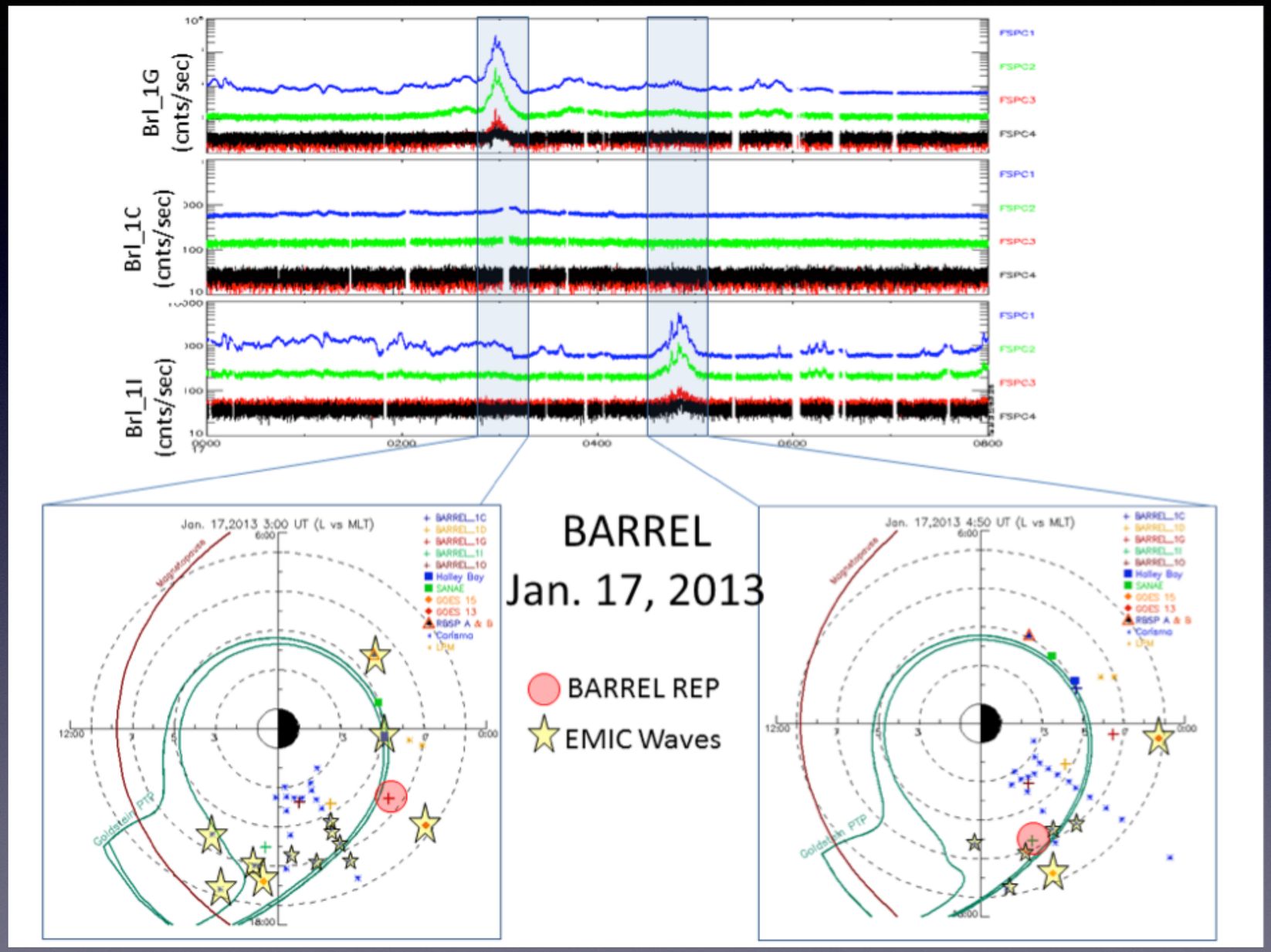
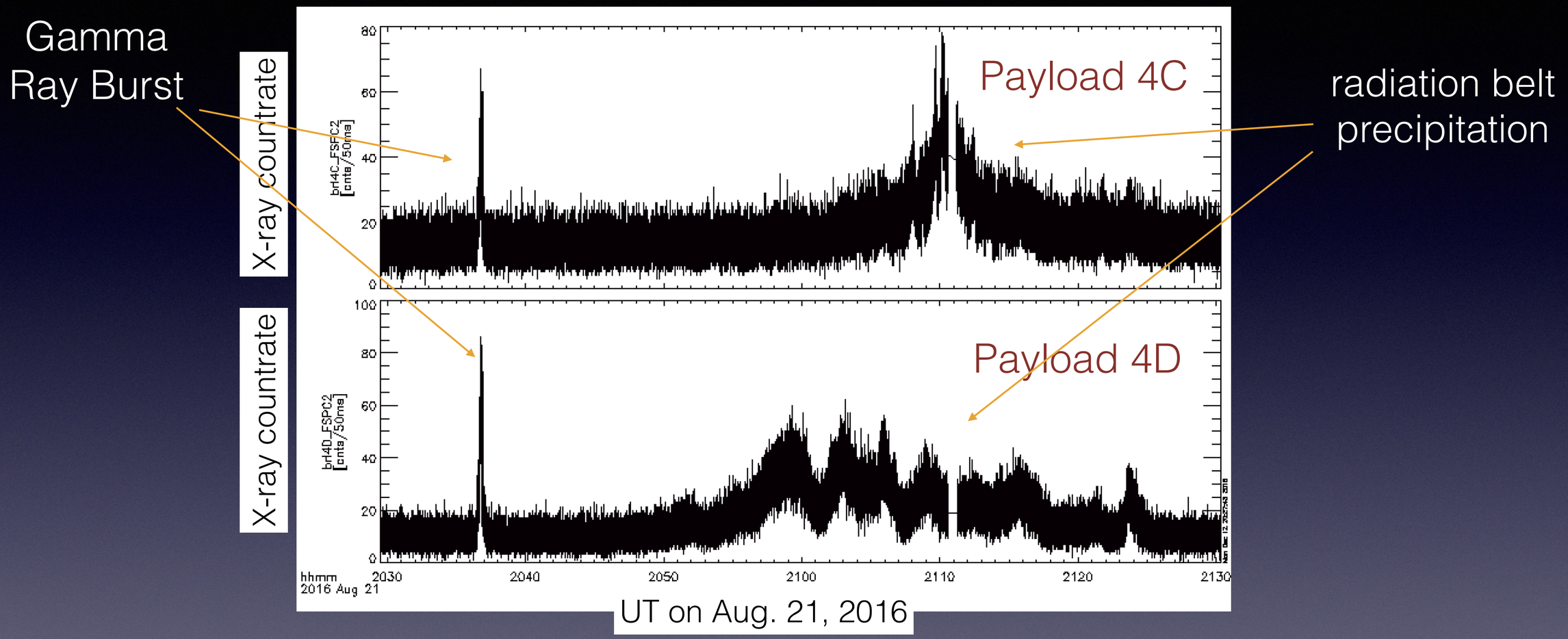
Duskside Precipitation is Highly Localized

