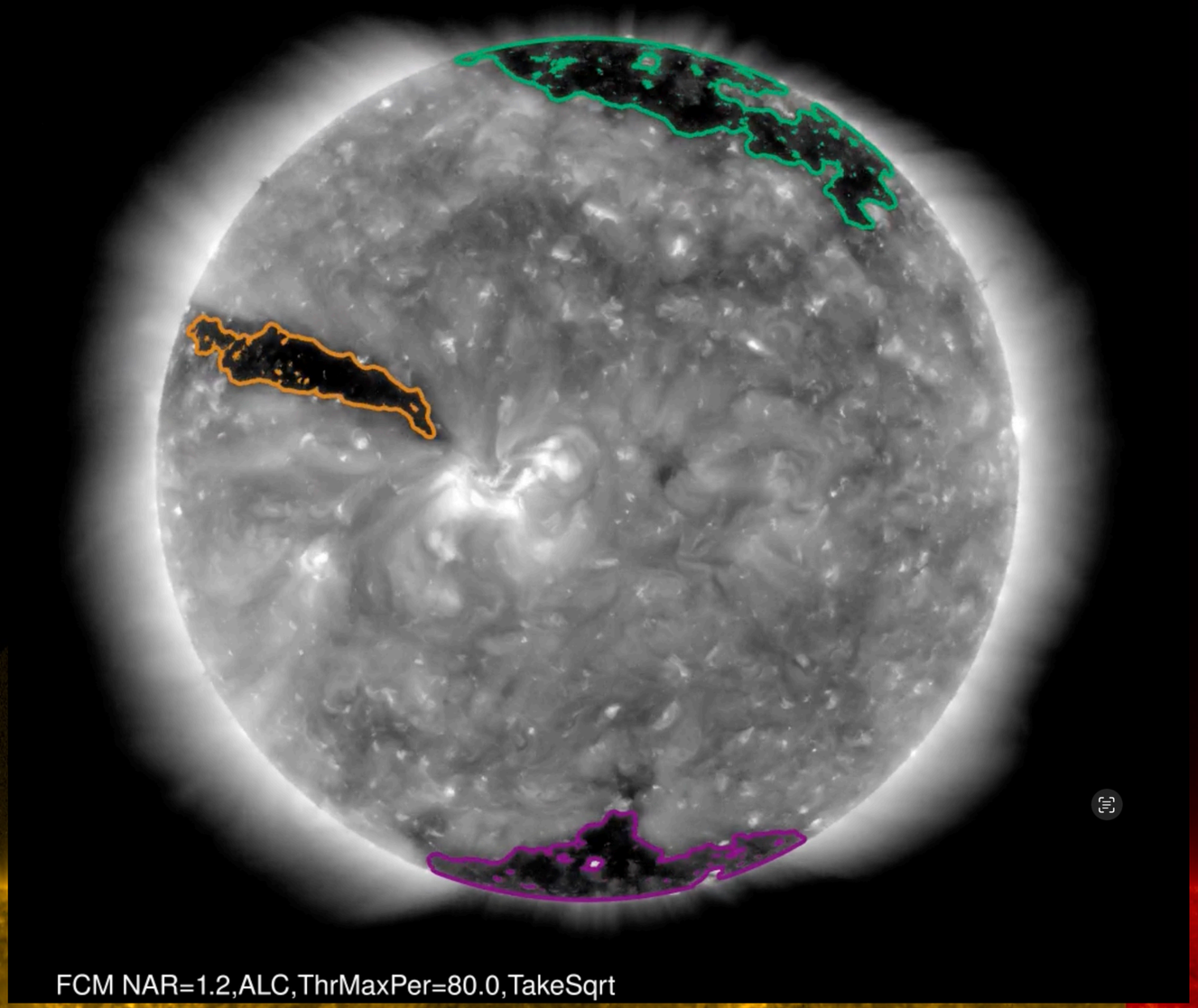


Detections on observations



SPoCA

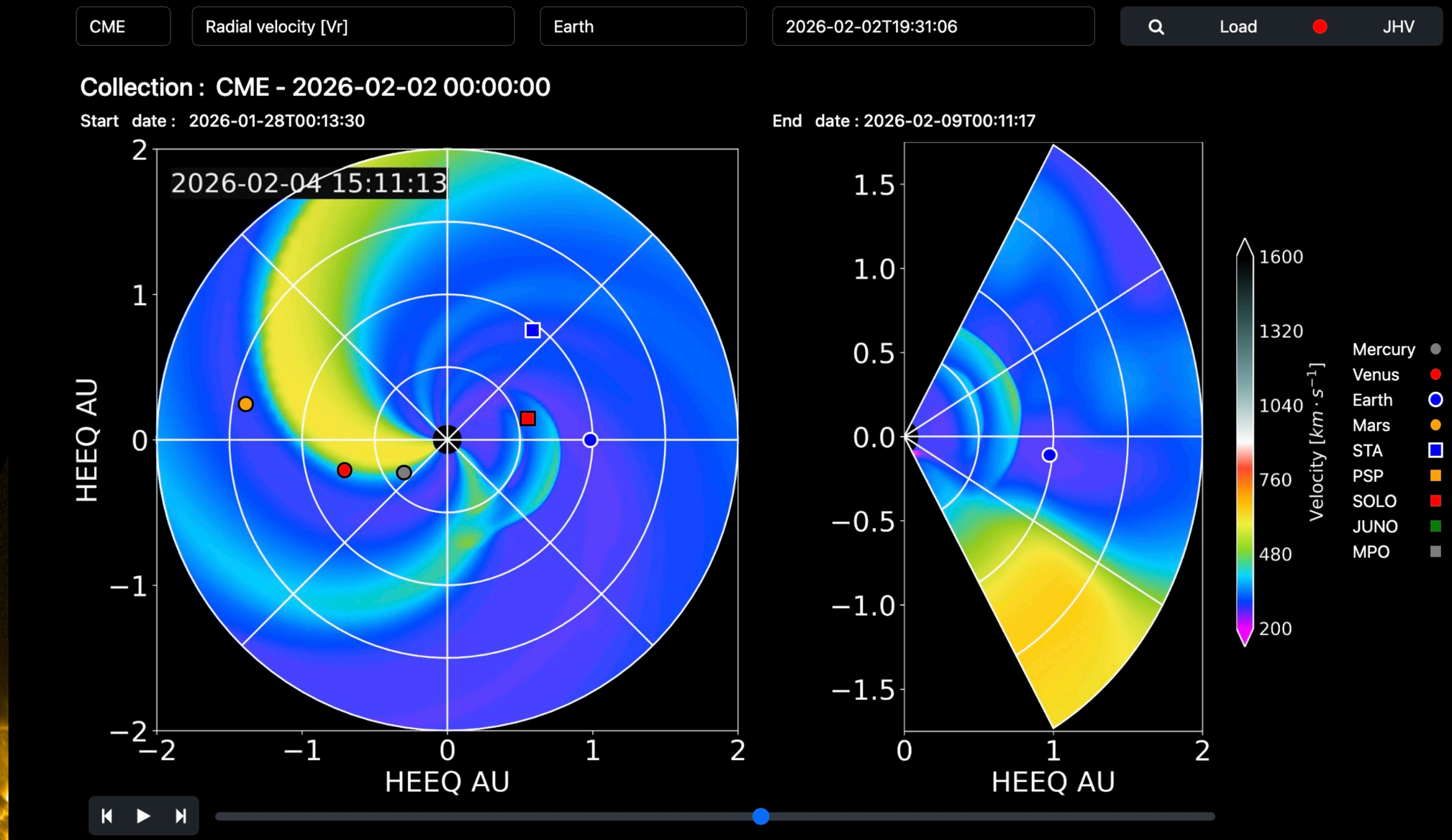
Detections on observations



SPoCA

May point to external data outside of the control of the provider (dataset cannot be repeated due to technical reasons e.g. too large)

