

ASIM observations of thunderstorms – and a proposal for an extended payload on the ISS ASIM+

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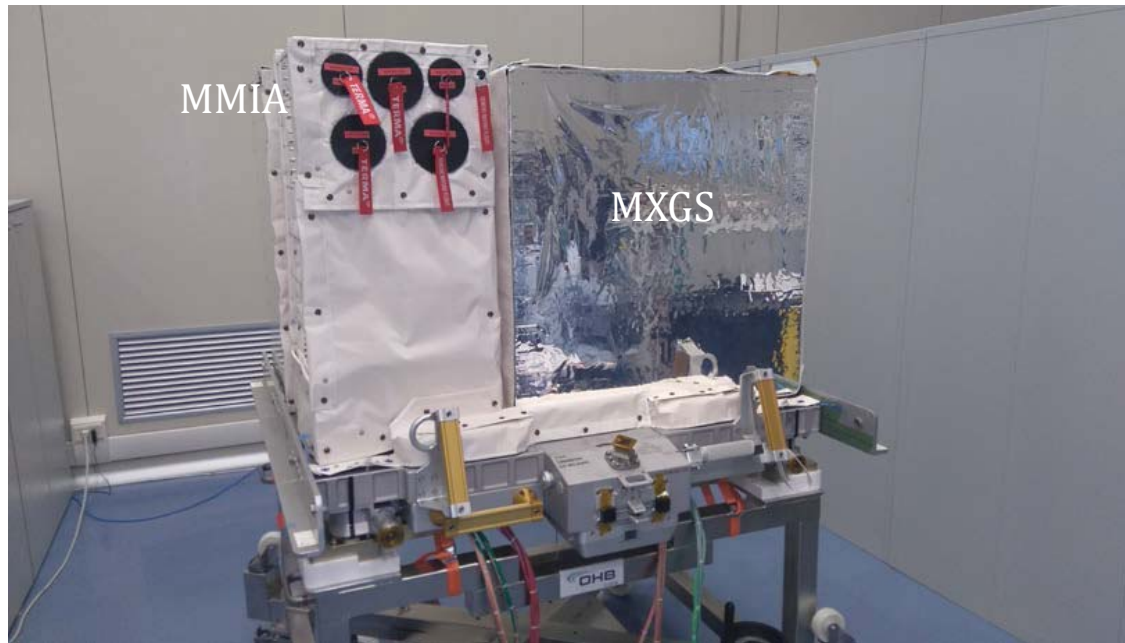
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The instruments



MMIA

Two cameras

- CHU 1: 337.0 nm/5 nm:
- CHU 2: 777.4 nm/3 nm:
- 12 frames/s
- 400 m resolution (nadir)

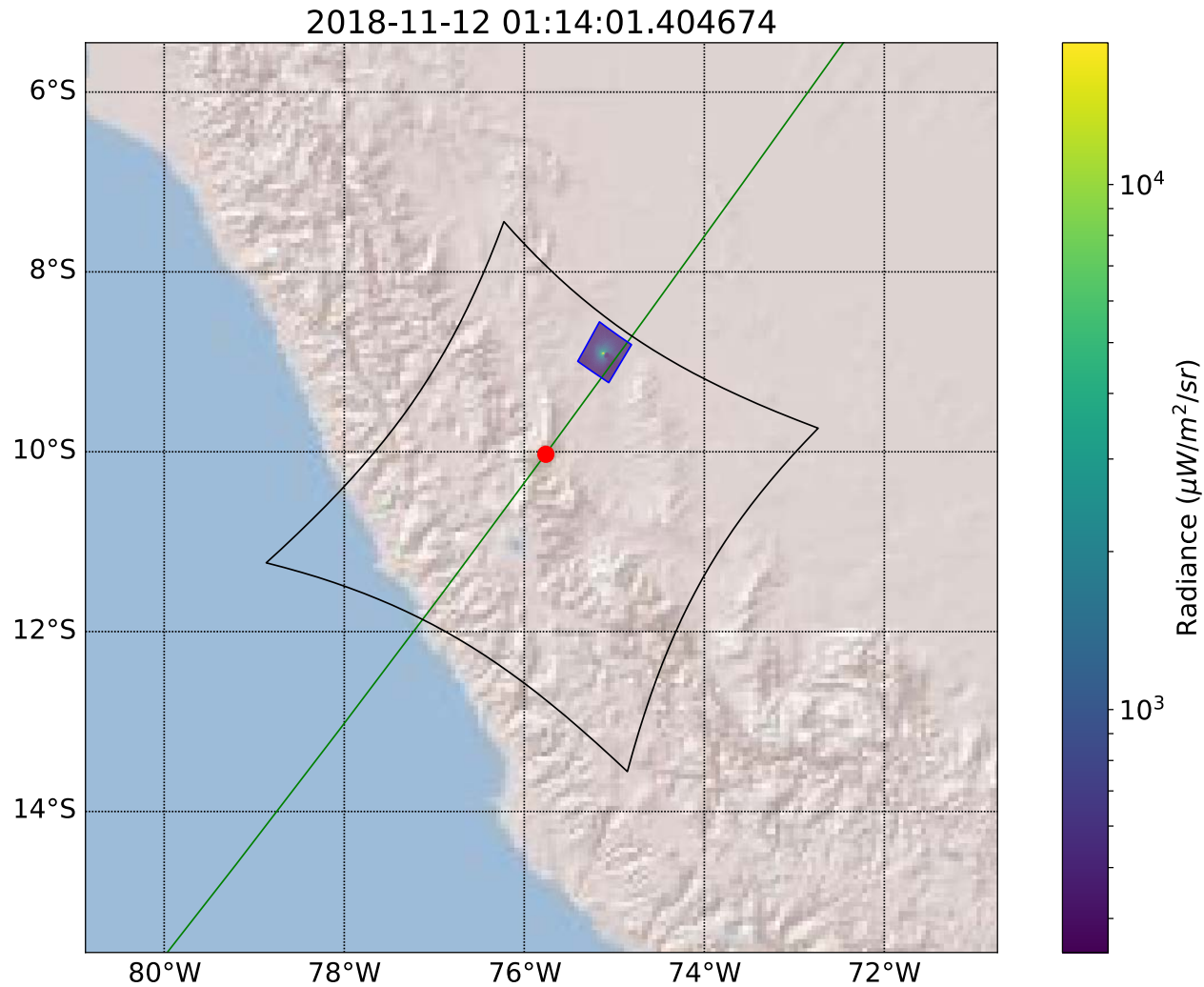
Three photometers

- PHOT 1: 337.0 nm/4 nm
- PHOT 2: 180-230 nm
- PHOT 3: 777.4 nm/5 nm
- 100 kHz sampling

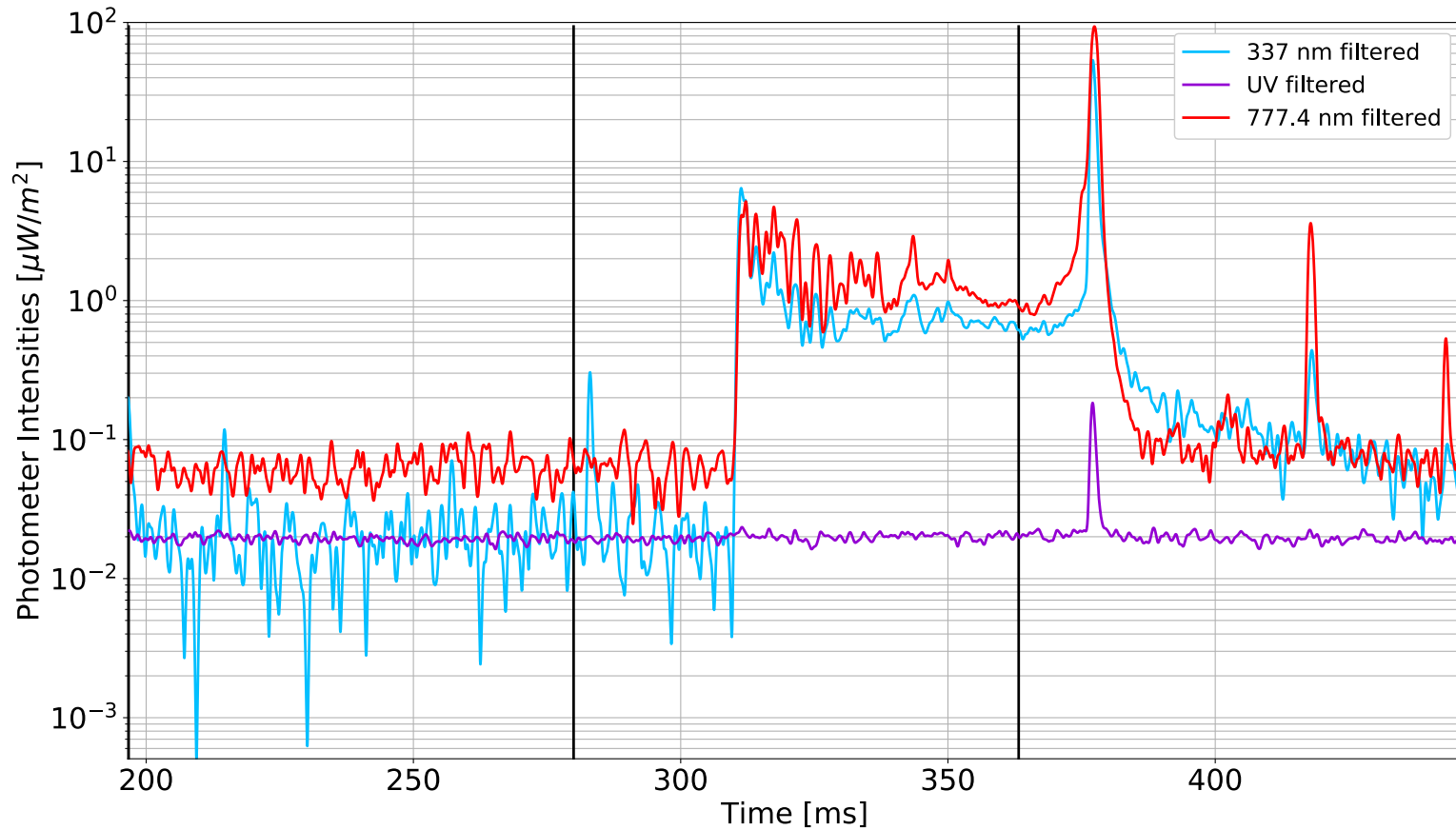
- MXGS: The Modular X- and Gamma-ray Sensor
- MMIA: The Modular Multi-spectral Imaging Array
- The instruments point towards nadir