- During BARREL Antarctic campaigns, 18 dusk-side relativistic electron precipitation.
- In all cases, only single balloon detected the event



Woodger et al., 2018 JGR

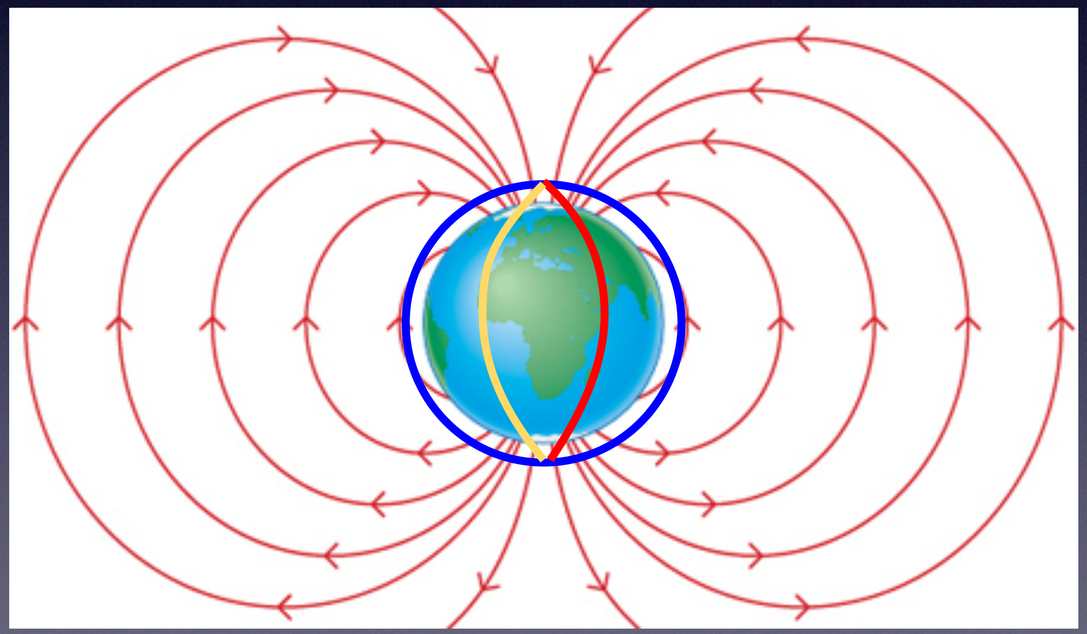
Small-scale Structure of Relativistic Precipitation