Simulation data



Events / Forecast / Alerts

Observations
Field1
…

Detections
Field1
…

Algorithms
Field1
…

Annotations
Field1
…

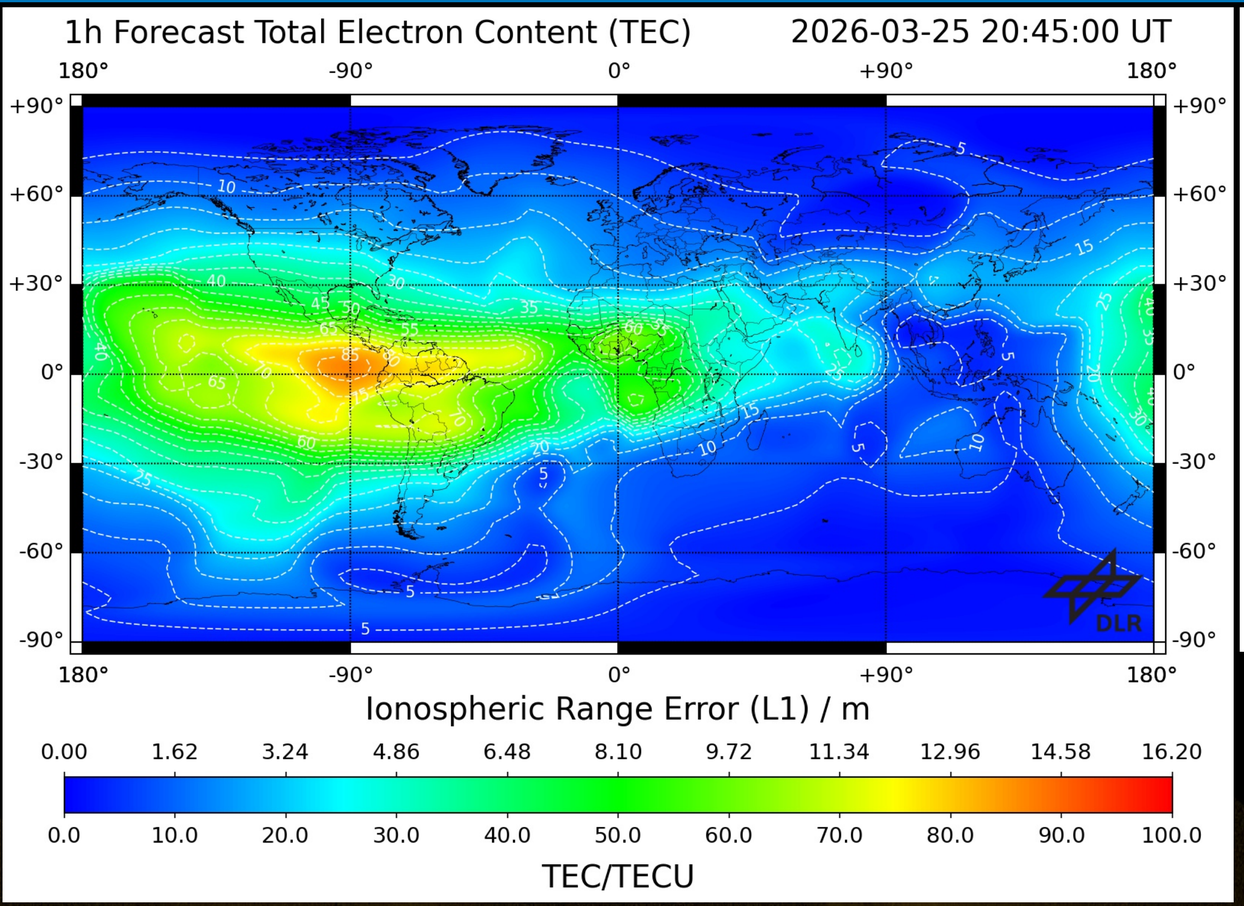
Concepts that wrap
Field1
…

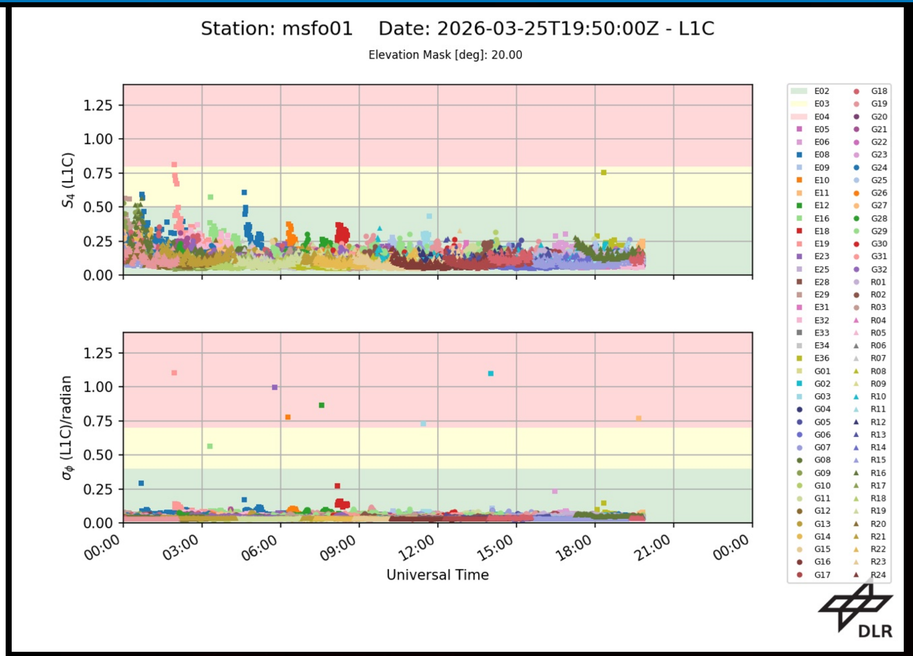
Alerts
Field1
…

Forecasts
Field1
…

Many Links
Field1
Field2
Field3
Field4

Transient dataset (we have a limited amount)





- Fof2
- MUF
- SDO/AIA
- SUVI
- RADIATION data

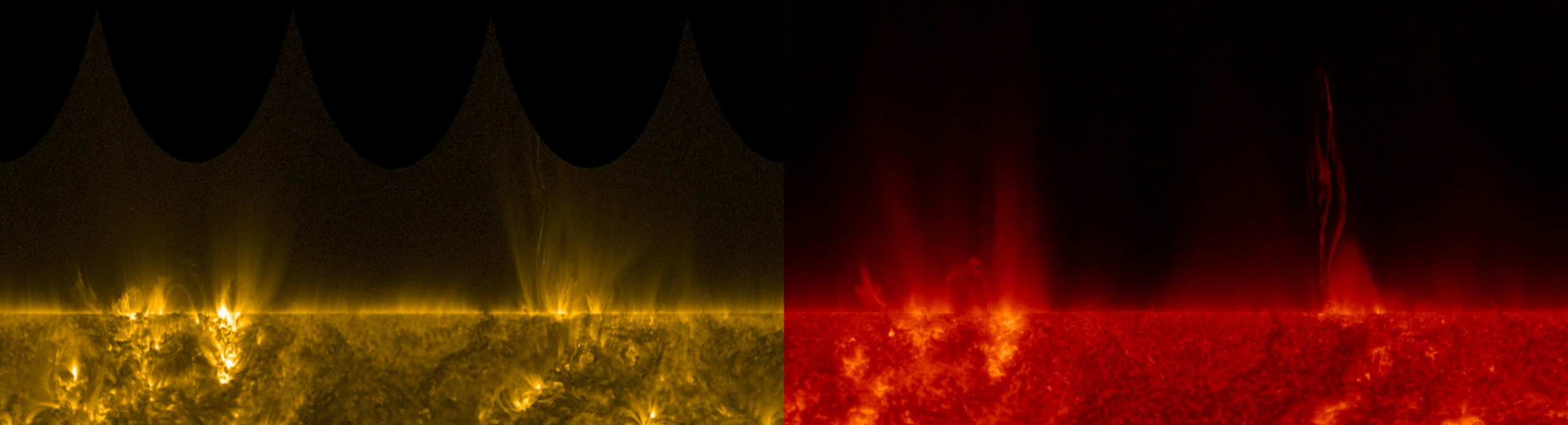
Near-realtime data

- Stereo-A (COR2)
- SOHO LASCO (level 0.5)
- GOES Xray/proton/electron fluxes
  etc.
- In situ solar wind measurements
- Magnetic parameters at/near earth
  or in situ

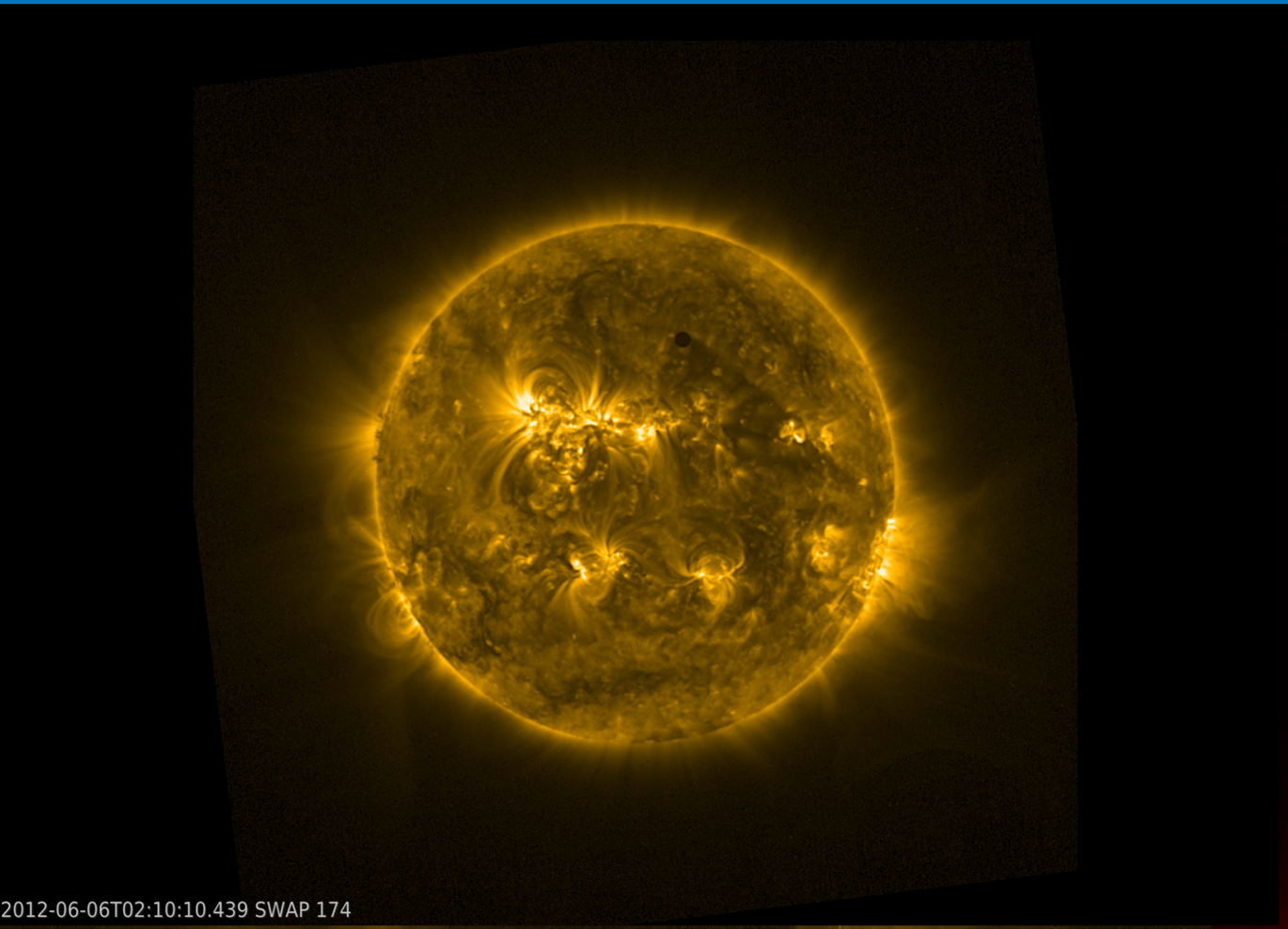
We tend to keep an archive on some of those
(also for validation purposes)

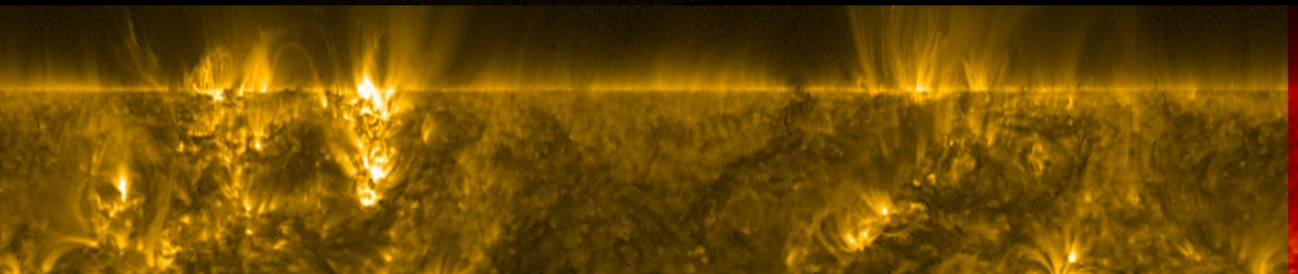
Near-realtime data

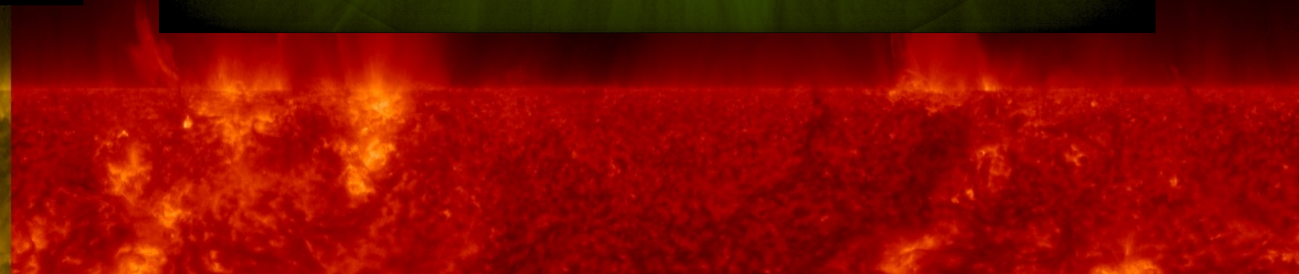
GOES series datasets (near-realtime) sometimes switch their primary/secondary satellite and from satellite to satellite