ASIM: Peru 181112-01:14 UTC

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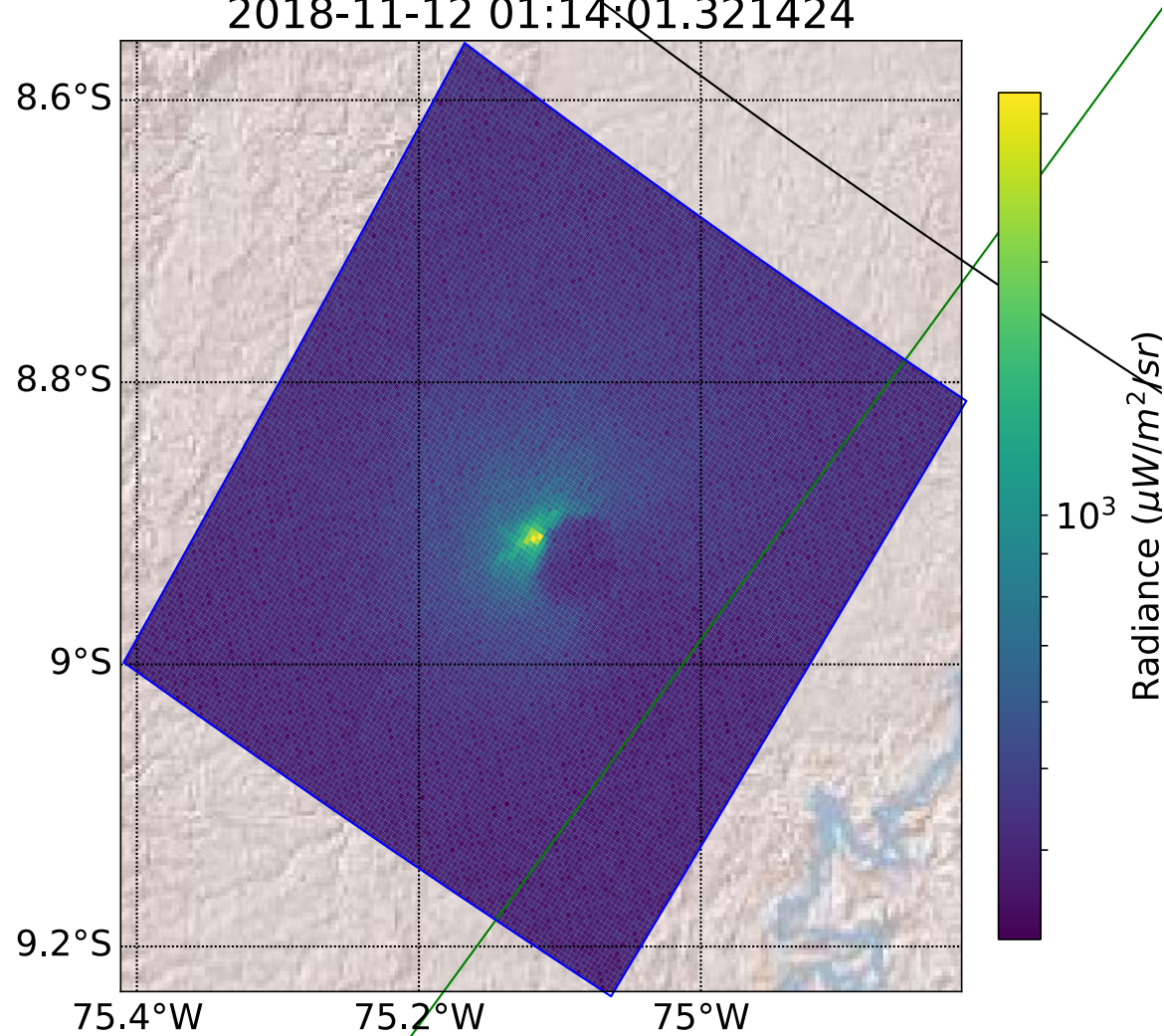


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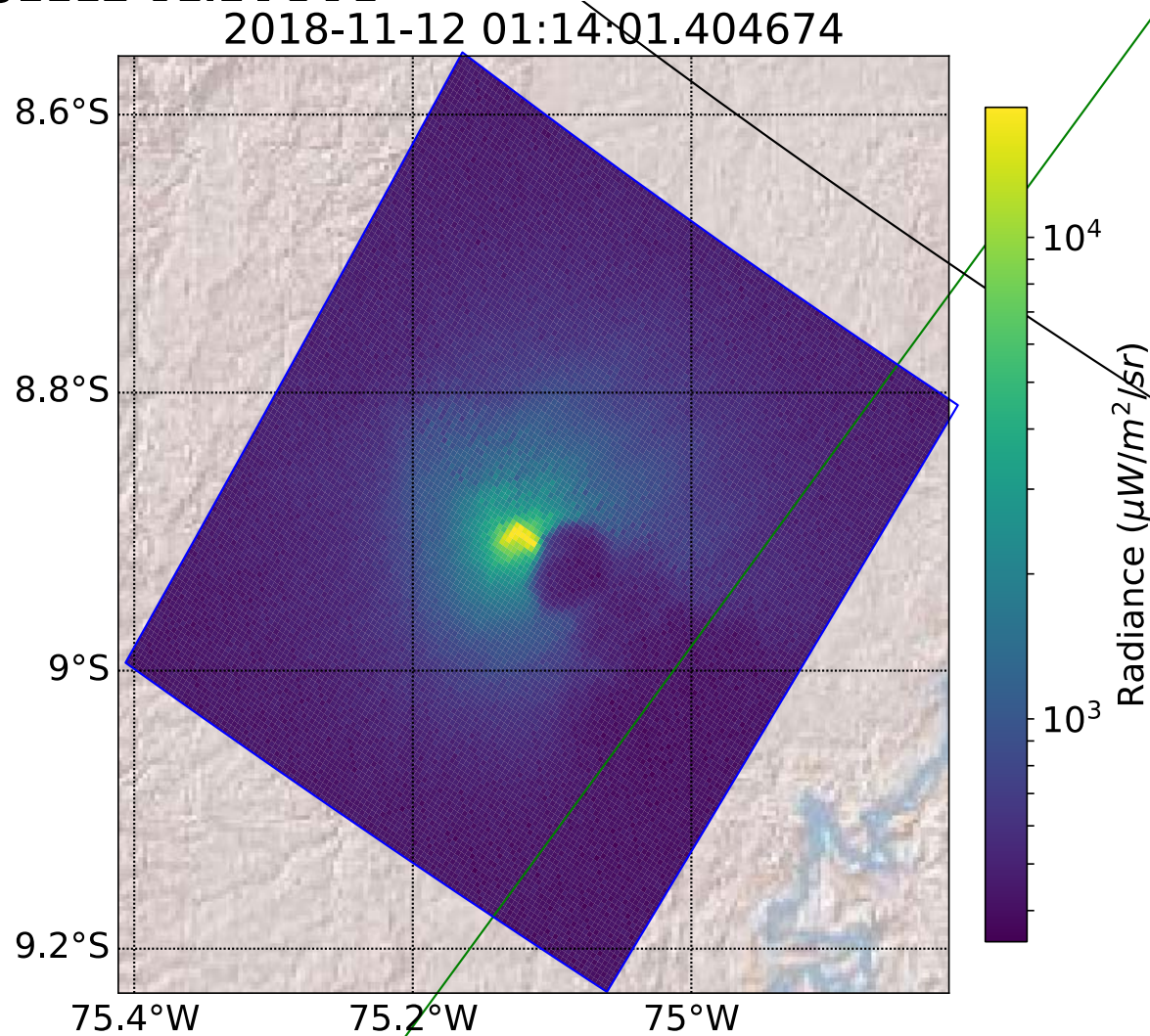
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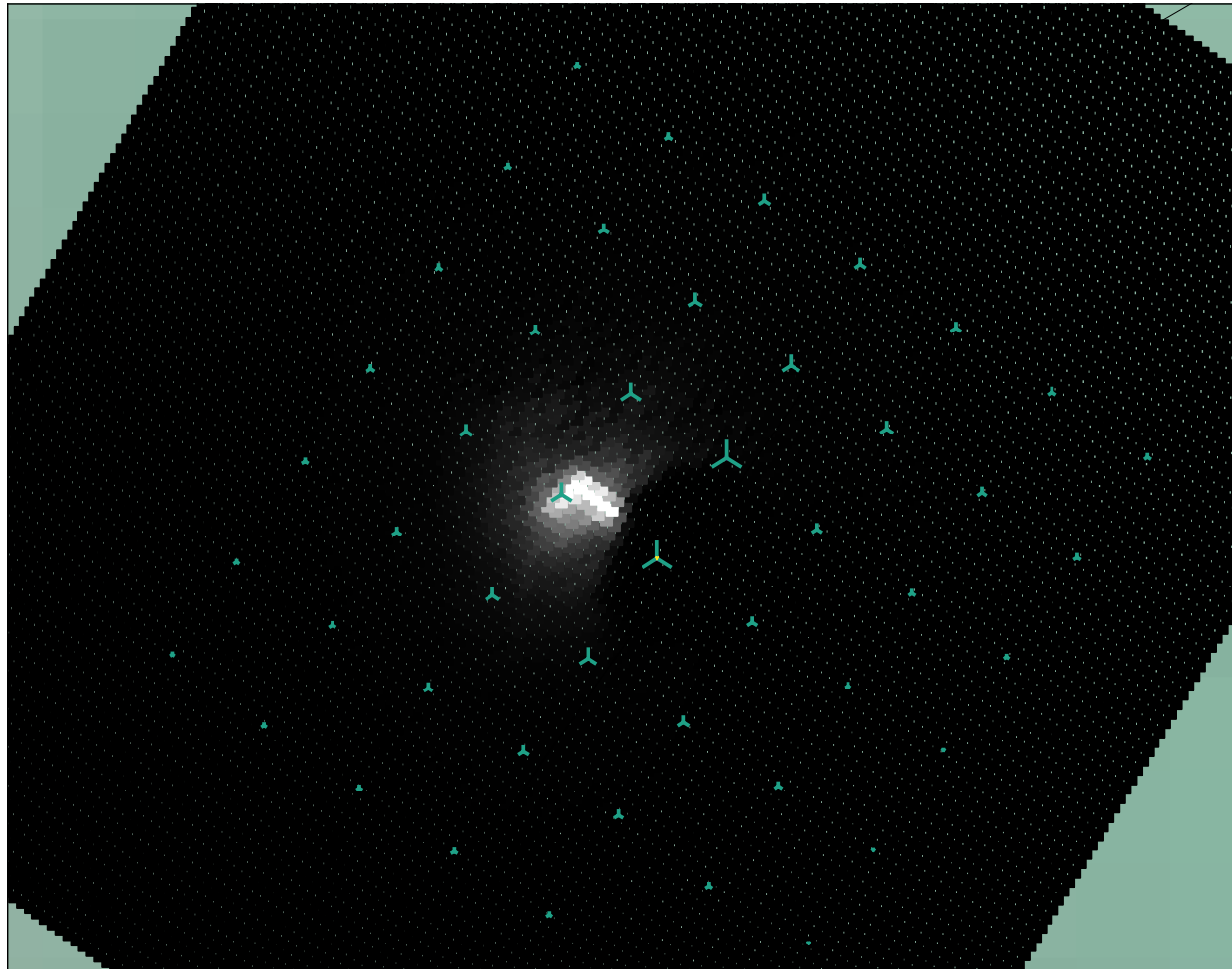