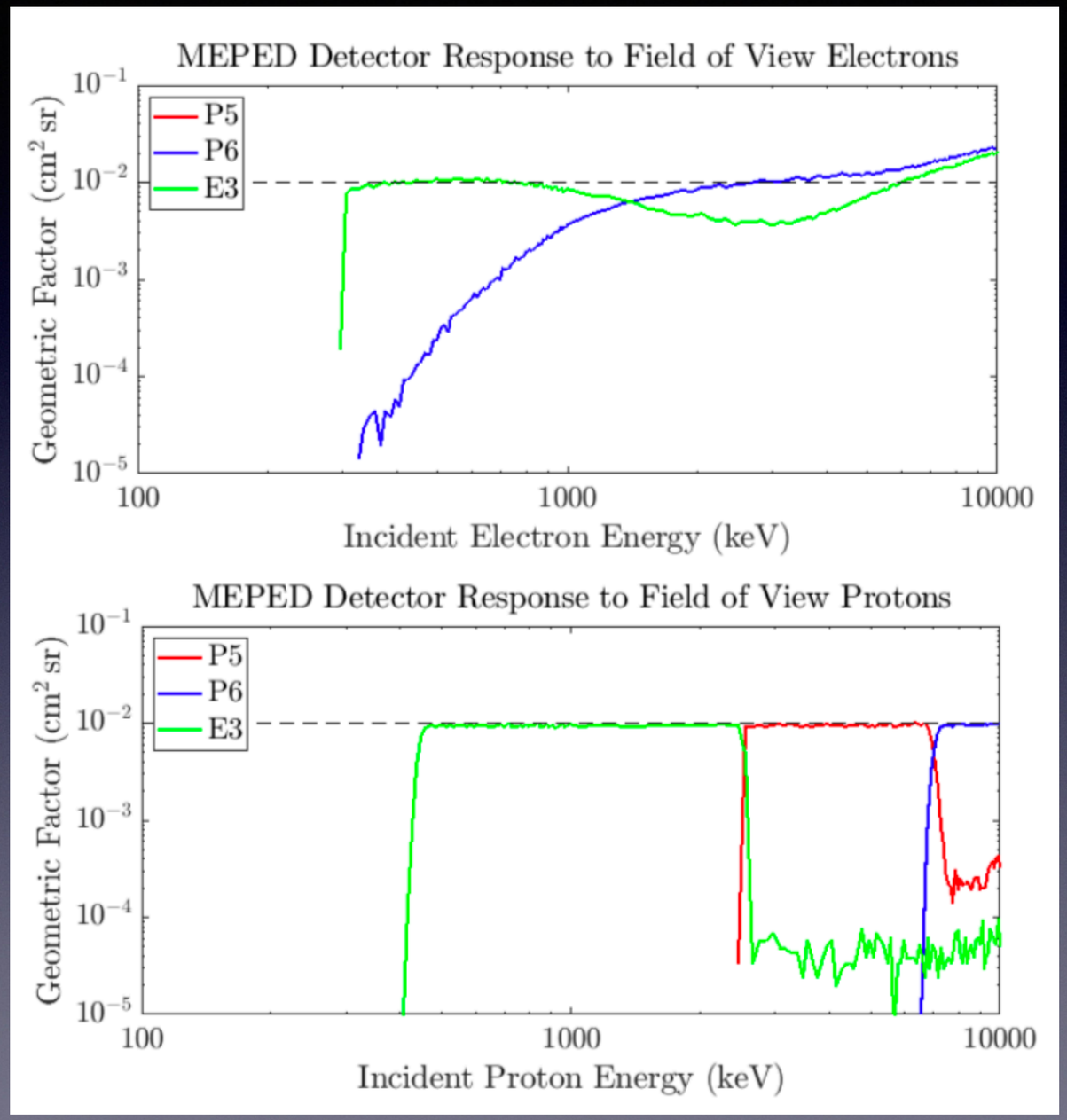


- During Sweden 2015 campaign, two balloons detected duskside REP
- Balloons were ~100 km apart, of order the field of view of each payload
- Differences imply structure at <~100 km scales (~1000 km at equator)

NOAA POES MEPED Detector Response

- Use multiple POES satellites to investigate spatial scale
- P6 channel contaminated with electrons
- P5 channel is not contaminated

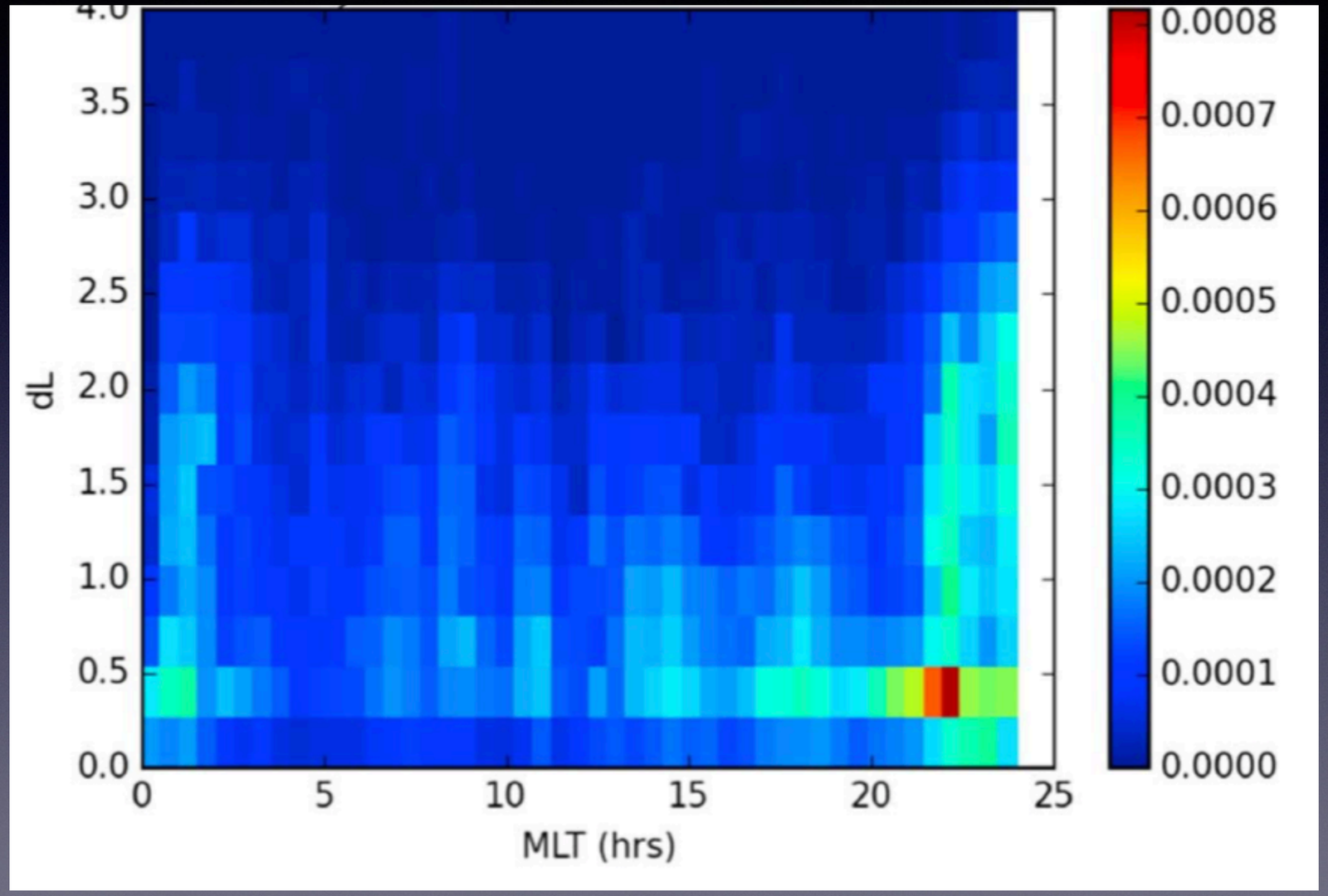




[After Yando et al., 2011]