Space(craft) observations (generic)







Space(craft) observations (generic)

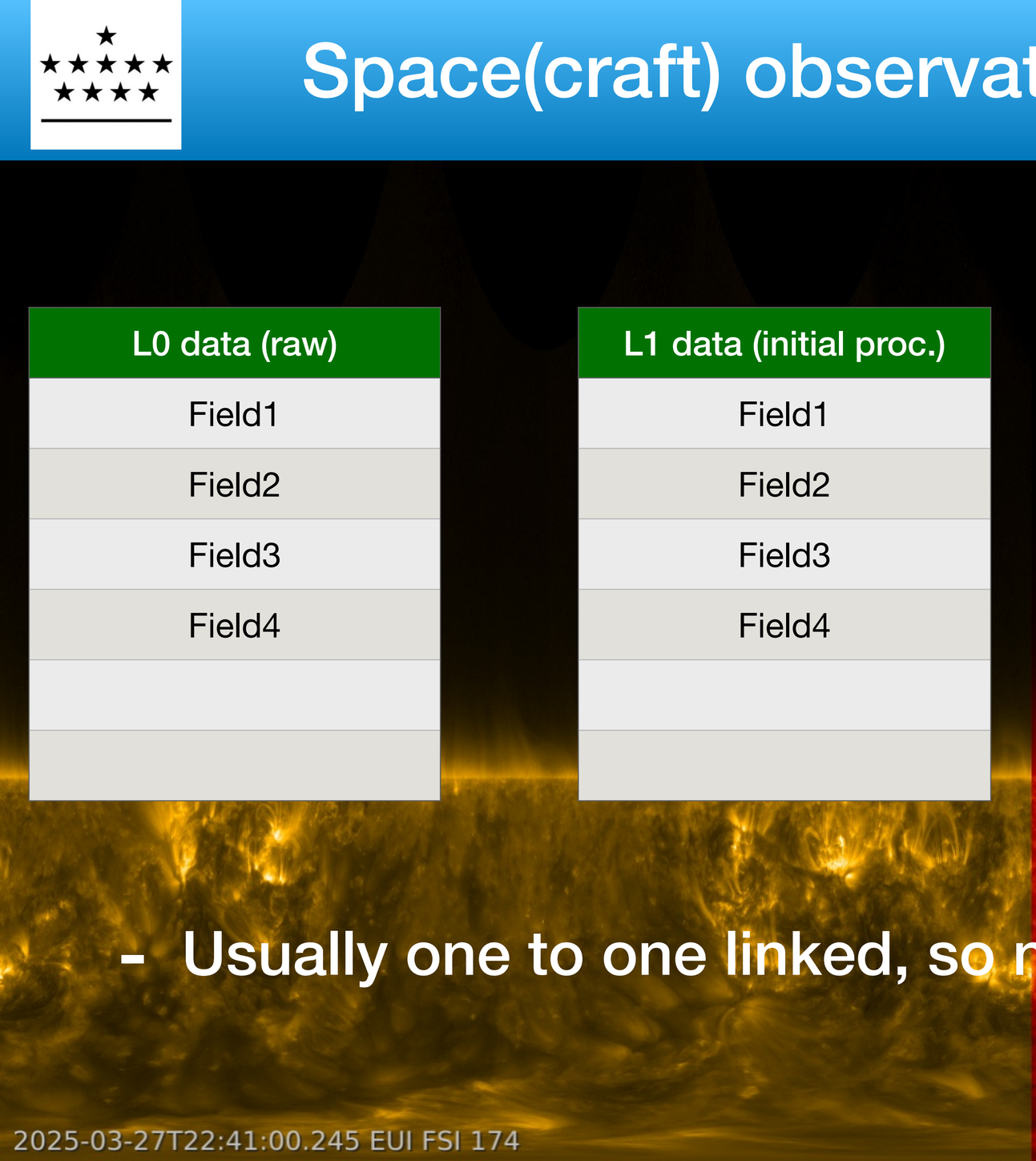
L0 data (raw)
Field1
Field2
Field3
Field4

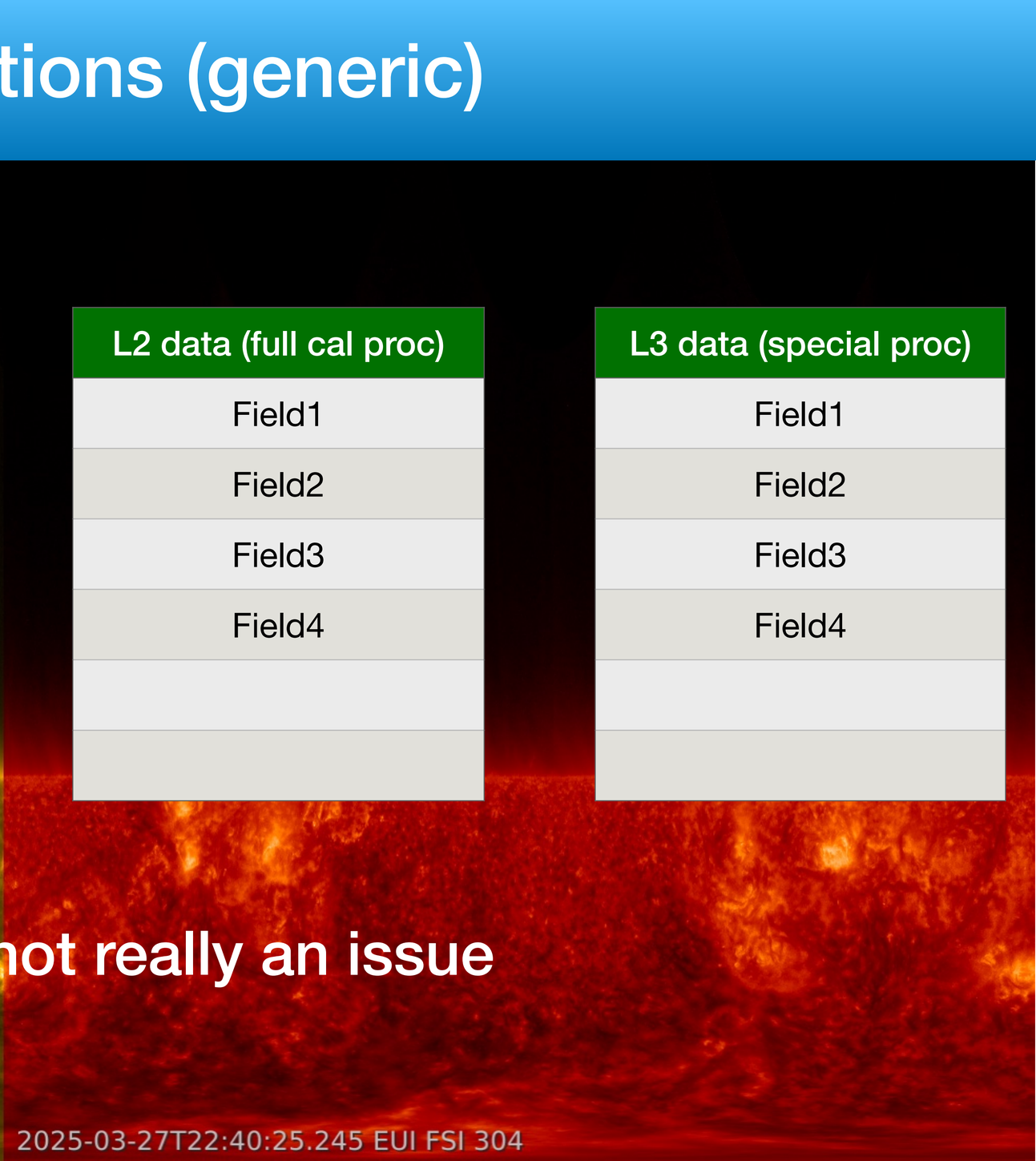
L1 data (initial proc.)
Field1
Field2
Field3
Field4

L2 data (full cal proc)
Field1
Field2
Field3
Field4

L3 data (special proc)
Field1
Field2
Field3
Field4

- Usually one to one linked, so not really an issue





Space(craft) observations (generic)