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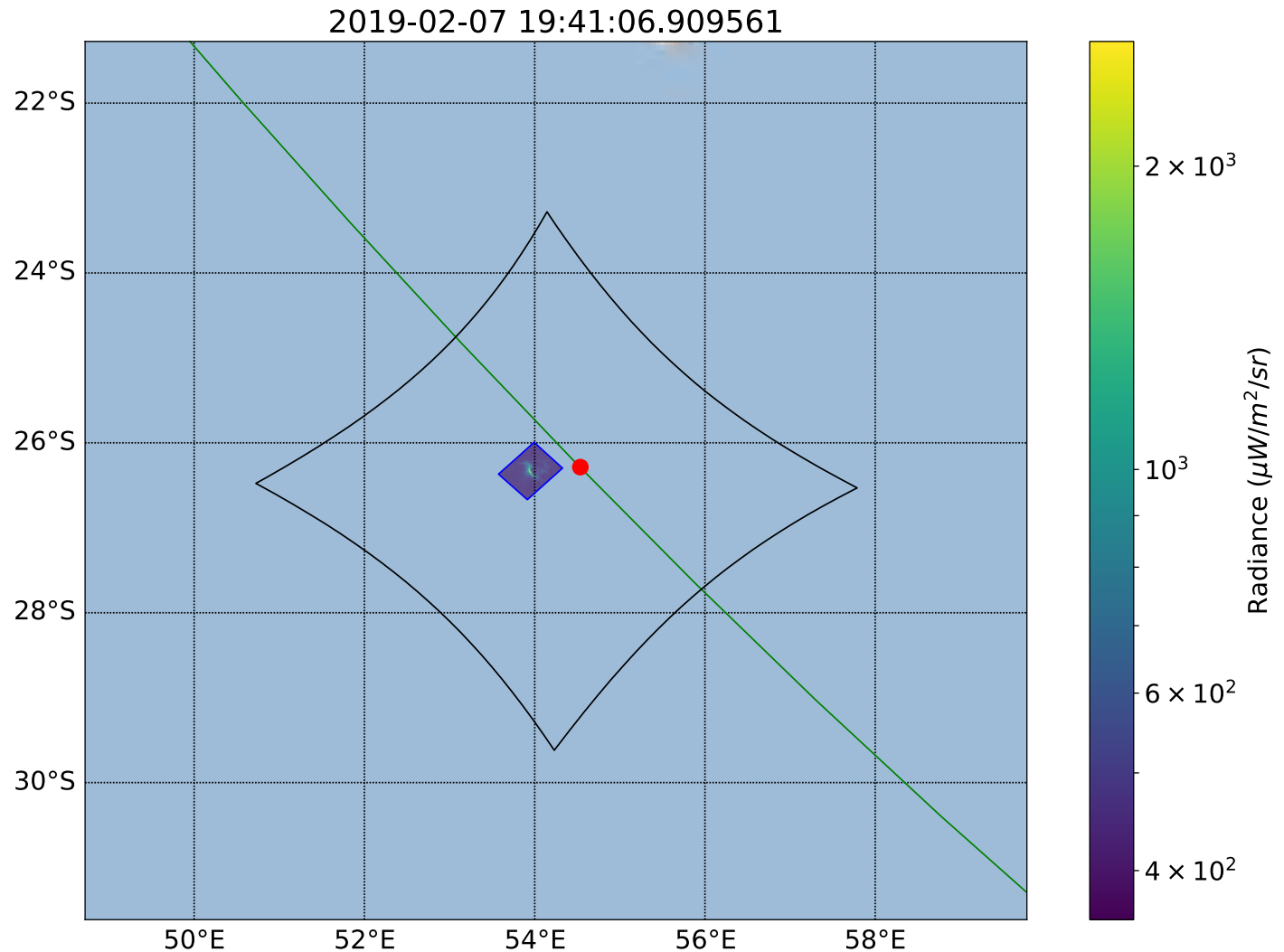