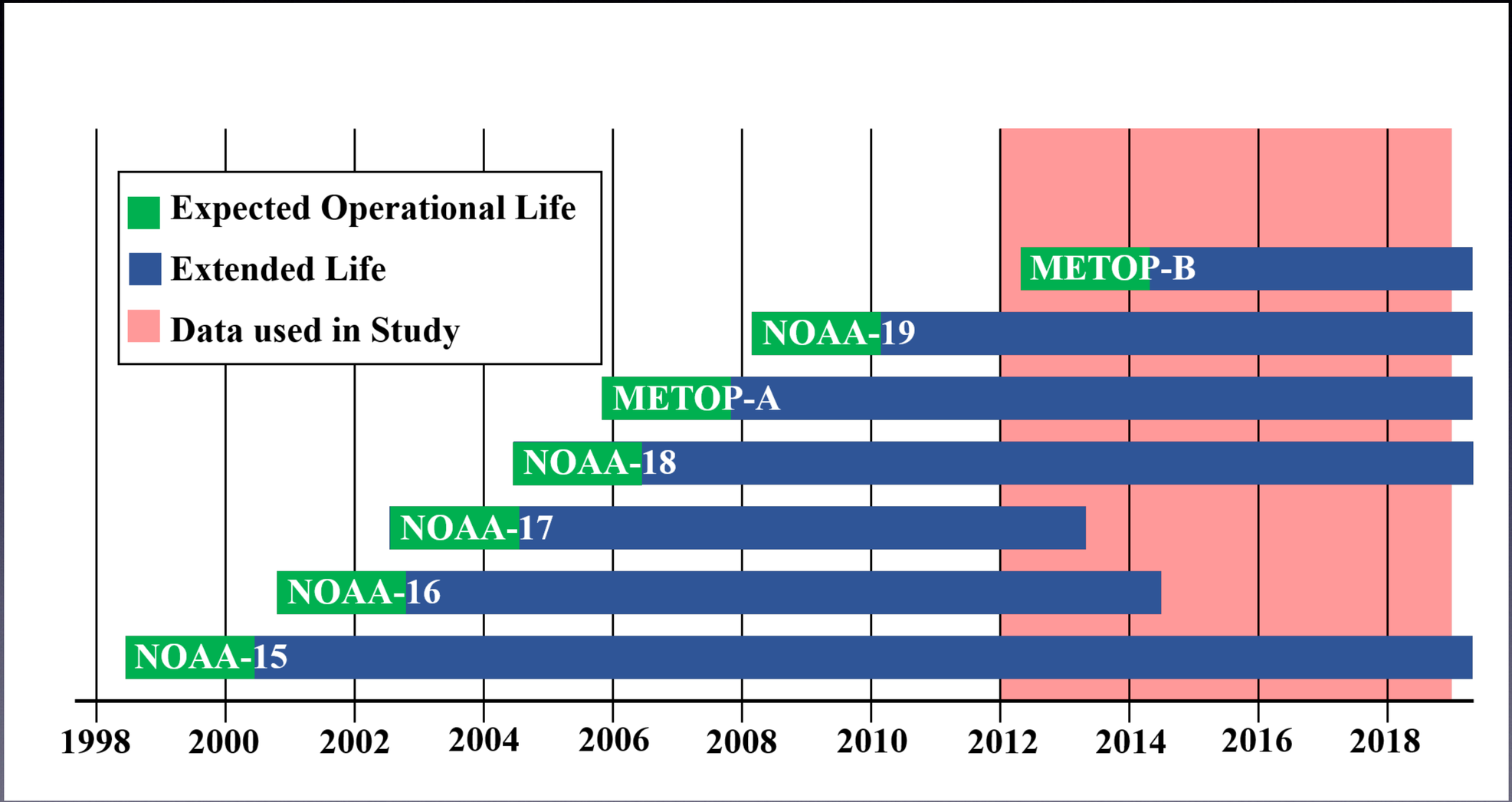
Spatial Scale from POES 16s Data

- ~15 years of POES 16-s resolution data.
- Events selected using P6 channel (along with criteria for P5 and E3).
- Most events are narrow in L
- Events near midnight wider in L