L0 data (raw)
Field1
Field2
Field3
Field4

Linktable
Field1
Field2
Field3
Field4

L1 data (initial proc.)
Field1
Field2
Field3
Field4

Linktable
Field1
Field2
Field3
Field4

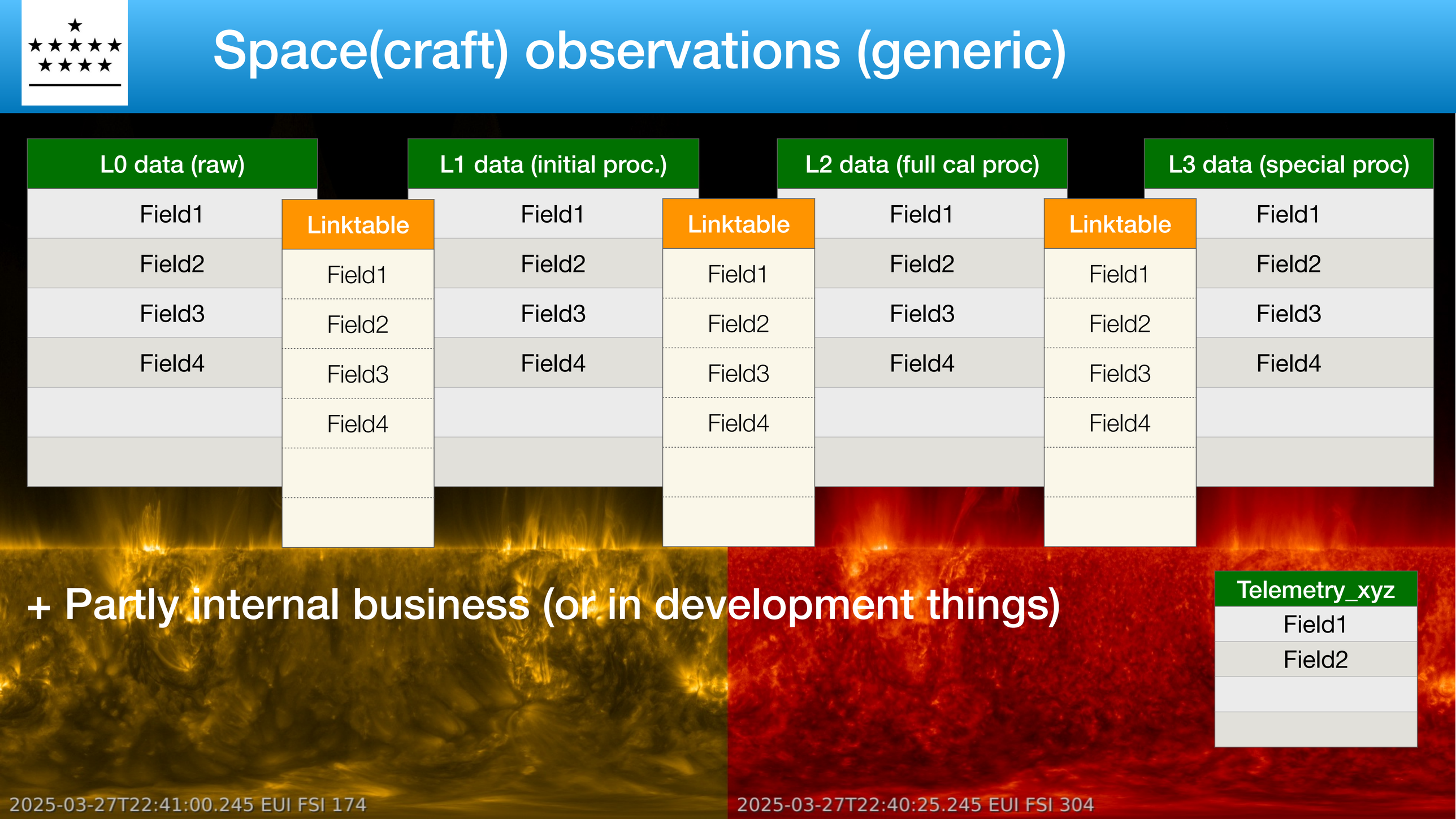
L2 data (full cal proc)
Field1
Field2
Field3
Field4

Linktable
Field1
Field2
Field3
Field4

L3 data (special proc)
Field1
Field2
Field3
Field4

+ Partly internal business (or in development things)

Telemetry_xyz
Field1
Field2



Space(craft) observations (versioning)

L0 data (raw)
L0_v2 data (raw)
L0_v3 data (raw)
Field1
Field2
Field3
Field4

L1 data (cal proc.)
L1_v2 data (cal proc.)
L1_v2 data (cal proc.)
Field1
Field2
Field3
Field4

L2 data (astrophys proc)
L2_v2 data (astrophys proc)
L2_v3 data (astrophys proc)
Field1
Field2
Field3
Field4

L3 data (special proc)
L3_v2 data (special proc)
L3_v3 data (special proc)
Field1
Field2
Field3
Field4

- How to deal with data that is updated ?
- How to “hide” part of the internal business?
- Is there a standardized way?

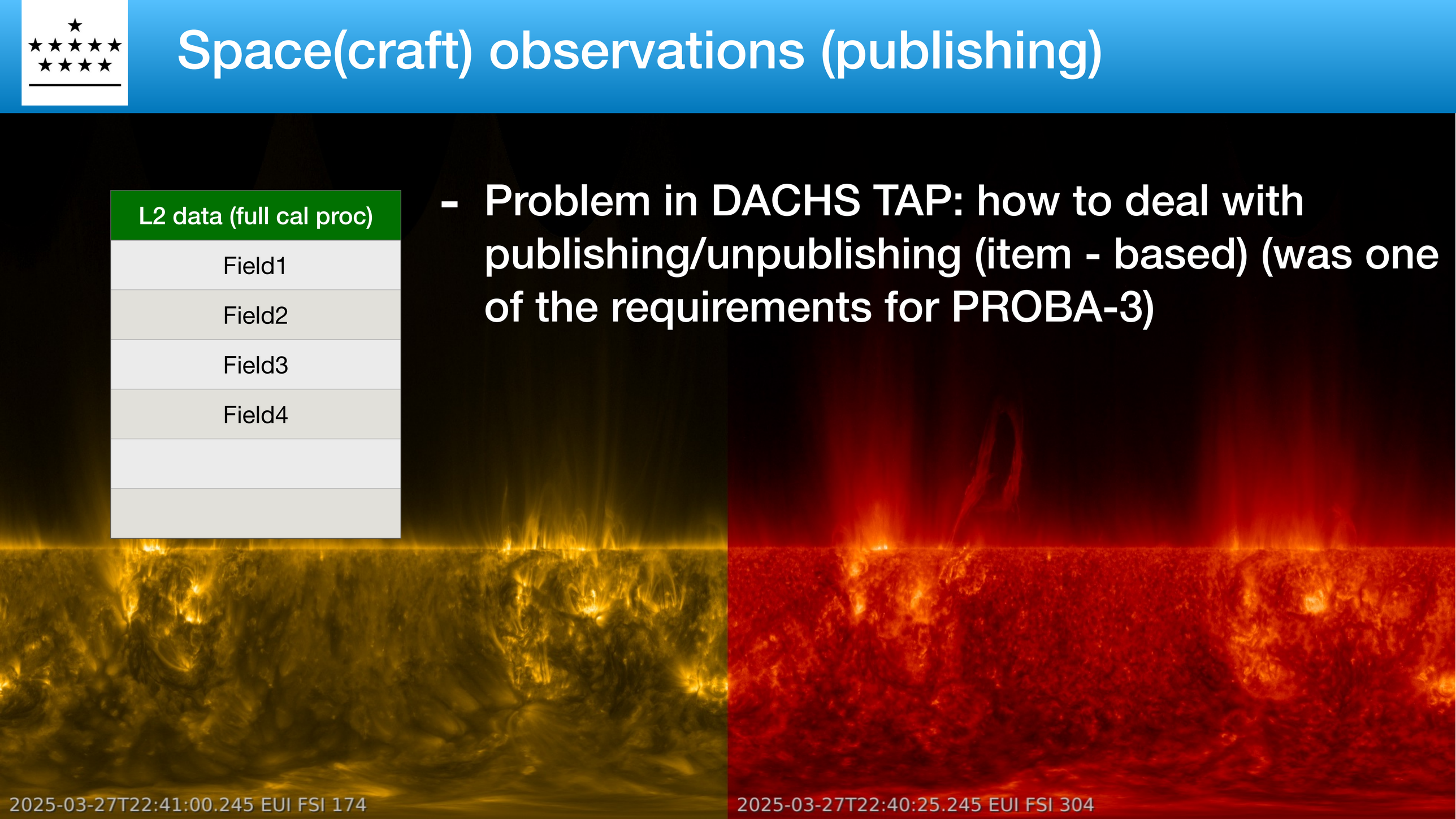
Derived images
Field1
Field2

Telemetry_xyz
Field1
Field2

Space(craft) observations (publishing)

L2 data (full cal proc)
Field1
Field2
Field3
Field4

- Problem in DACHS TAP: how to deal with publishing/unpublishing (item - based) (was one of the requirements for PROBA-3)