ASIM-GLM: Peru 181112-01:14

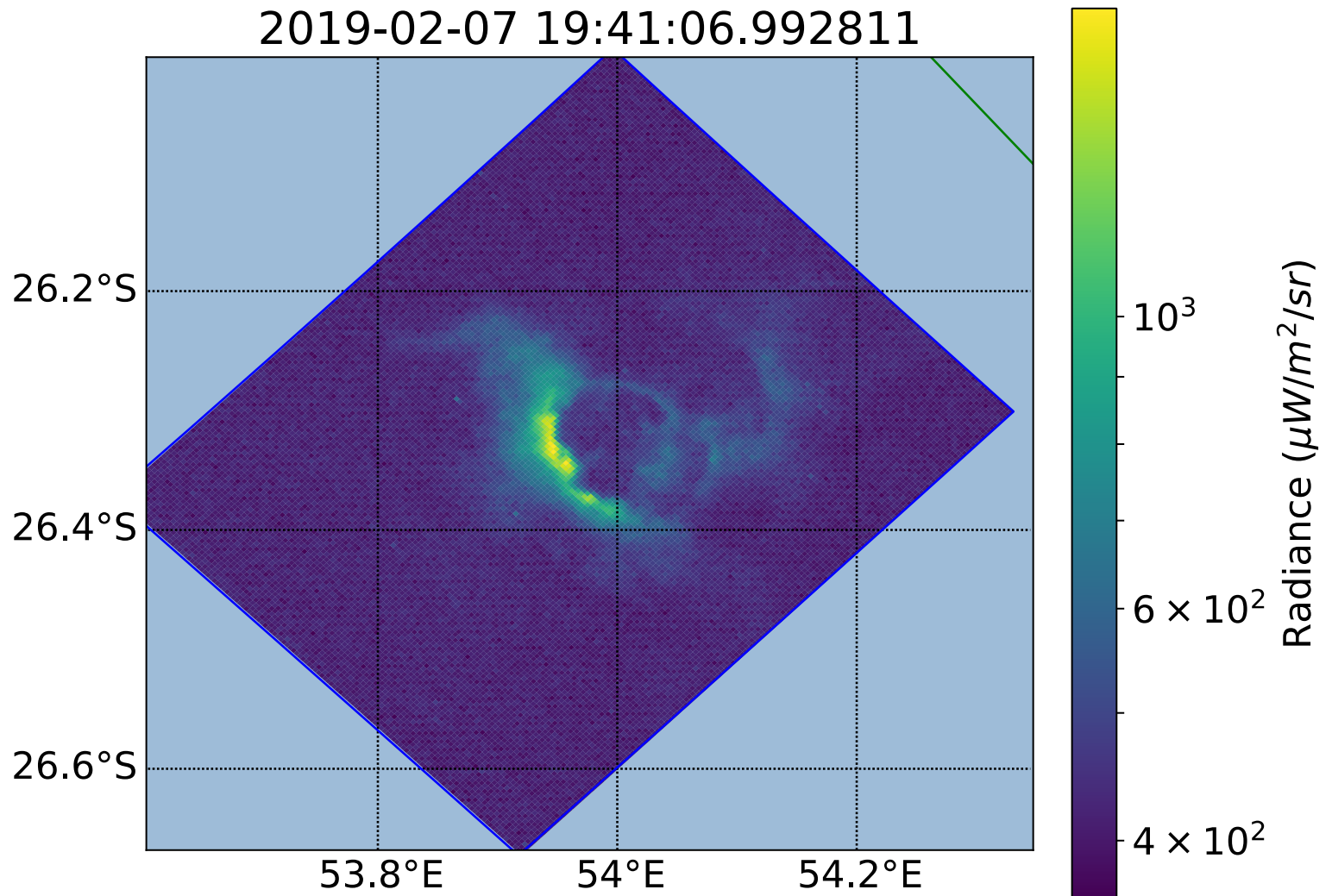


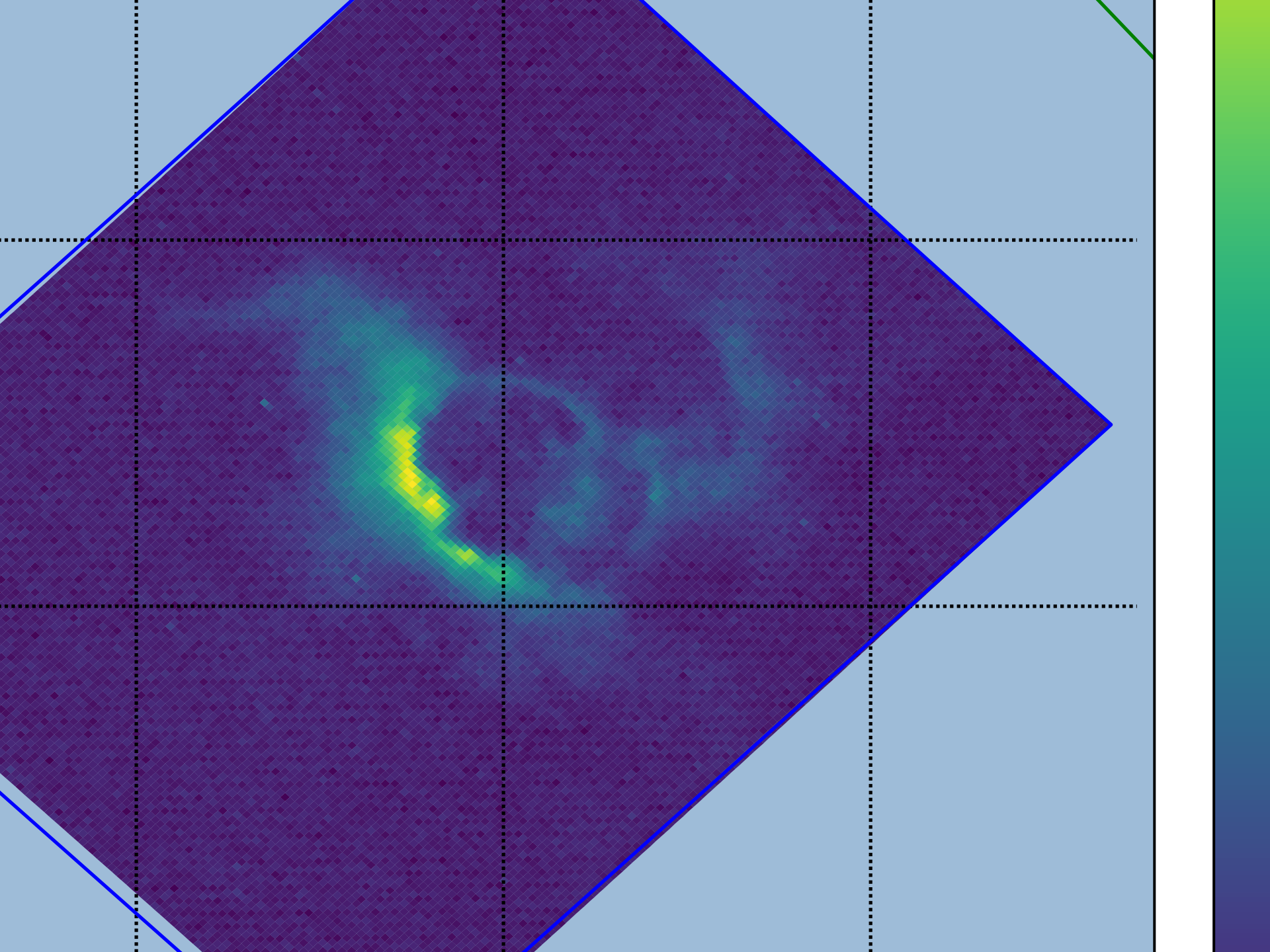
ASIM-LIS : Madagascar 190207-19:41

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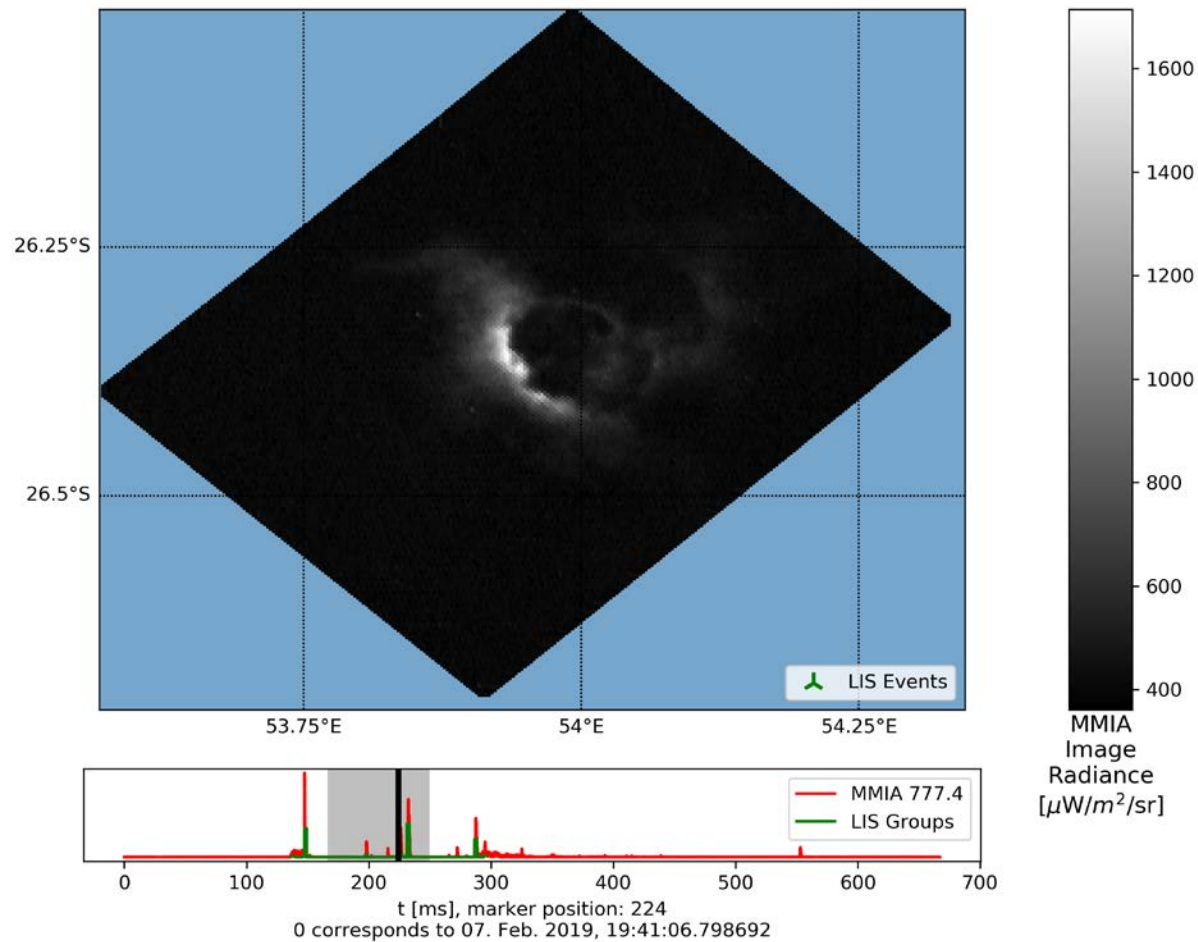


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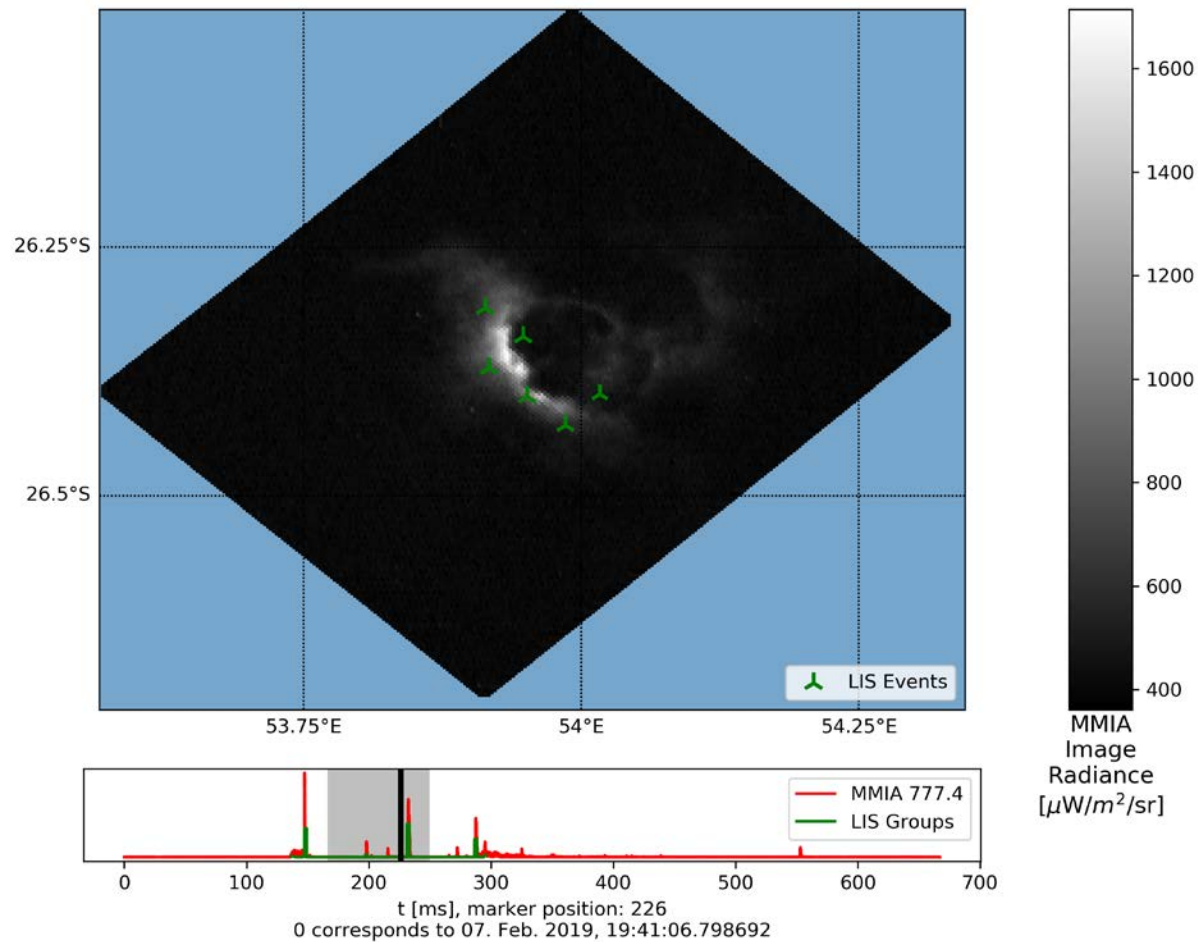