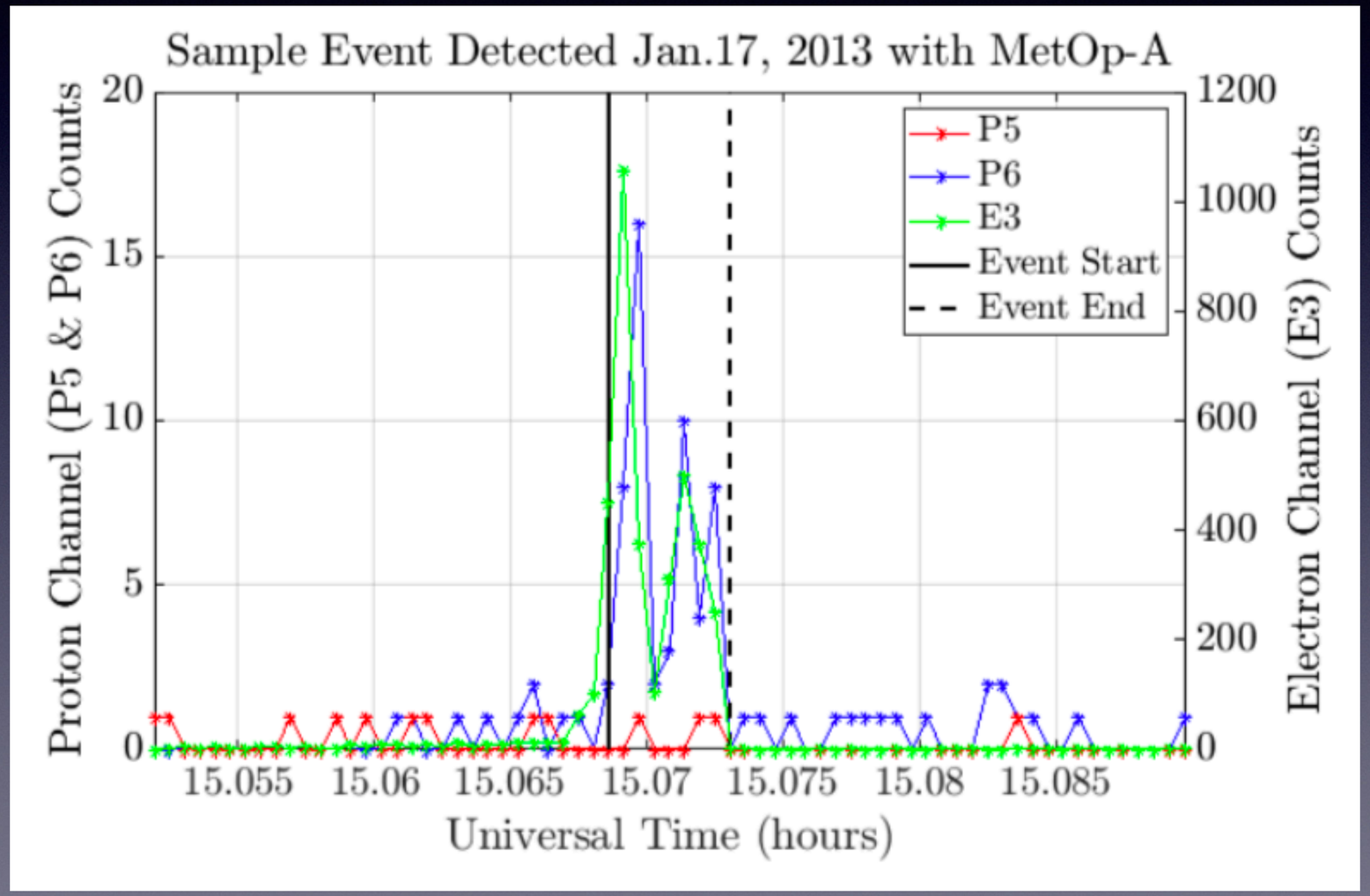
[Shekhar, et al., 2017]

Availability of higher resolution (2s) POES Data



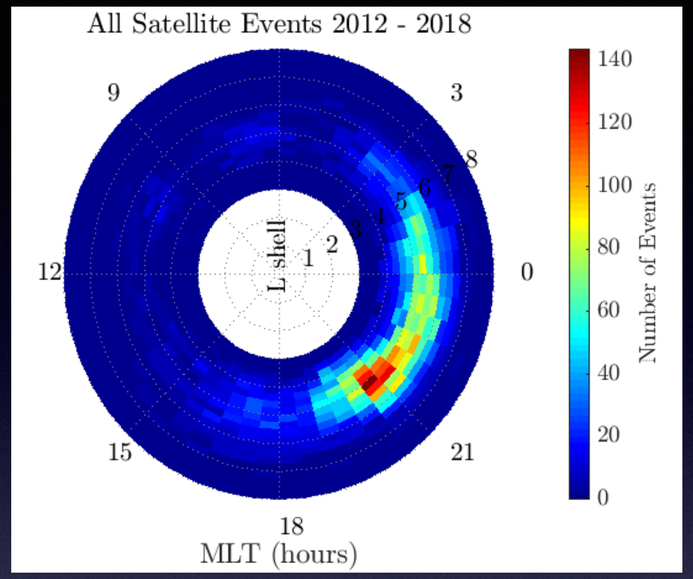
Recent Work Using 2s POES Data

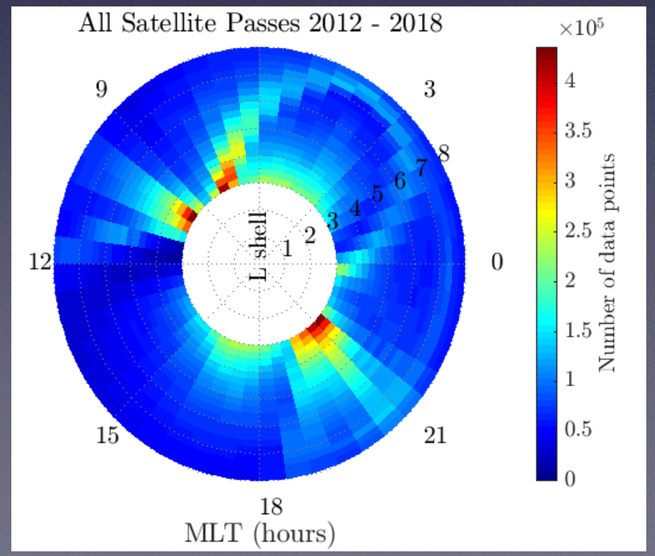
- Selection criteria: threshold in P6 for candidate event
- + requirement on P5 count rate : average counts below ~1
- + requirement on E3 count rate: E3 > P6