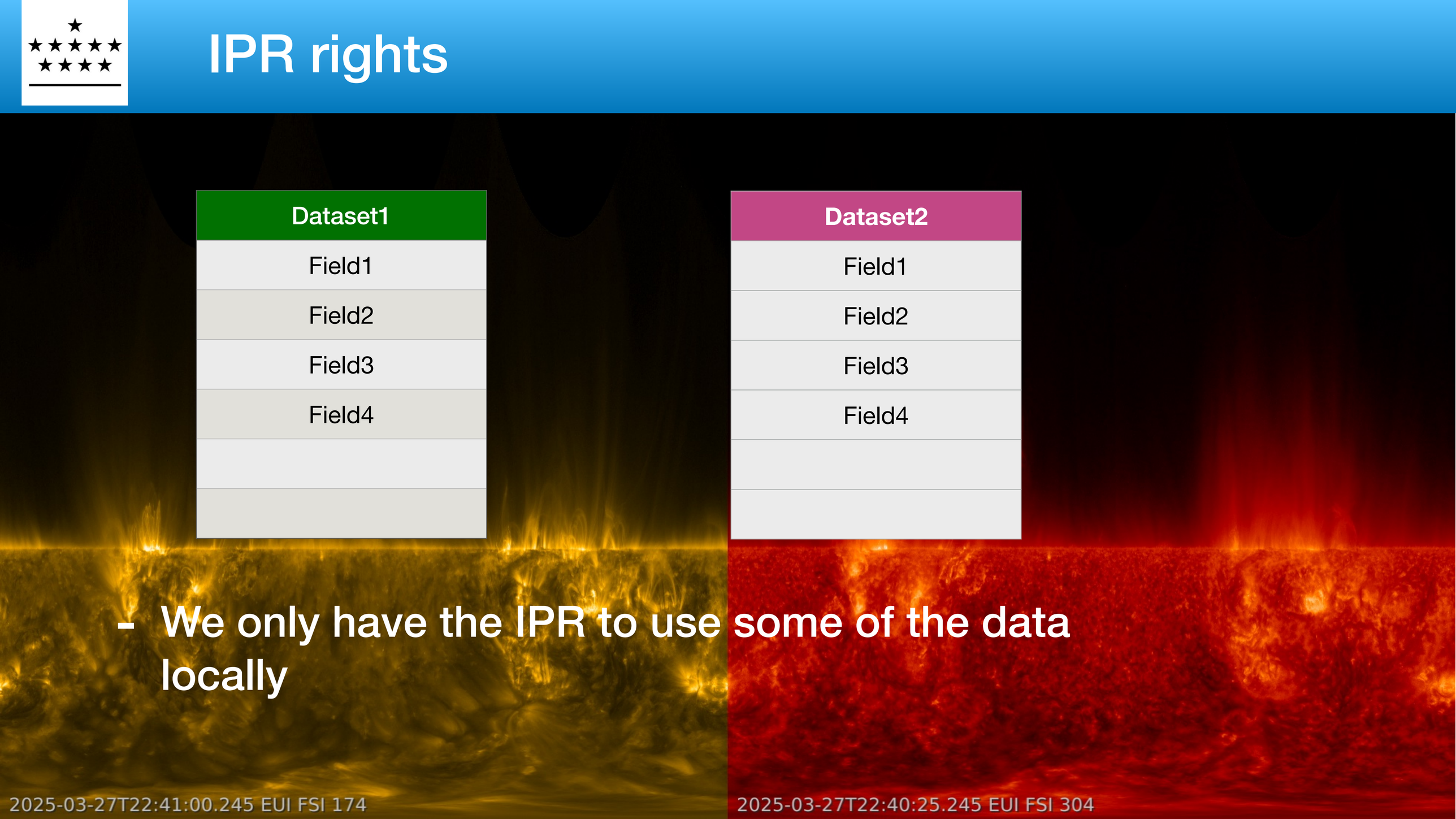


IPR rights

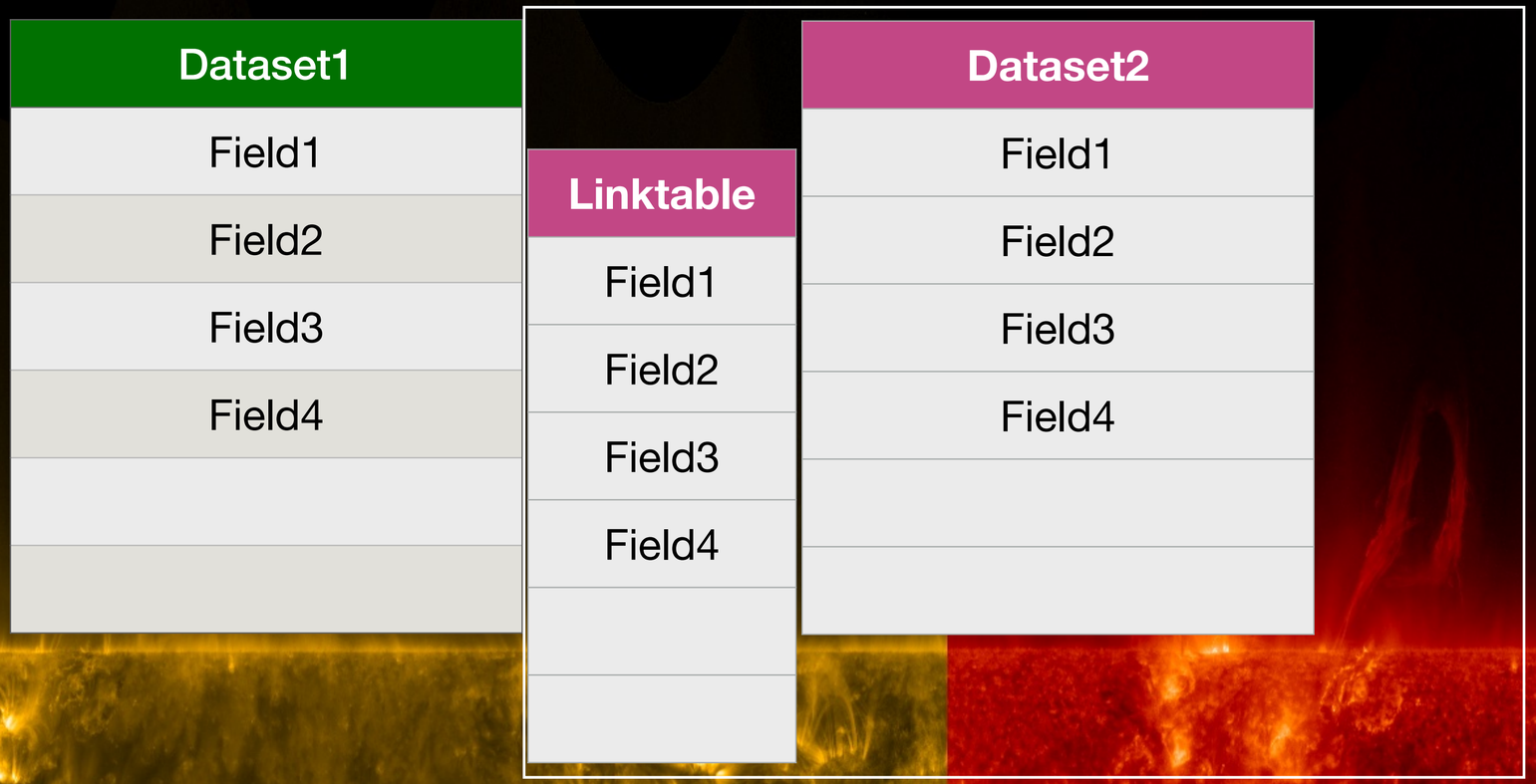
Dataset1
Field1
Field2
Field3
Field4

Dataset2
Field1
Field2
Field3
Field4

- We only have the IPR to use some of the data locally



IPR rights



→ No IPR

- We only have the IPR to use the data locally (yet local distribution is interesting)

2025-03-27T22:41:00.245 EUI FSI 174

2025-03-27T22:40:25.245 EUI FSI 304

Private data/User dependent data(sets)