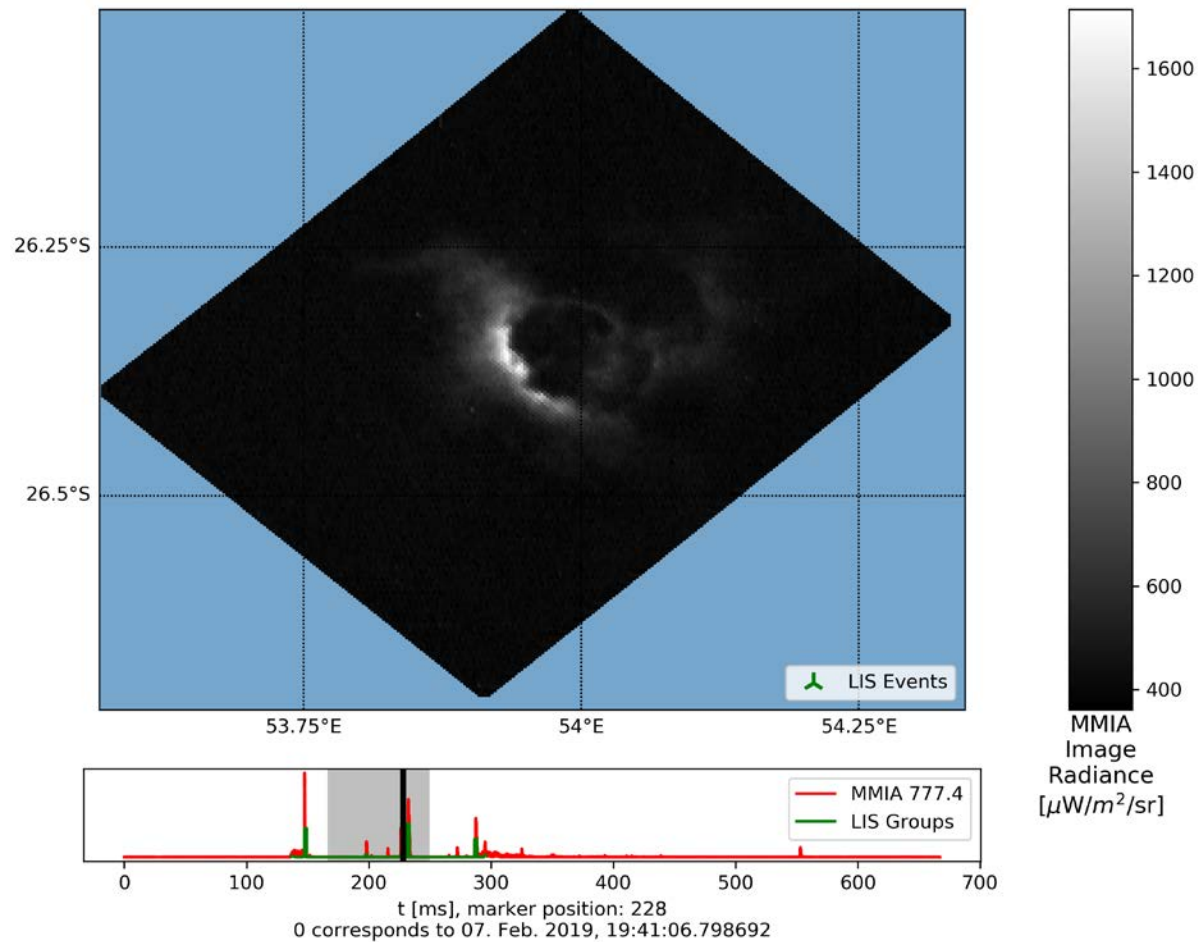
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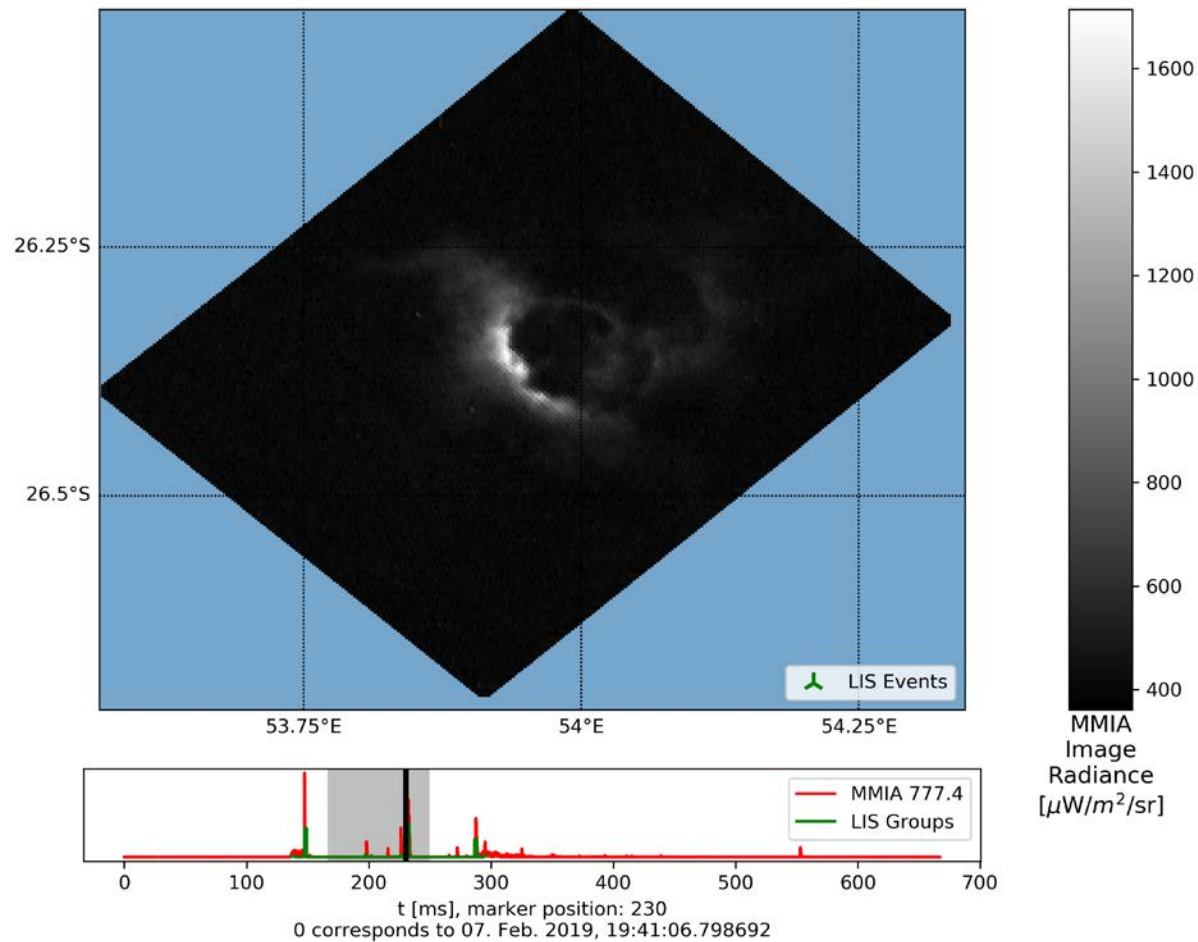
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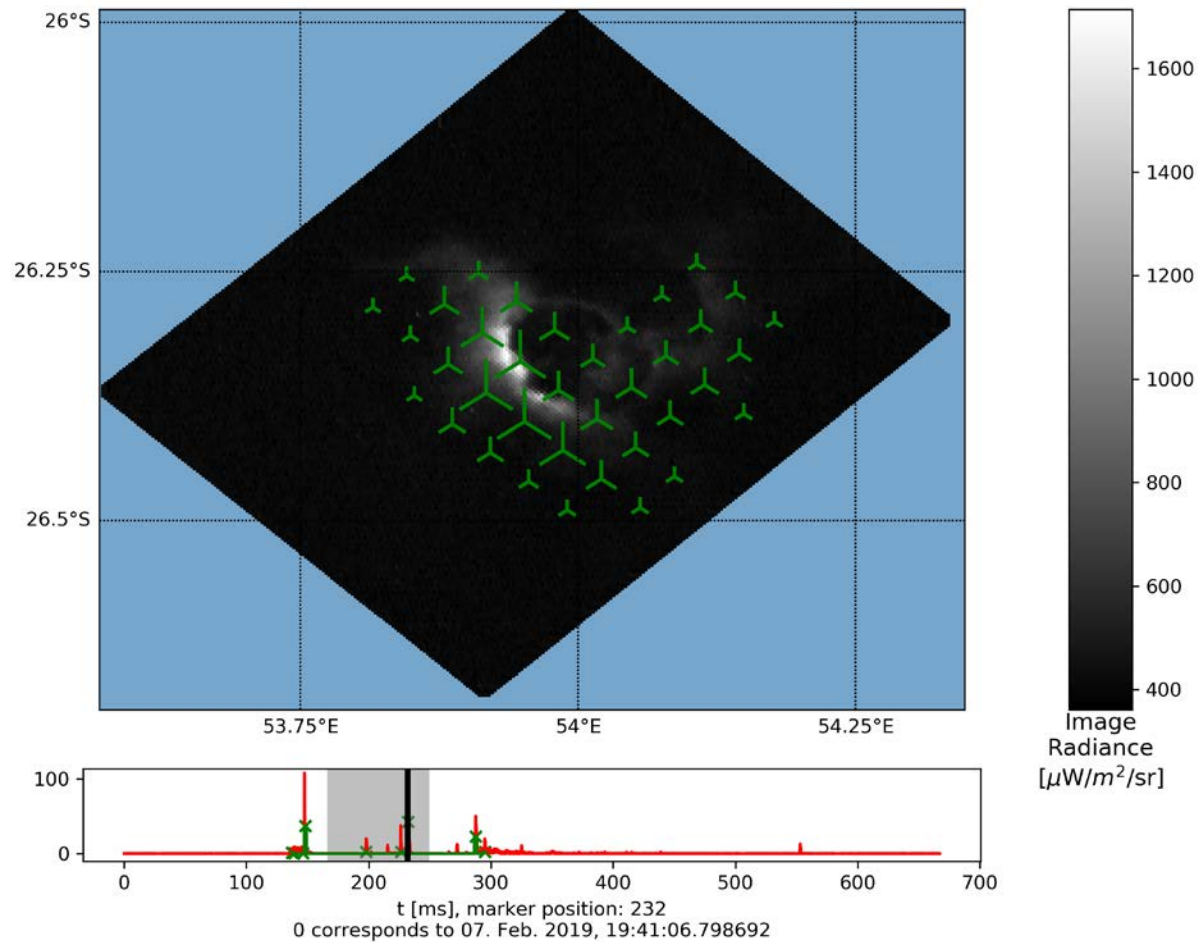
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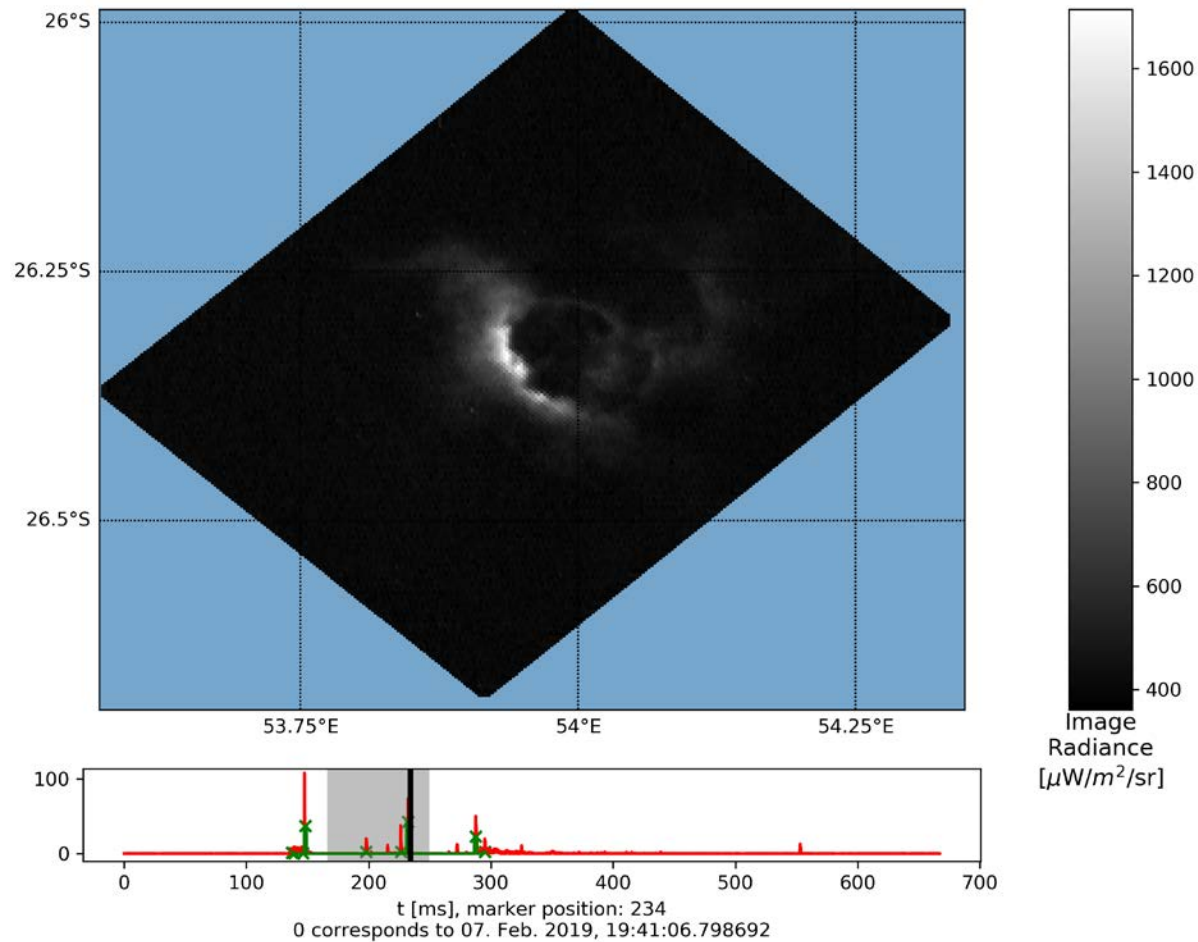