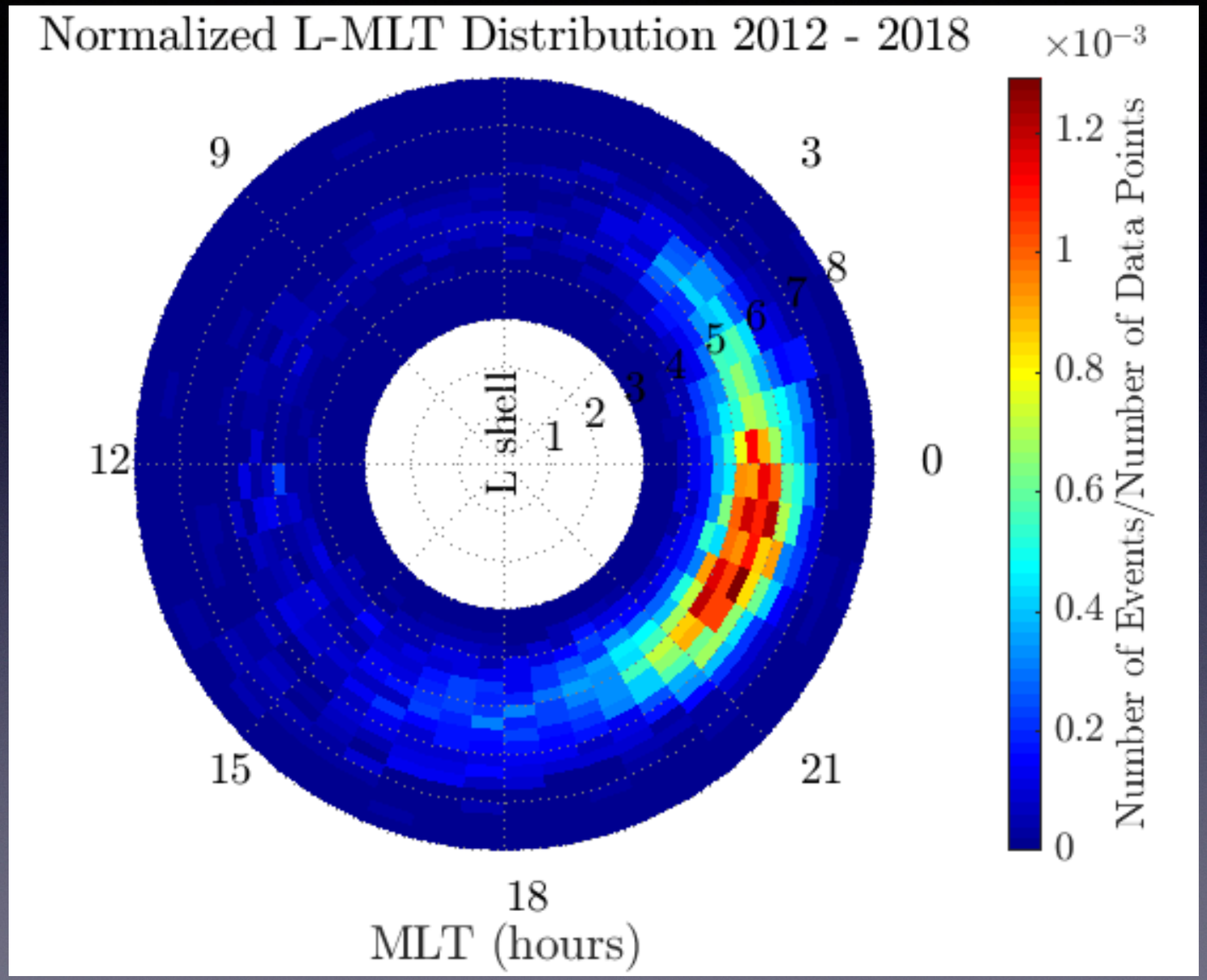


[Gasque, et al.]