Dataset1
Field1
Field2
Field3
Telephone number

- Do not expose

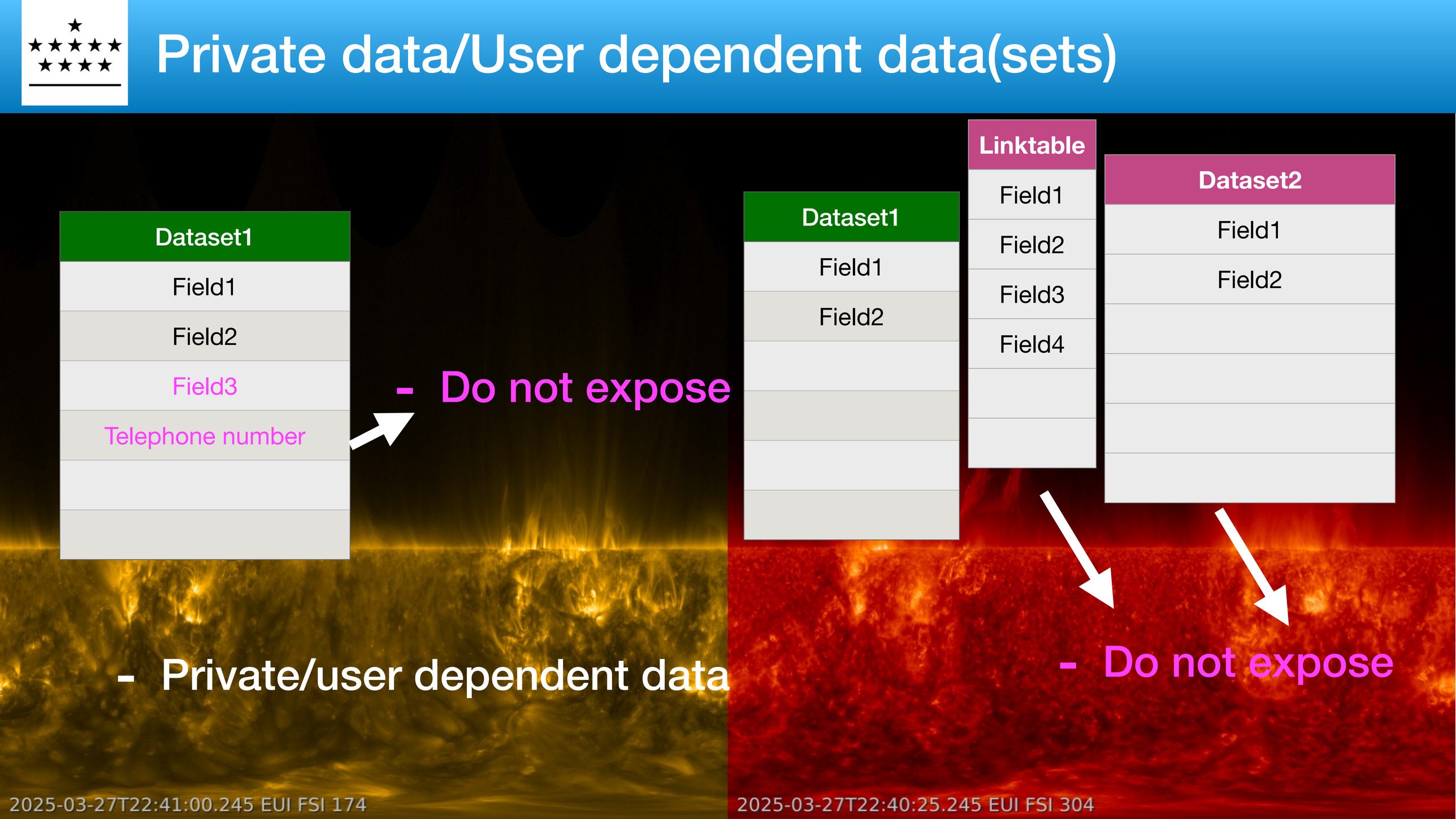
- Private/user dependent data

Dataset1
Field1
Field2

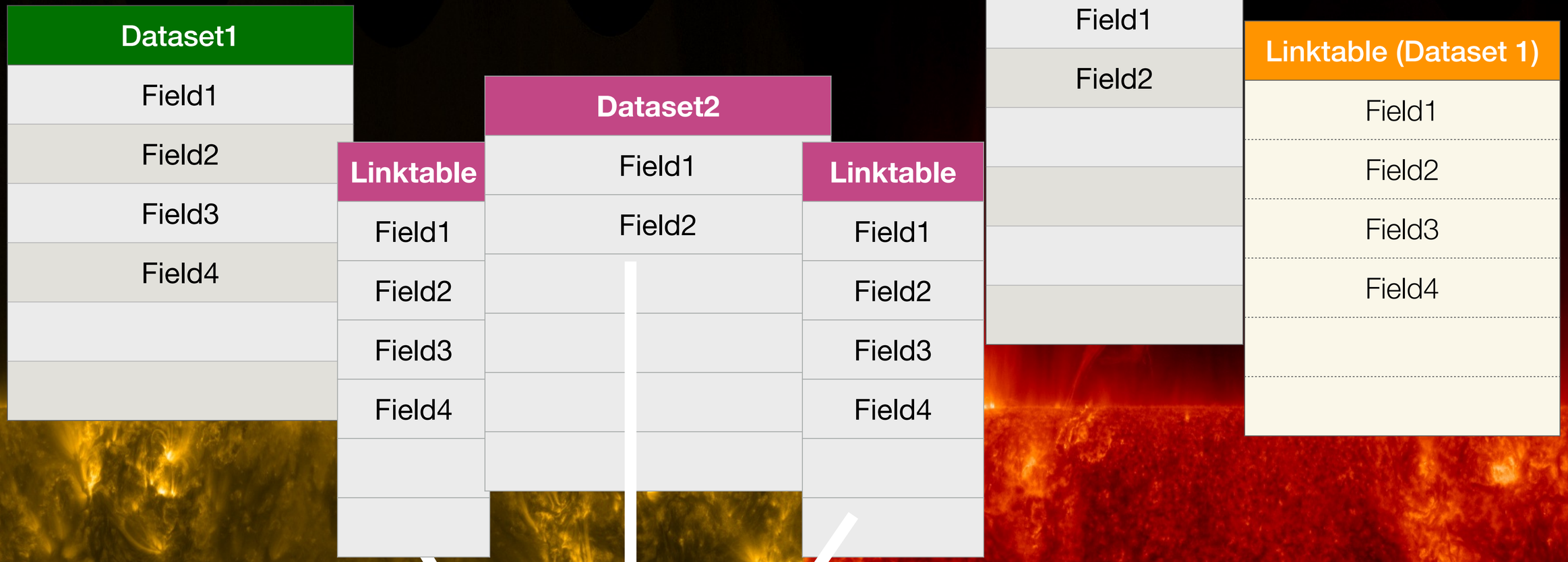
Linktable
Field1
Field2
Field3
Field4

Dataset2
Field1
Field2

- Do not expose



Intermediate data



→ Do not expose to avoid confusion

Events / Forecast / Alerts

Observations
Field1
…

Detections
Field1
…

Algorithms
Field1
…

Annotations
Field1
…

Concepts that wrap
Field1
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Alerts
Field1
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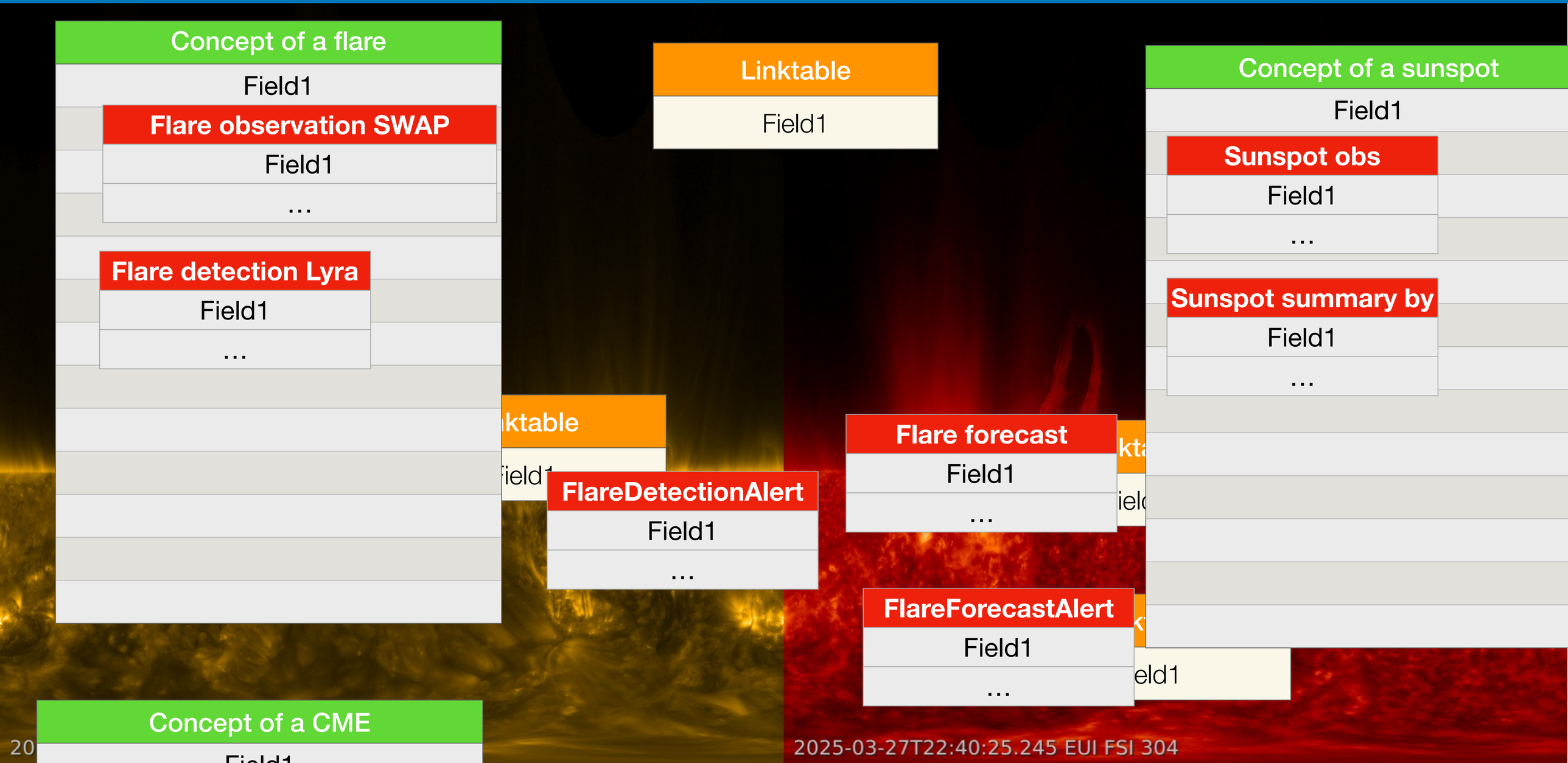
Forecasts
Field1
…

Many Links
Field1
Field2
Field3
Field4

Events / Forecast / Alerts

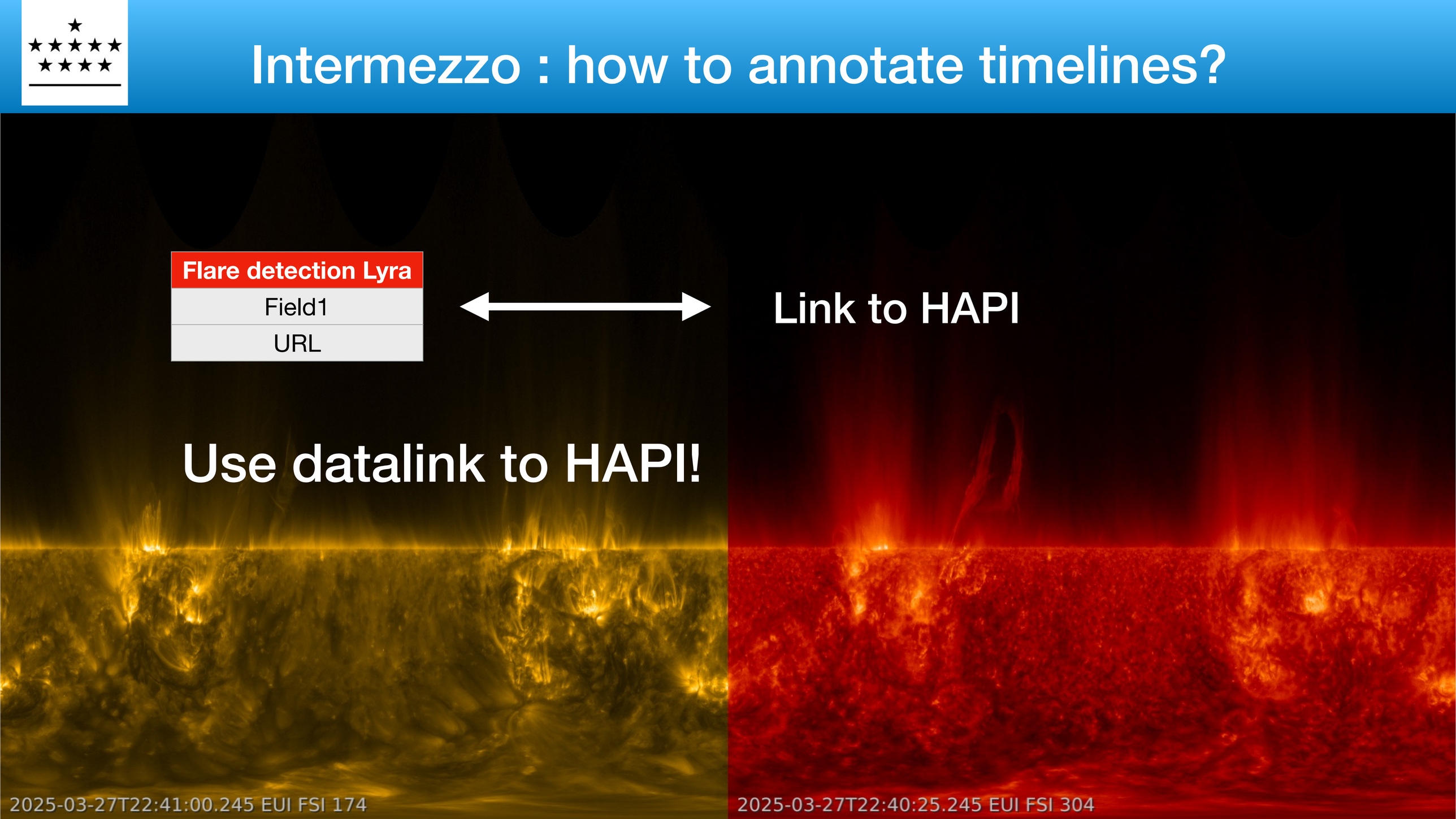


Intermezzo : how to annotate timelines?

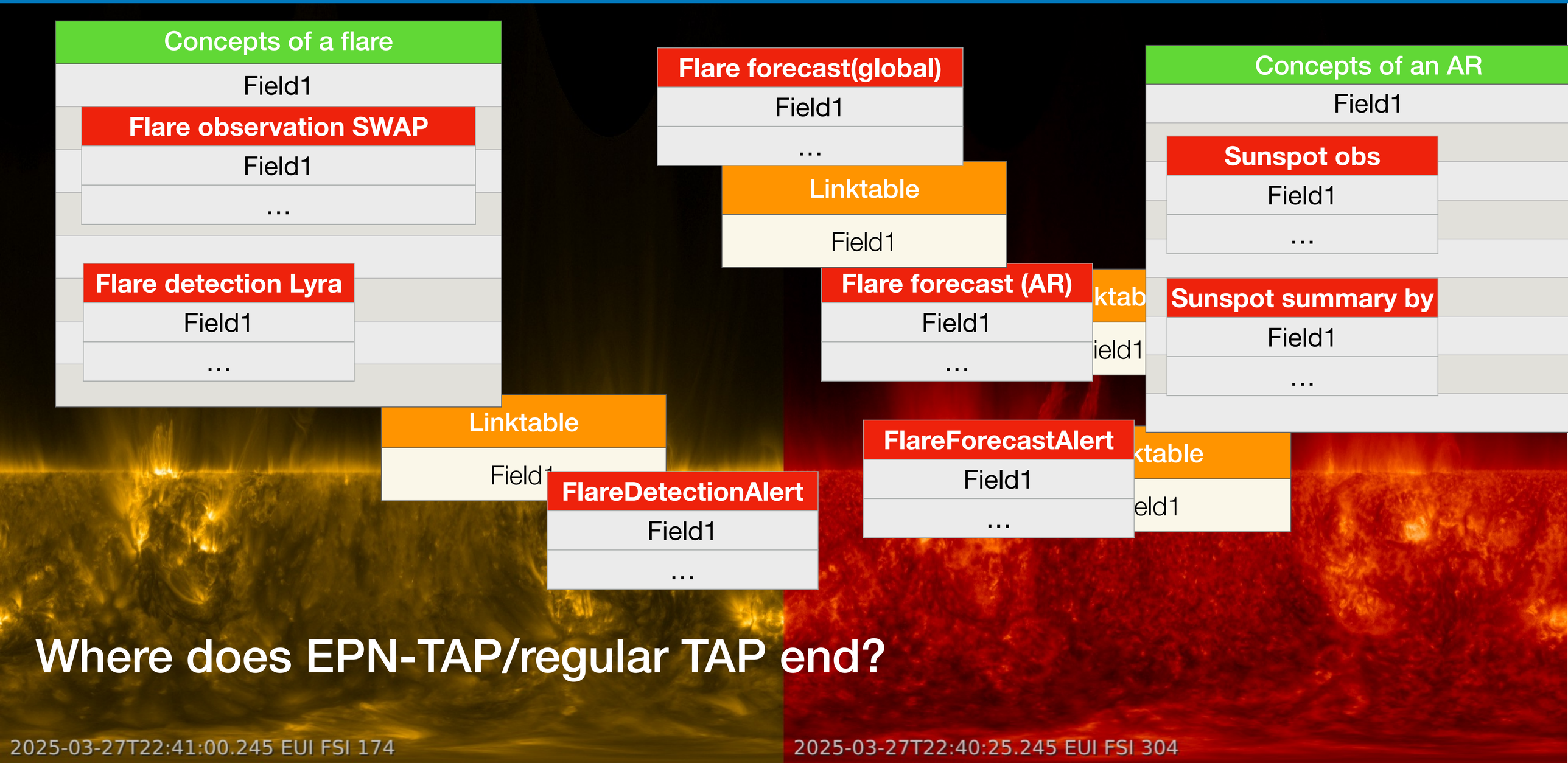
Flare detection Lyra
Field1
URL

Link to HAPI

Use datalink to HAPI!