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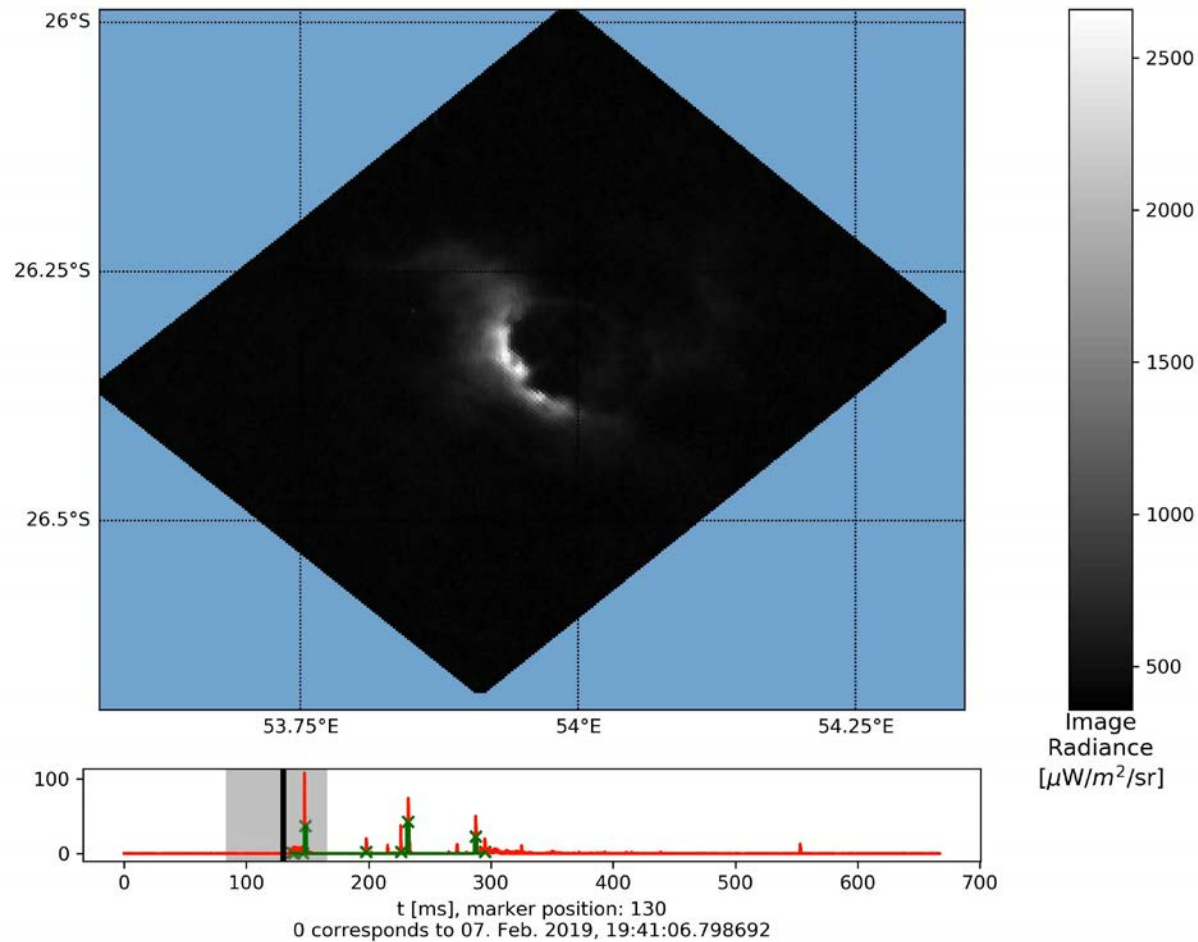
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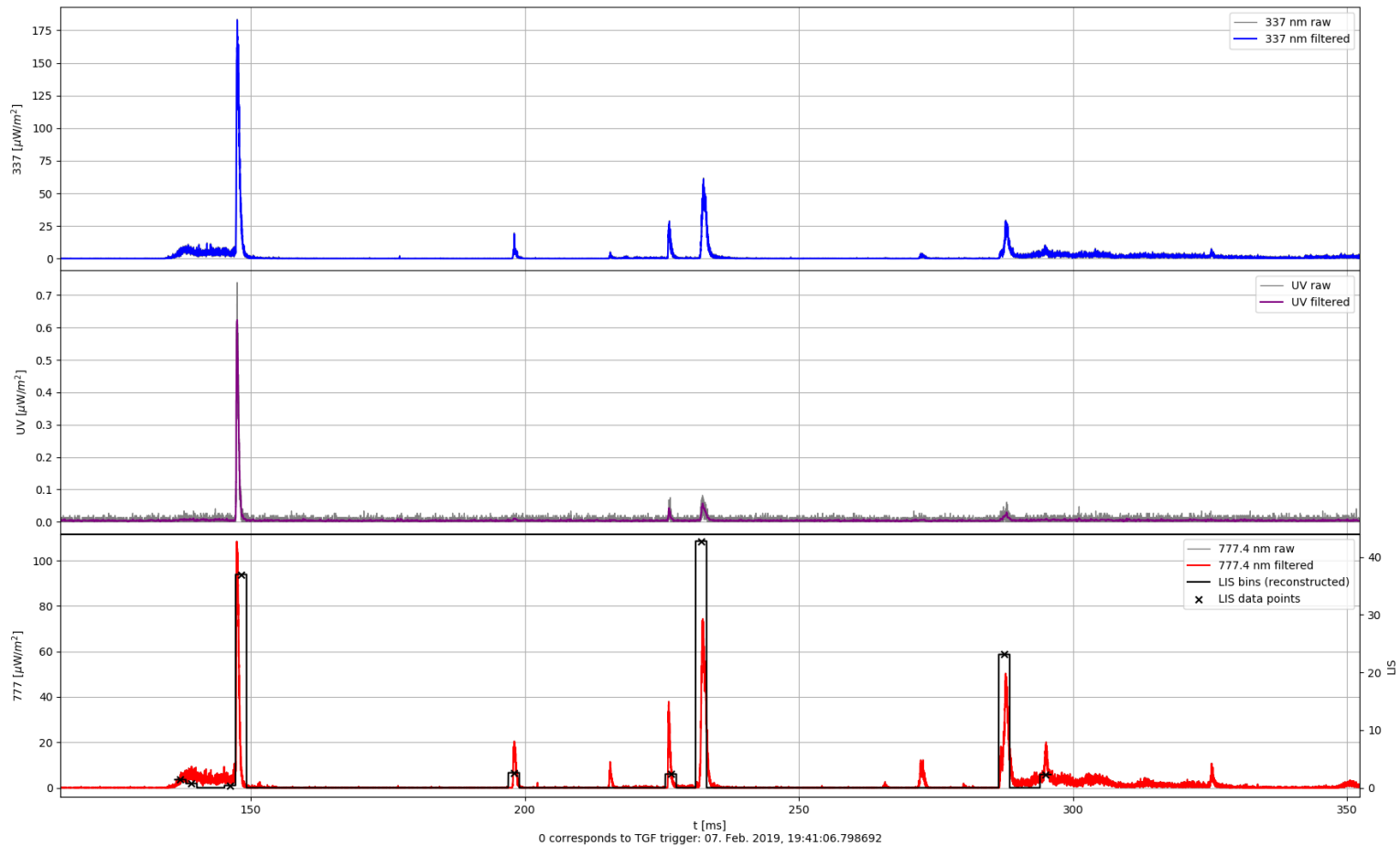
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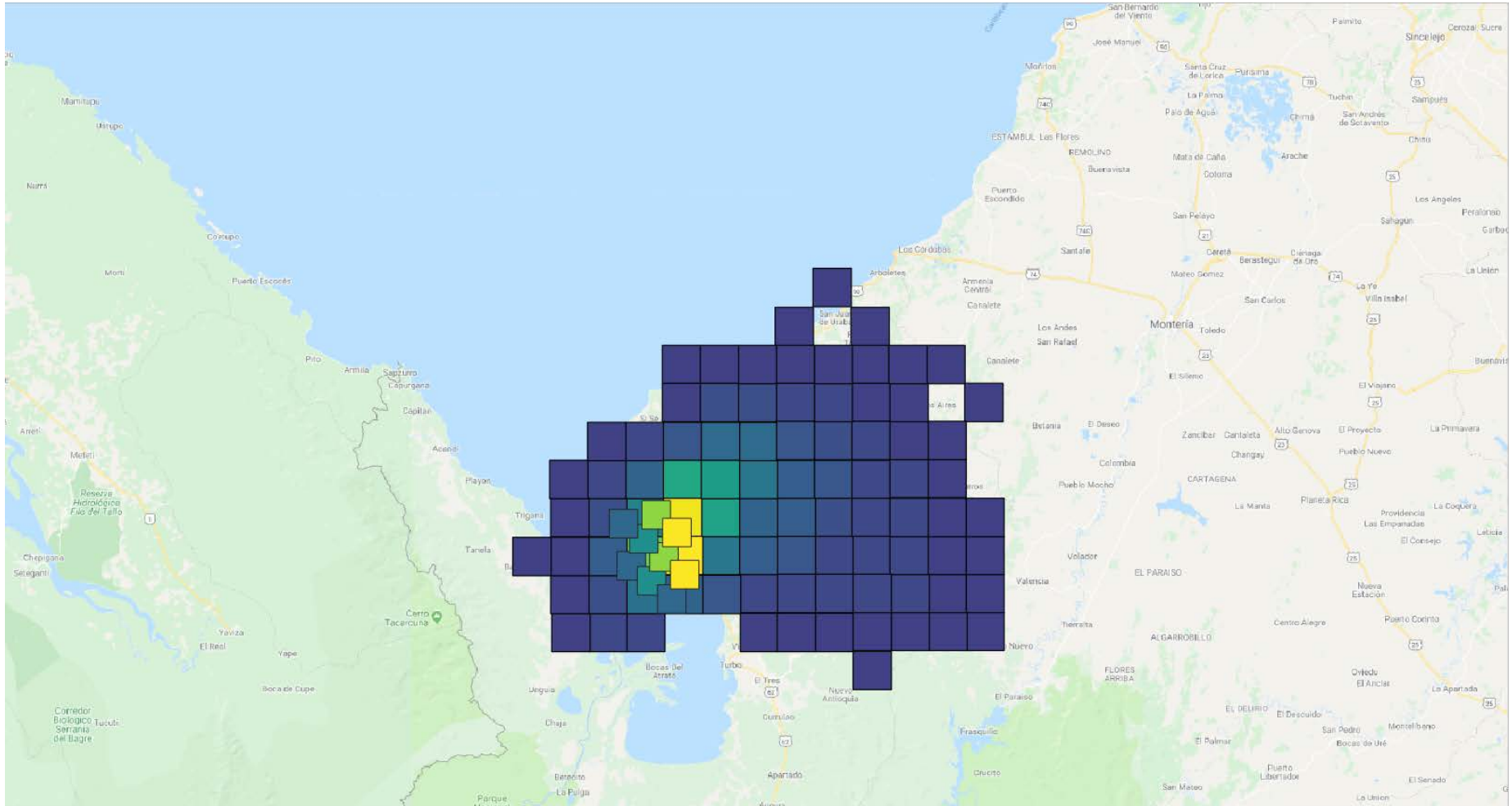