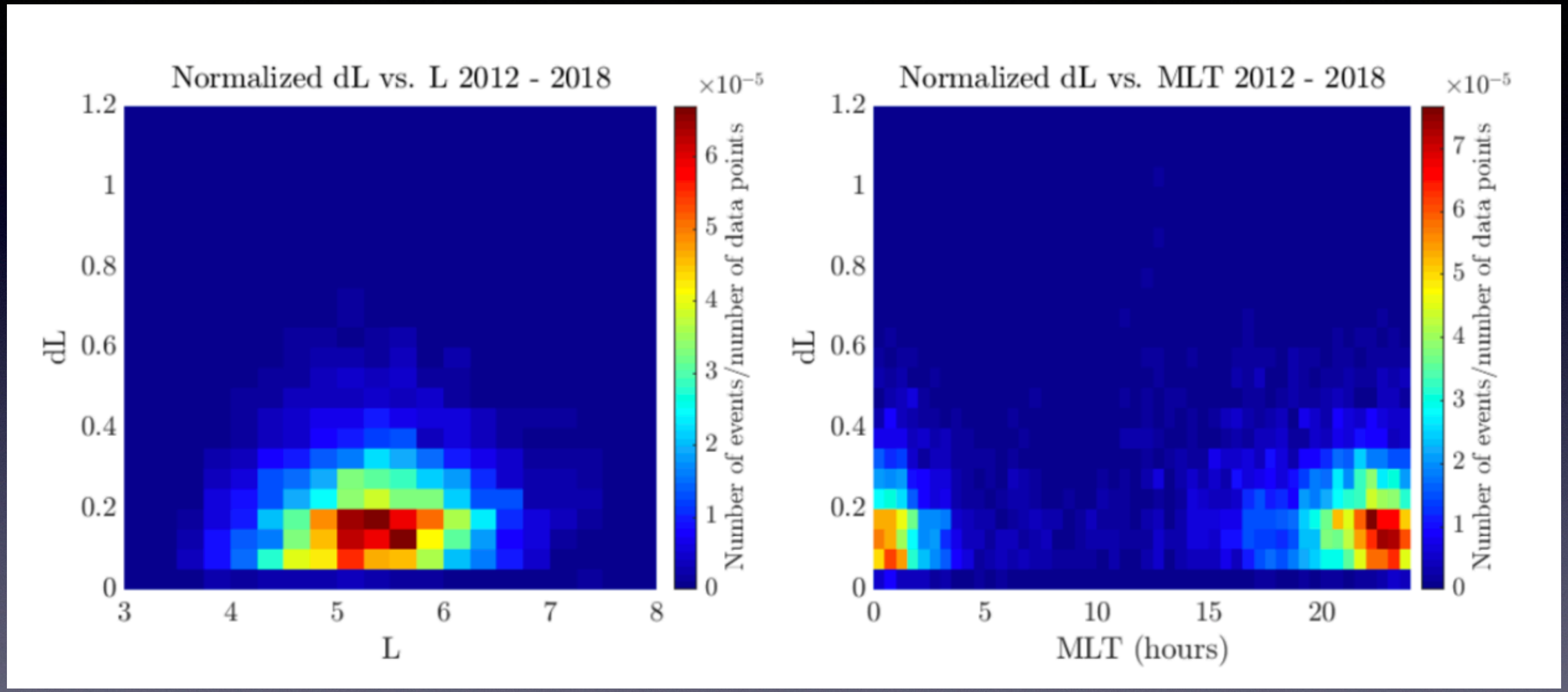
Distribution of Events: 2s Data







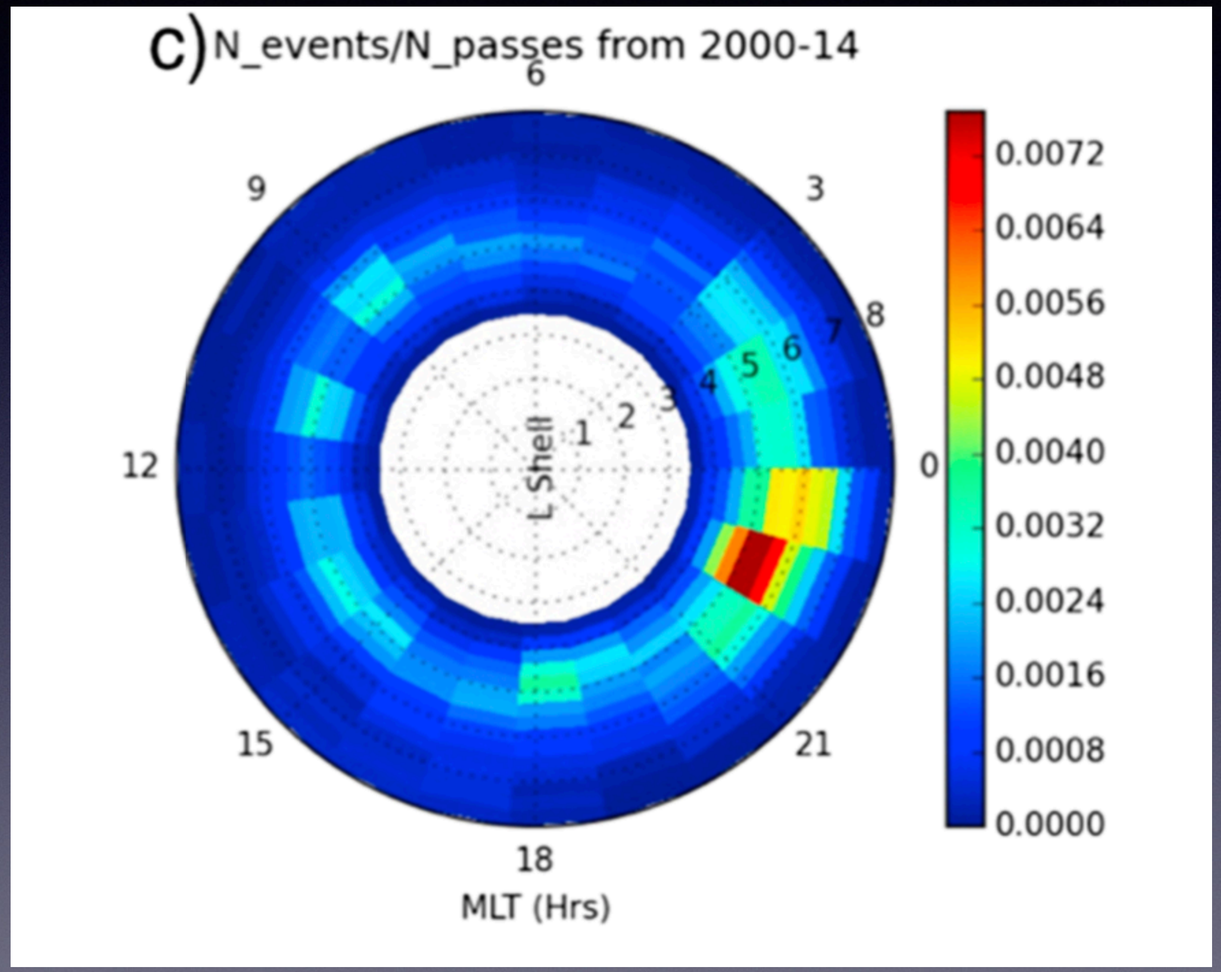
Delta-L vs. L and MLT for 2s Data



- Events are very narrow in L