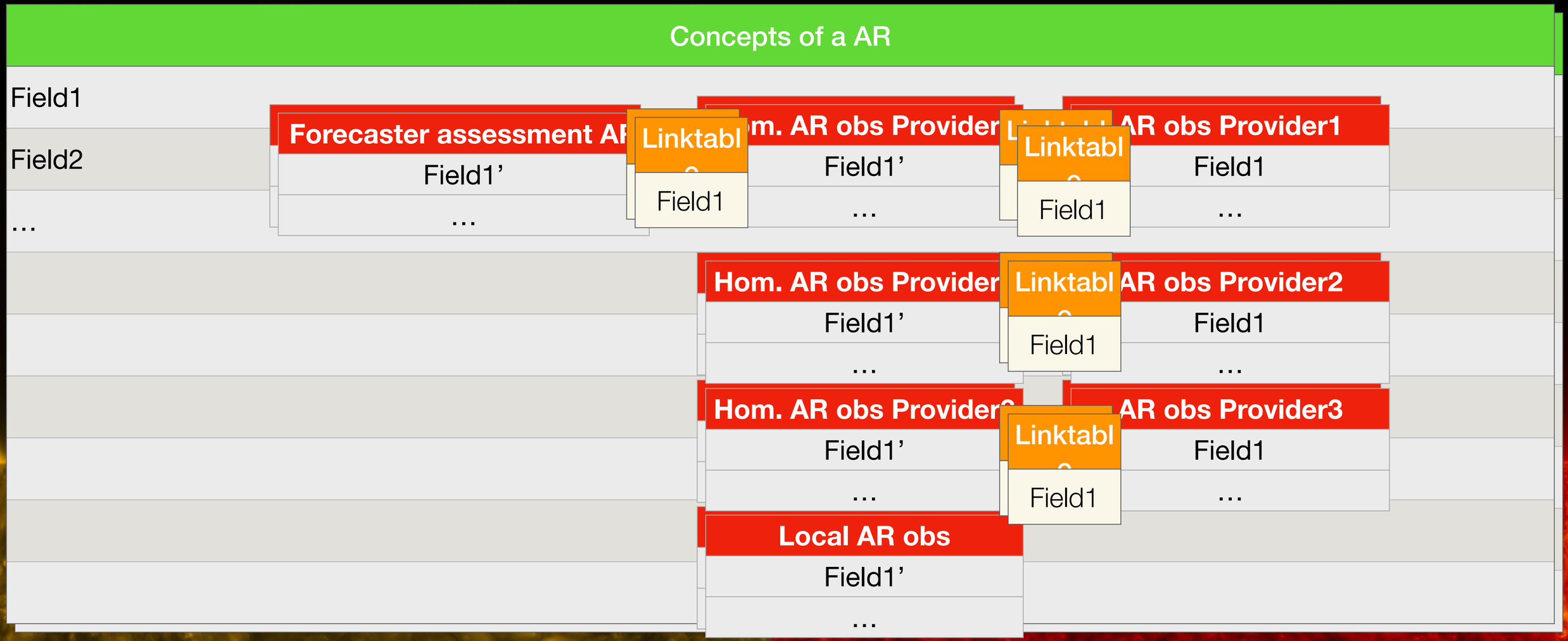


Borders of EPN-TAP



Where does EPN-TAP/regular TAP end?

Borders of EPN-TAP



2025-03-27T22:41:00.245 EUI FSI 174

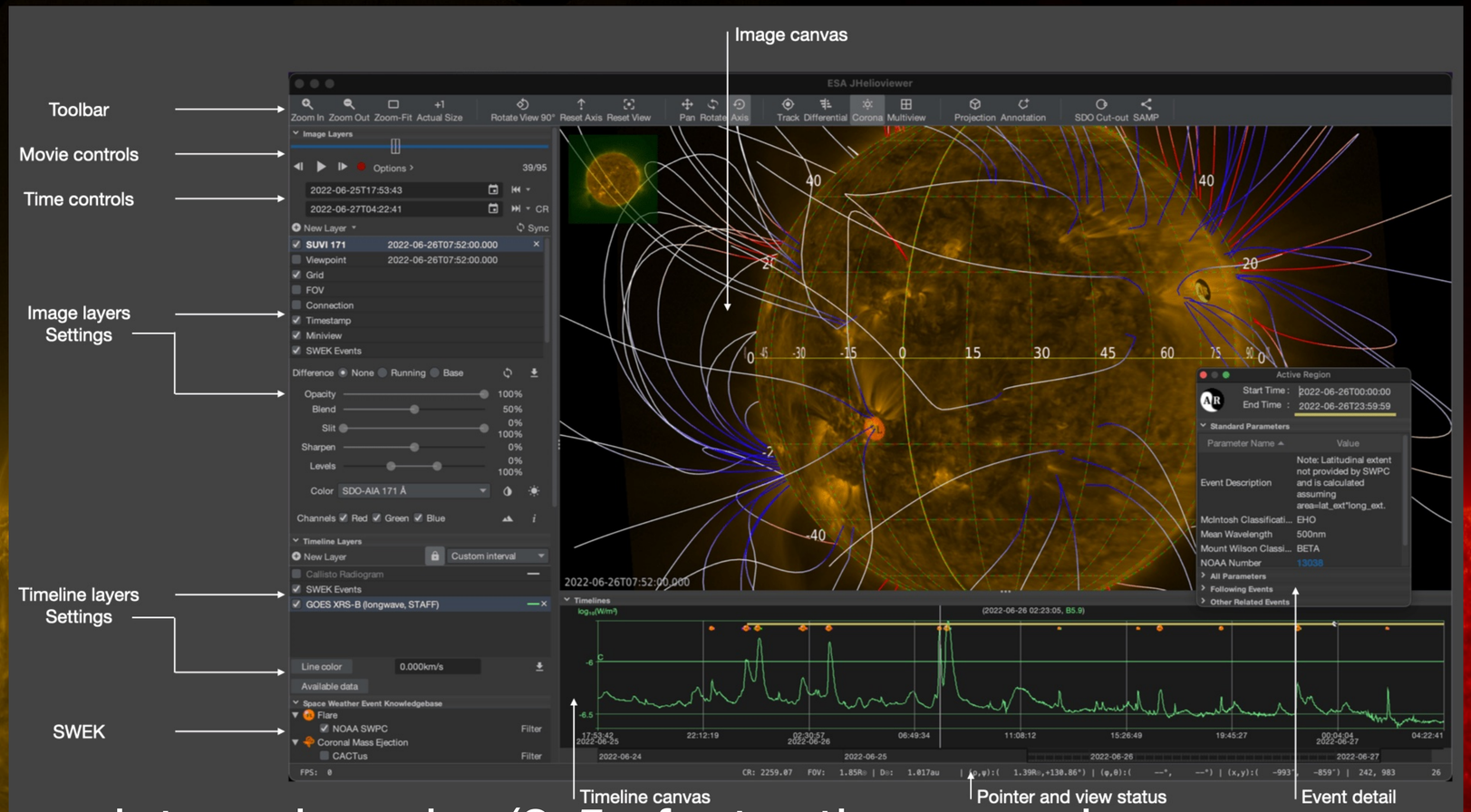
2025-03-27T22:40:25.245 EUI FSI 304

JHelioviewer

https://swhv.oma.be/user_manual/

Uses at its core jp2 images

RPLC; progressive in resolution
Layer/Resolution/Quality/Progression



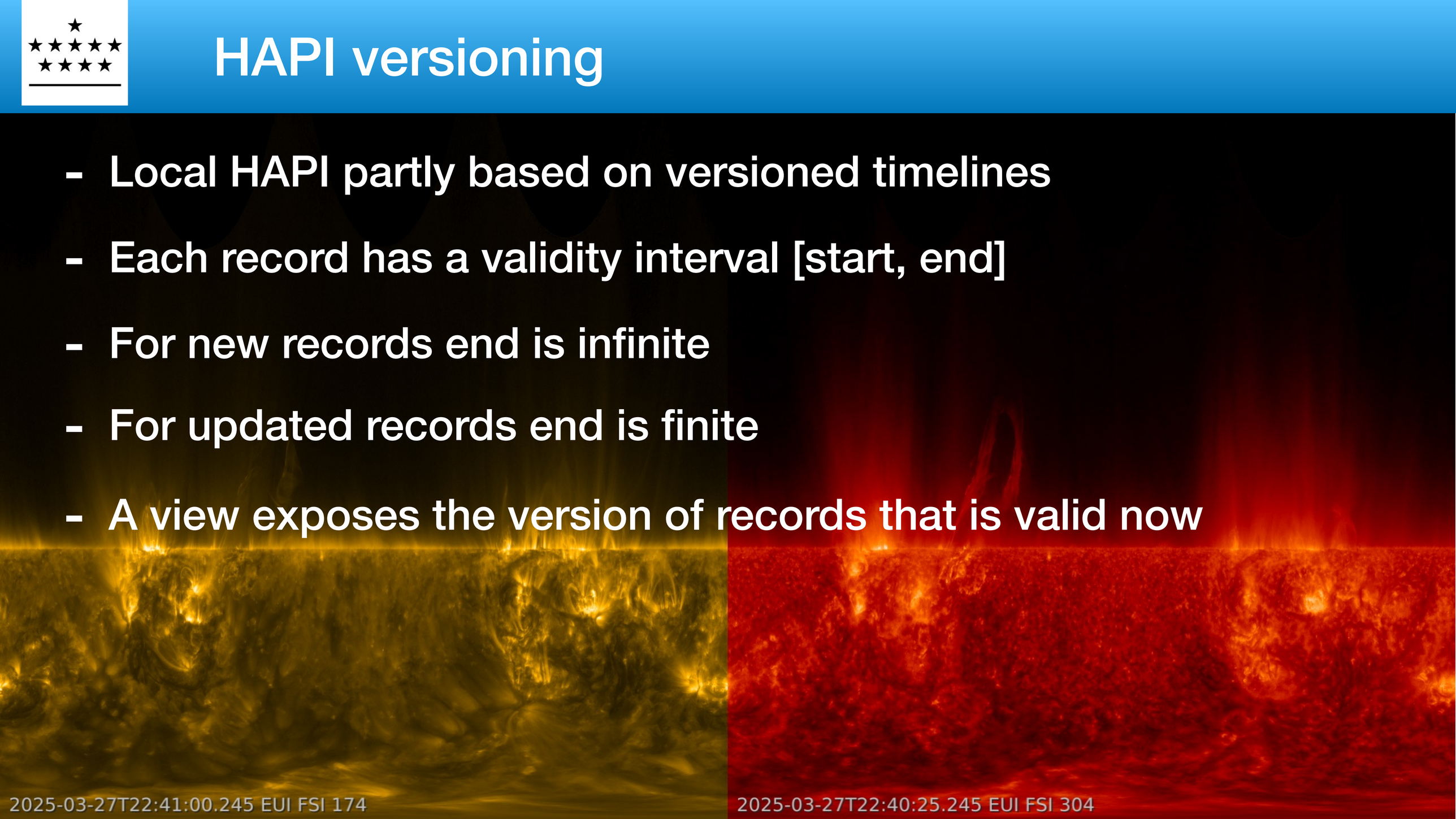
Downside: proprietary decoder (2-5x faster than openjpeg, was very relevant in the past)