ASIM-LIS – GLM : Columbia 181113-02:02

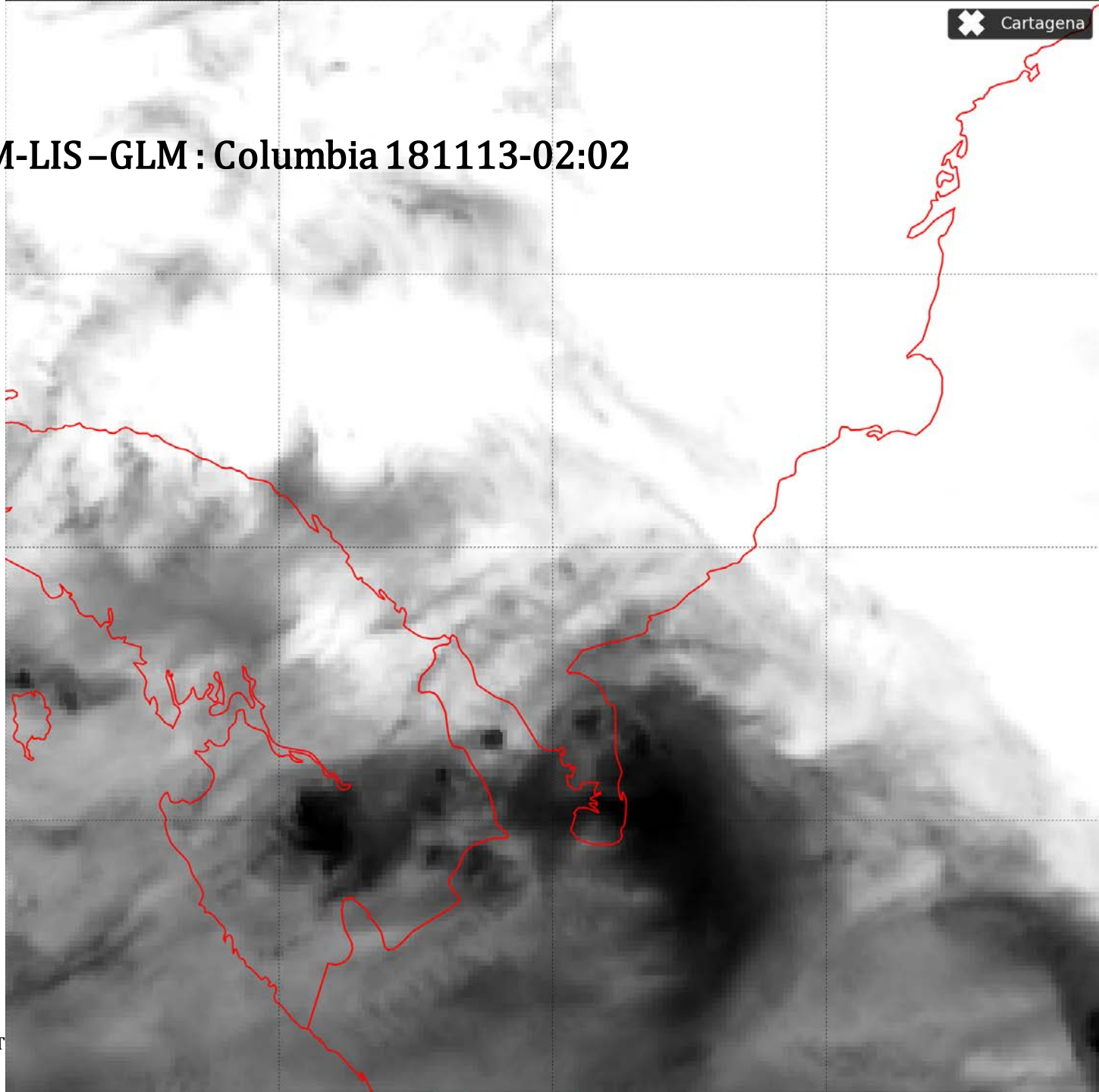
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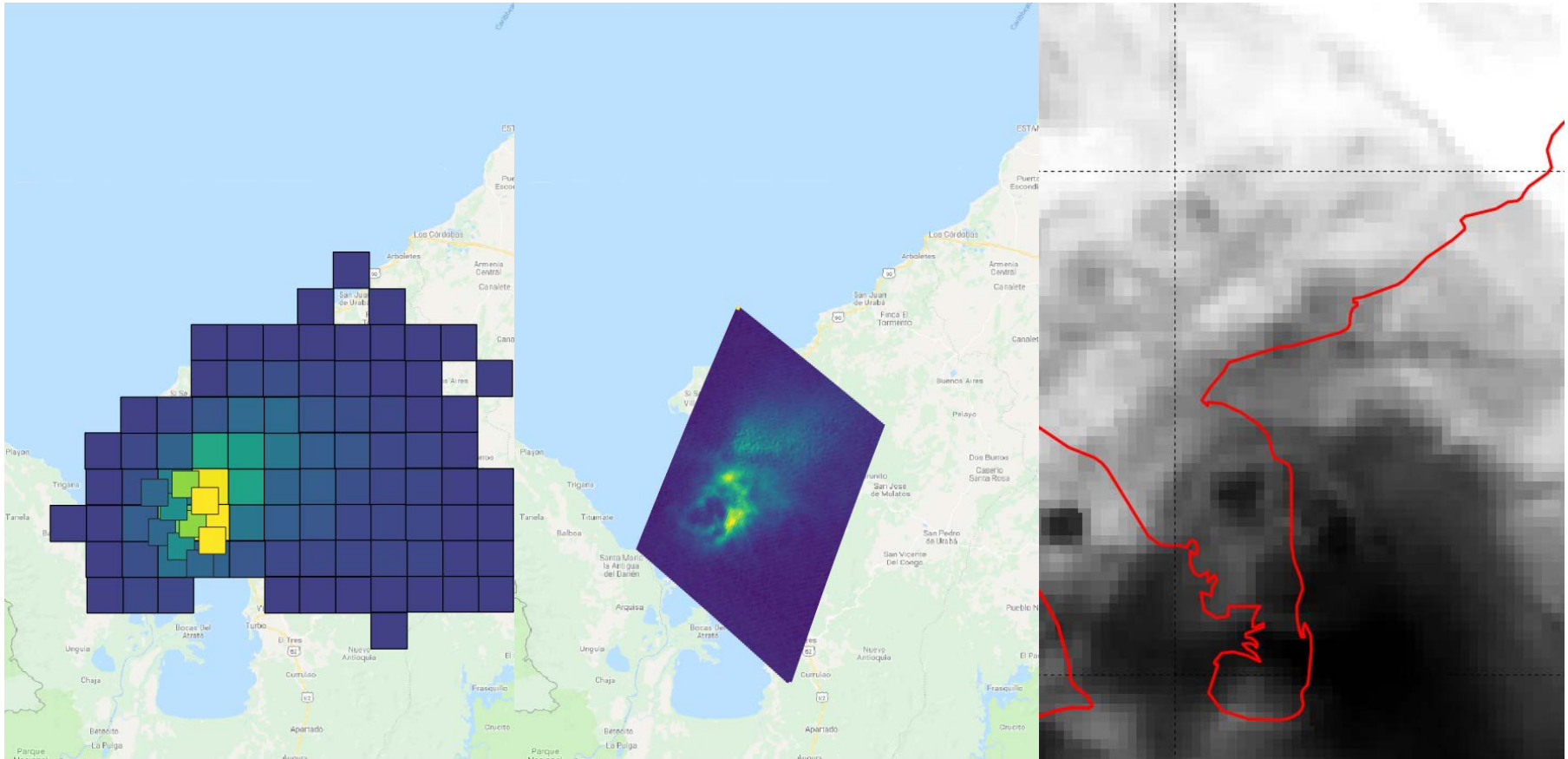
ASIM-LIS –GLM : Columbia 181113-02:02



ASIM-LIS-GLM : Columbia 181113-02:02

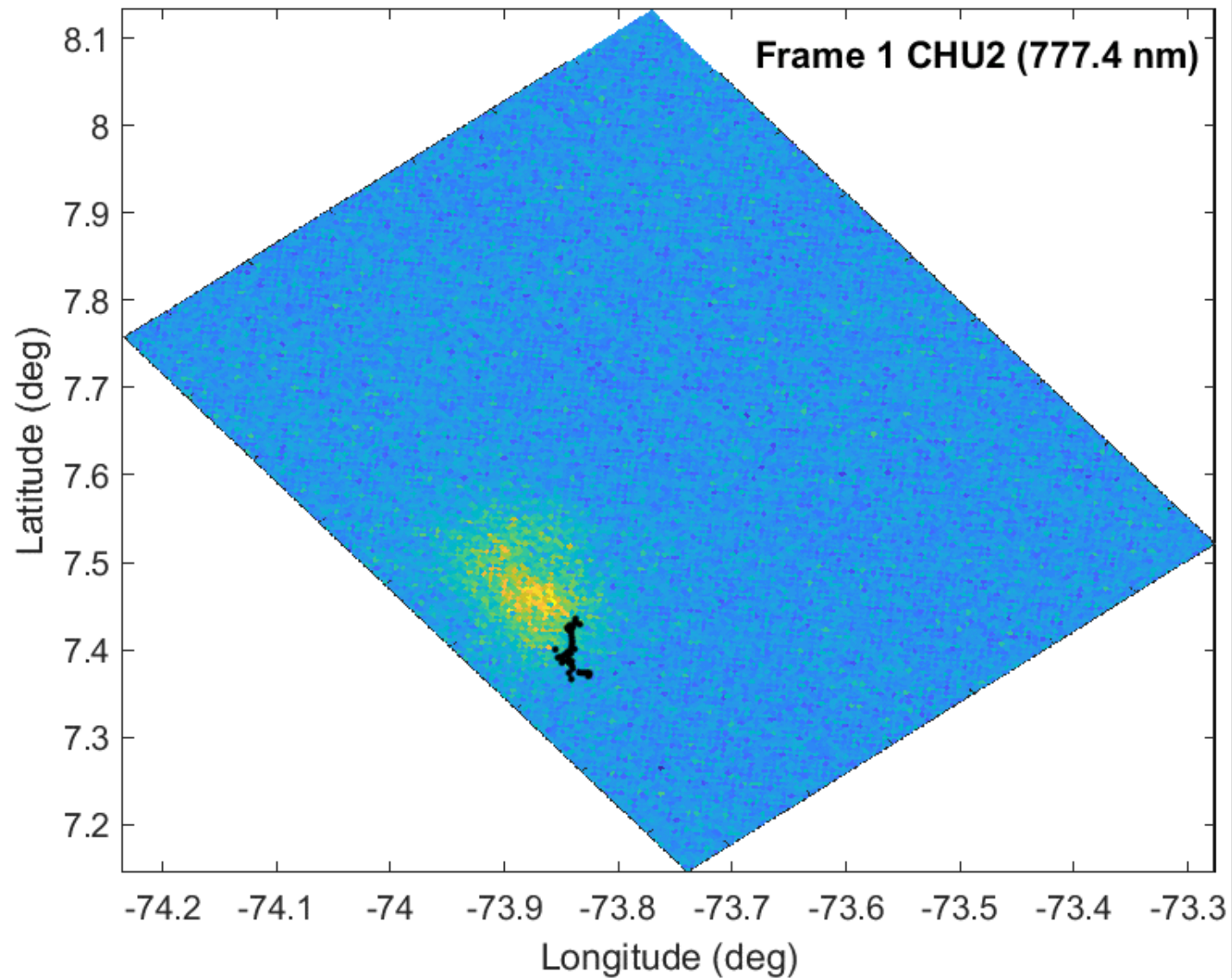


ASIM-LIS –GLM : Columbia 181113-02:02

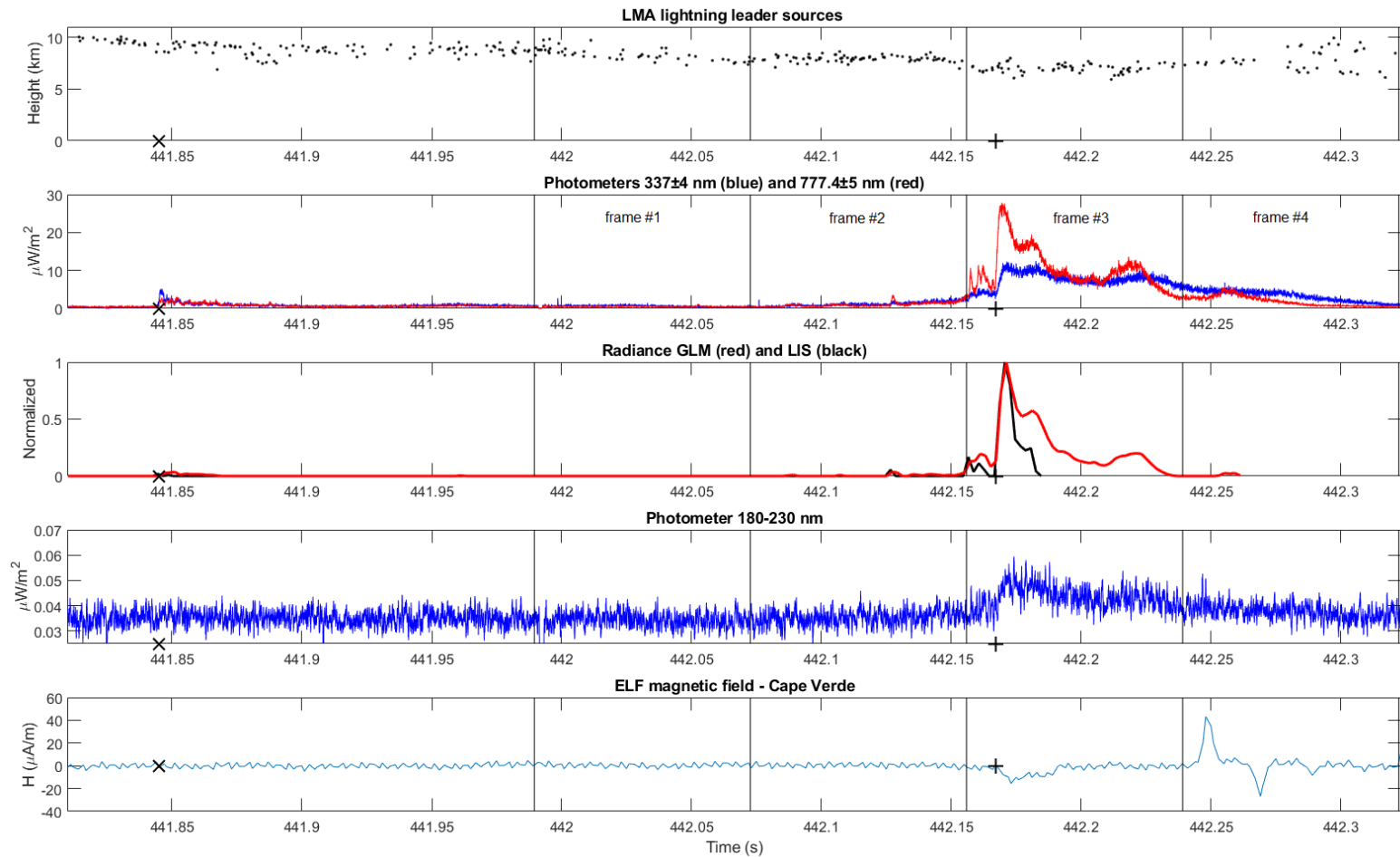


ASIM-LIS – GLM : Columbia 181113-02:02

Columbia-ASIM-LIS-GLM-LMA 181122-08:57



Columbia-ASIM-LIS-GLM-LMA 181122-08:57



Some conclusions

Reasonable overall agreement between instruments

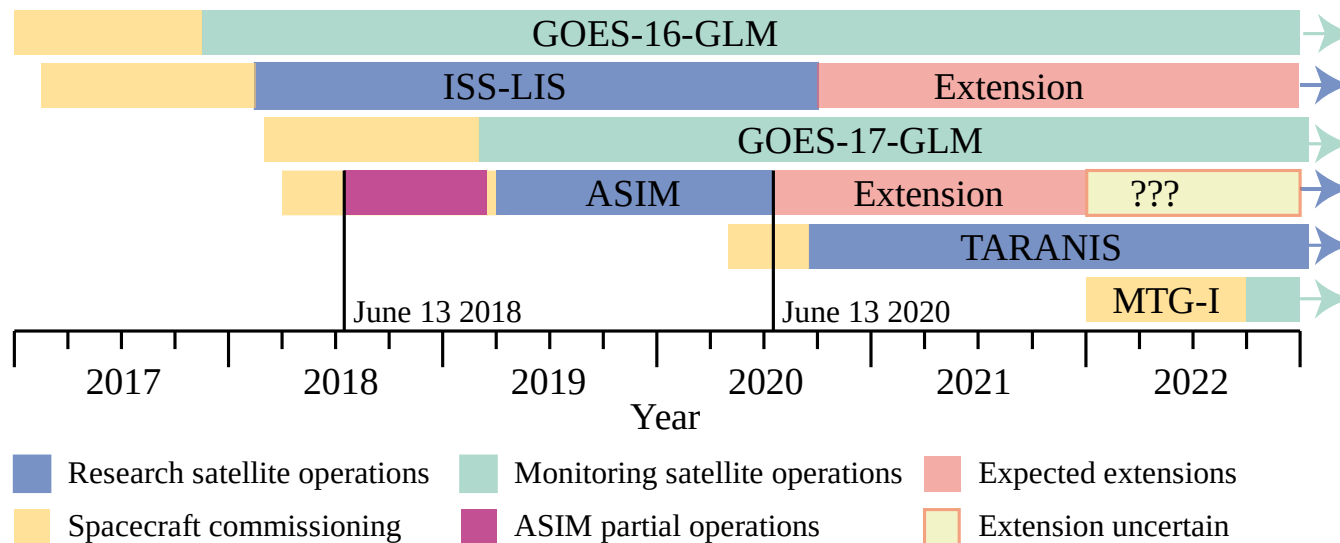
- GLM threshold appears to be the lowest of the three space instruments, giving a larger region of illumination of a flash – at times larger than ASIM. Much of the extended region could be cloud reflections of light.
- ASIM appears to have a lower threshold than LIS, because ASIM identifies a larger region of illumination. The question of distinguishing between cloud reflection and in-cloud activity may at times be resolved in ASIM observations with the aid of photometer curves.
- LIS appears to be at the right sensitivity for the flashes presented here, identifying illumination to the brightest locations.
- Good correspondence with ASIM-GLM light curves of one event
- Good prospects for combining GOES clouds with GOES lightning

Issues

- To distinguish in-cloud leader activity from lightning reflections in lower level cloud
- To incorporate cloud obstruction of main lightning source

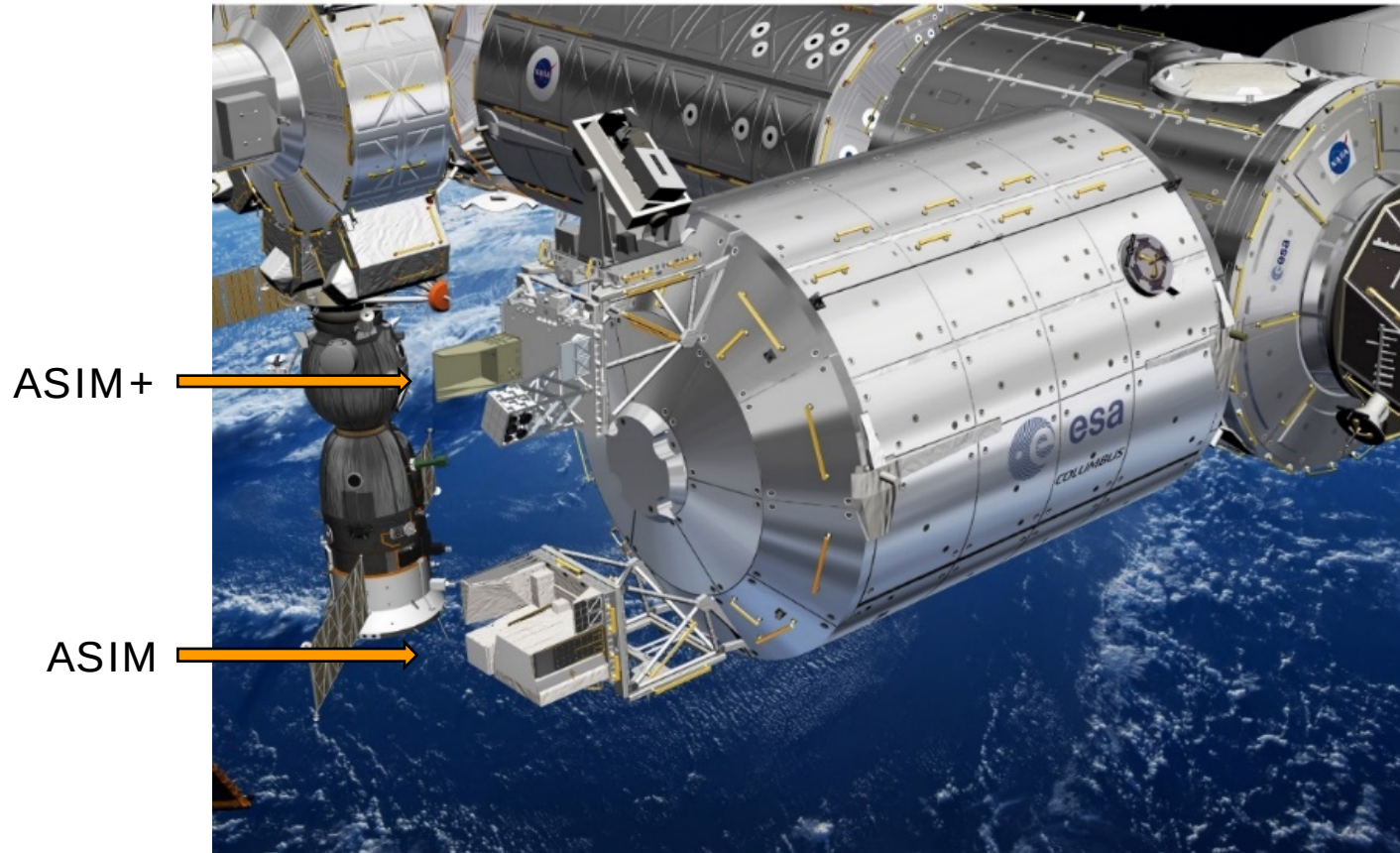
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The missions of the coming years



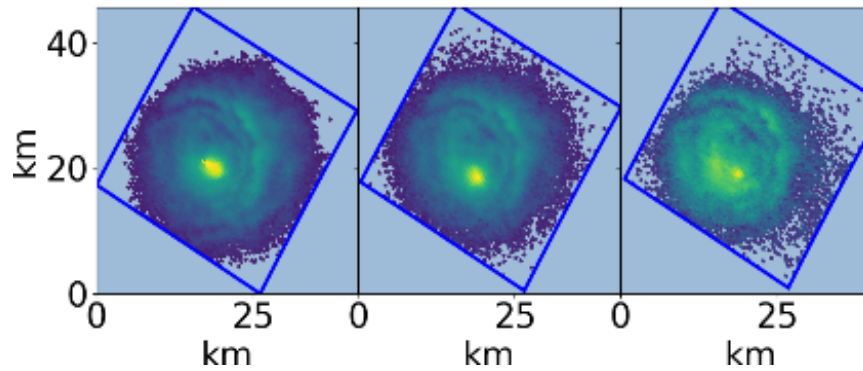
All missions are nadir-viewing

ASIM+ : Observations of thunderstorms at a slanted angle



A scenario of ASIM+ on Columbus - Reuse of ASIM optical module

Nadir vs angular view



Consecutive images of a cloud observed by ASIM



Image from the ISS (2015) Andreas Mogensen

ASIM+ Science and Applications

- Science:
 - Characterize corona and lightning activity in upper parts of thunderstorms
 - Model the chemical perturbations to greenhouse gasses of these and of gamma-glows in clouds
 - Apply models to MTG data of clouds and electrical activity
 - Include in climate models
- Applications
 - For MTG...