2025-03-27T22:41:00.245 EUI FSI 174

2025-03-27T22:40:25.245 EUI FSI 304

HAPI versioning

- Local HAPI partly based on versioned timelines
- Each record has a validity interval [start, end]
- For new records end is infinite
- For updated records end is finite
- A view exposes the version of records that is valid now



HAPI versioning (intermezzo)

- Local HAPI partly based on versioned timelines
- Each record has a validity interval [start, end]
- For new records end is infinite
- For updated records end is finite
- A view exposes the version of records that is valid now

This is what we expose publicly

HAPI (intermezzo)

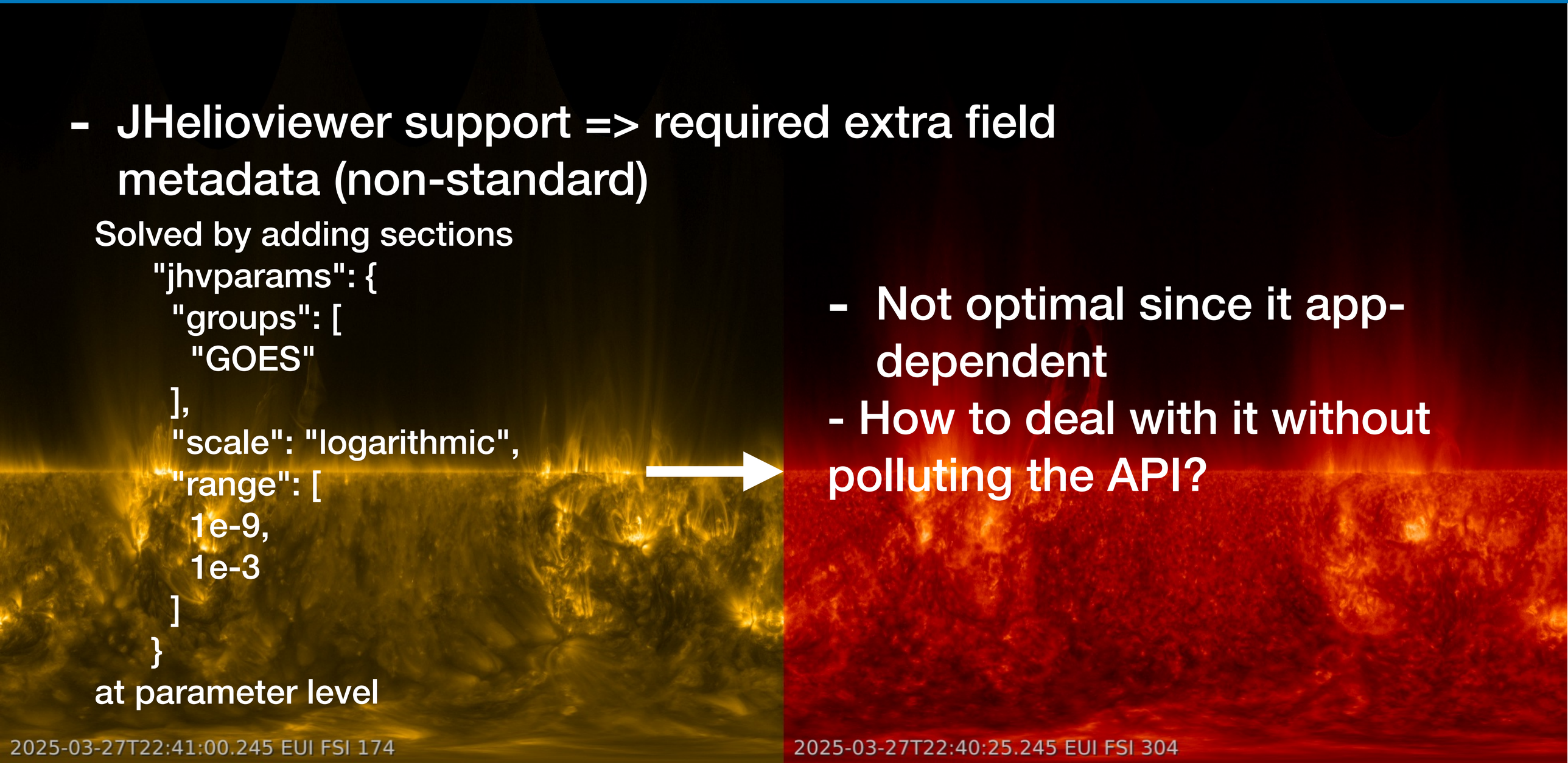
- JHelioviewer support => required extra field metadata (non-standard)

Solved by adding sections

```
"jhvparams": {
 "groups": [
  "GOES"
 ],
 "scale": "logarithmic",
 "range": [
  1e-9,
  1e-3
 ]
}
```

at parameter level

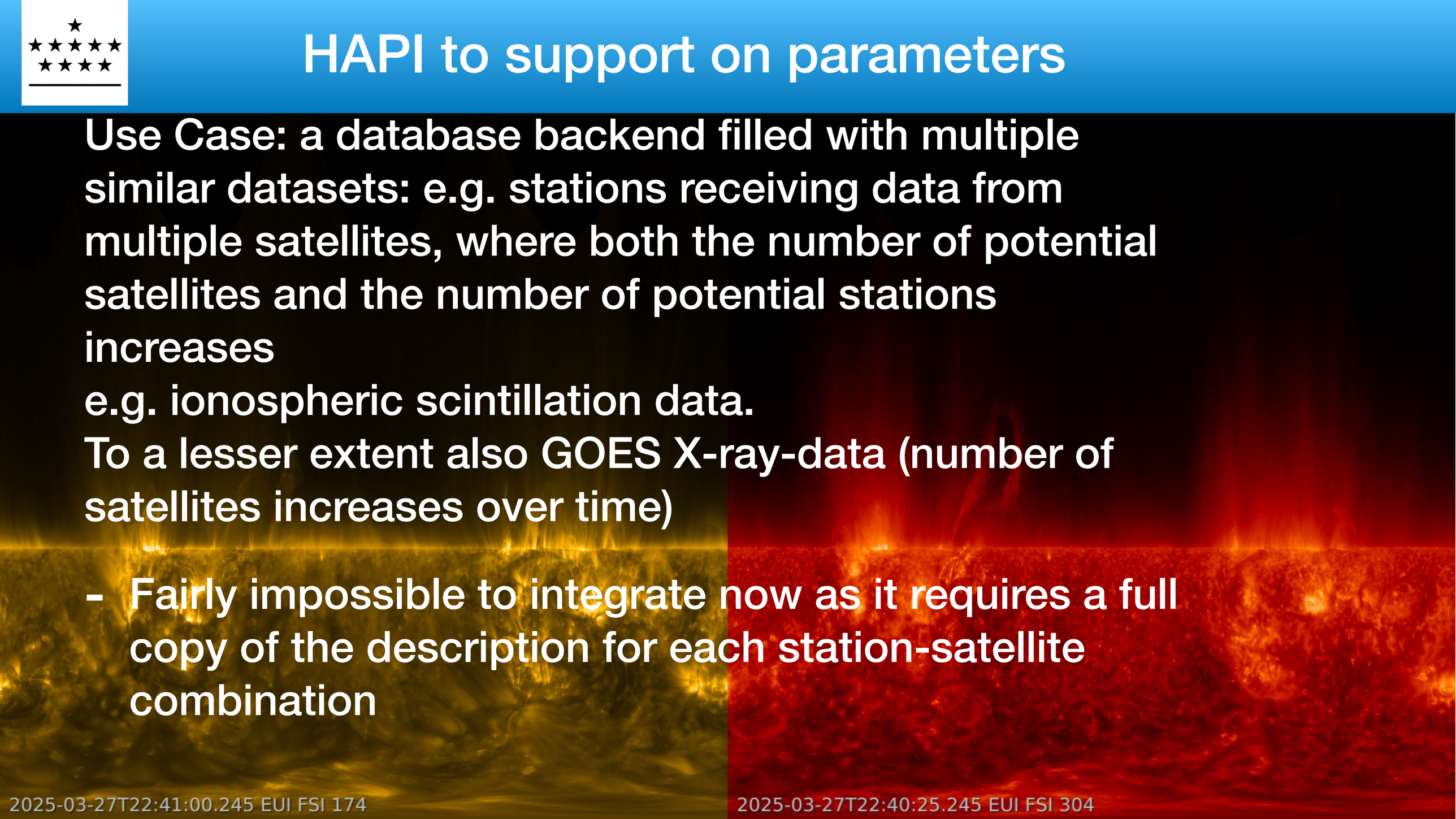
- Not optimal since it app-dependent
- How to deal with it without polluting the API?



HAPI to support on parameters

Use Case: a database backend filled with multiple similar datasets: e.g. stations receiving data from multiple satellites, where both the number of potential satellites and the number of potential stations increases
e.g. ionospheric scintillation data.
To a lesser extent also GOES X-ray-data (number of satellites increases over time)

- Fairly impossible to integrate now as it requires a full copy of the description for each station-satellite combination



HAPI problems

We use locally the node.js version

- Technical problem to send data compressed
- Mitigated by adding the compression on the traefik front layer

- Sometimes crashes (every third month) without obvious reason.