- Do not see the broad population near midnight

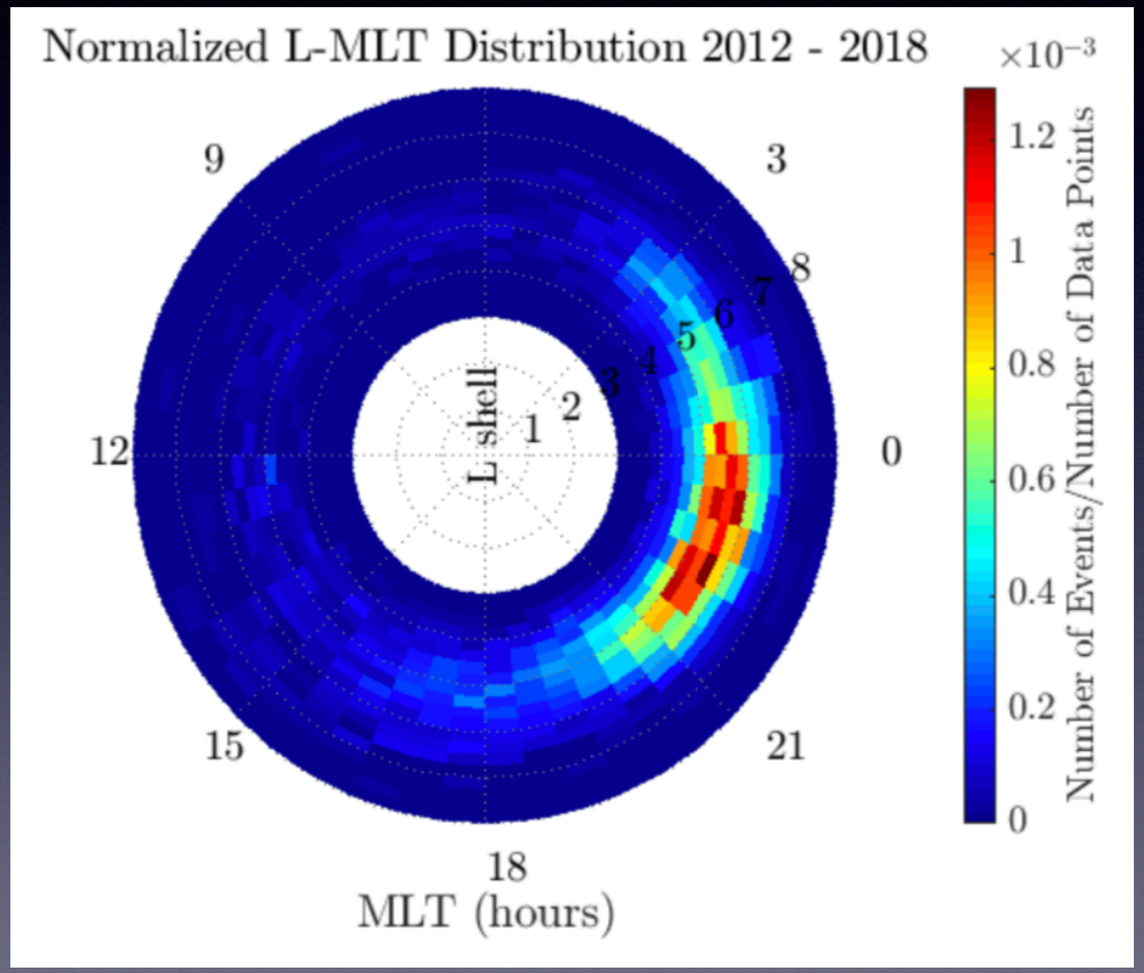
Event Comparison

16s-resolution data



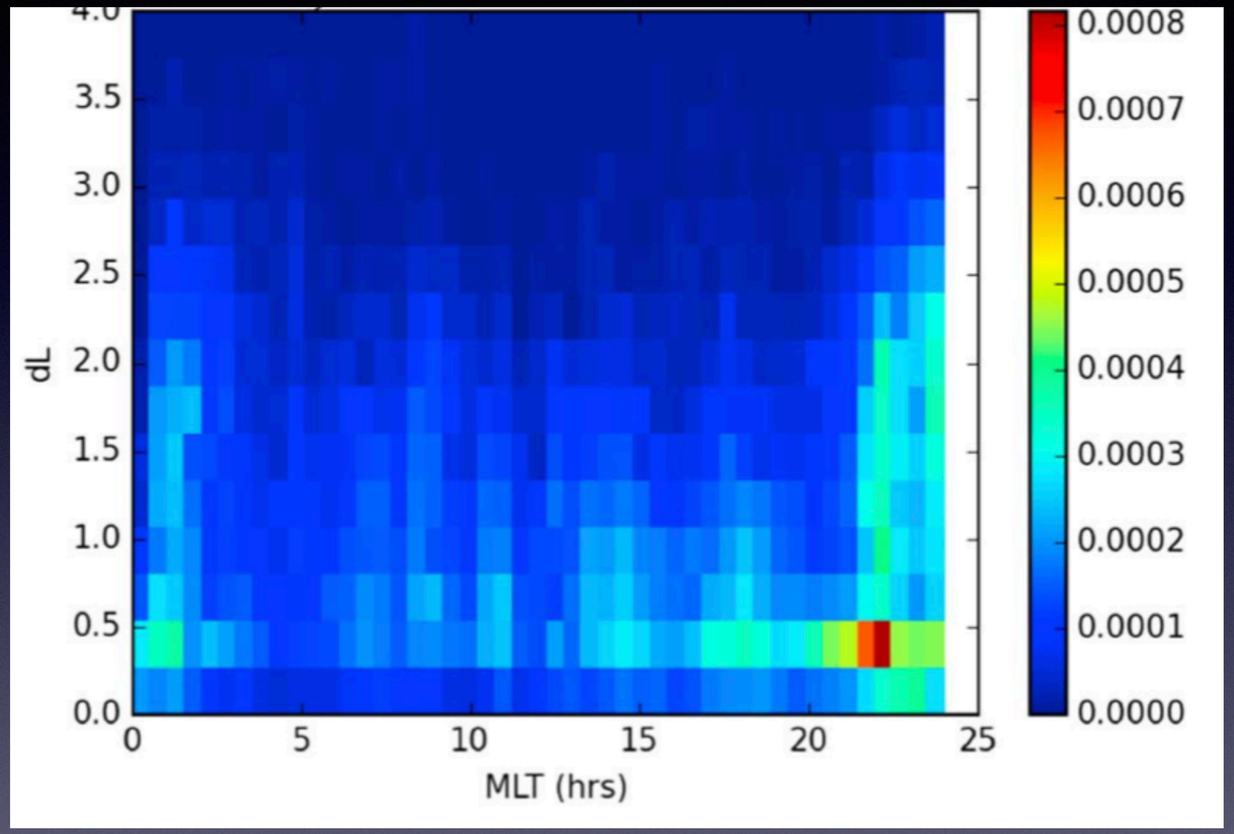
Shekhar, et al., 2017

2s-resolution data

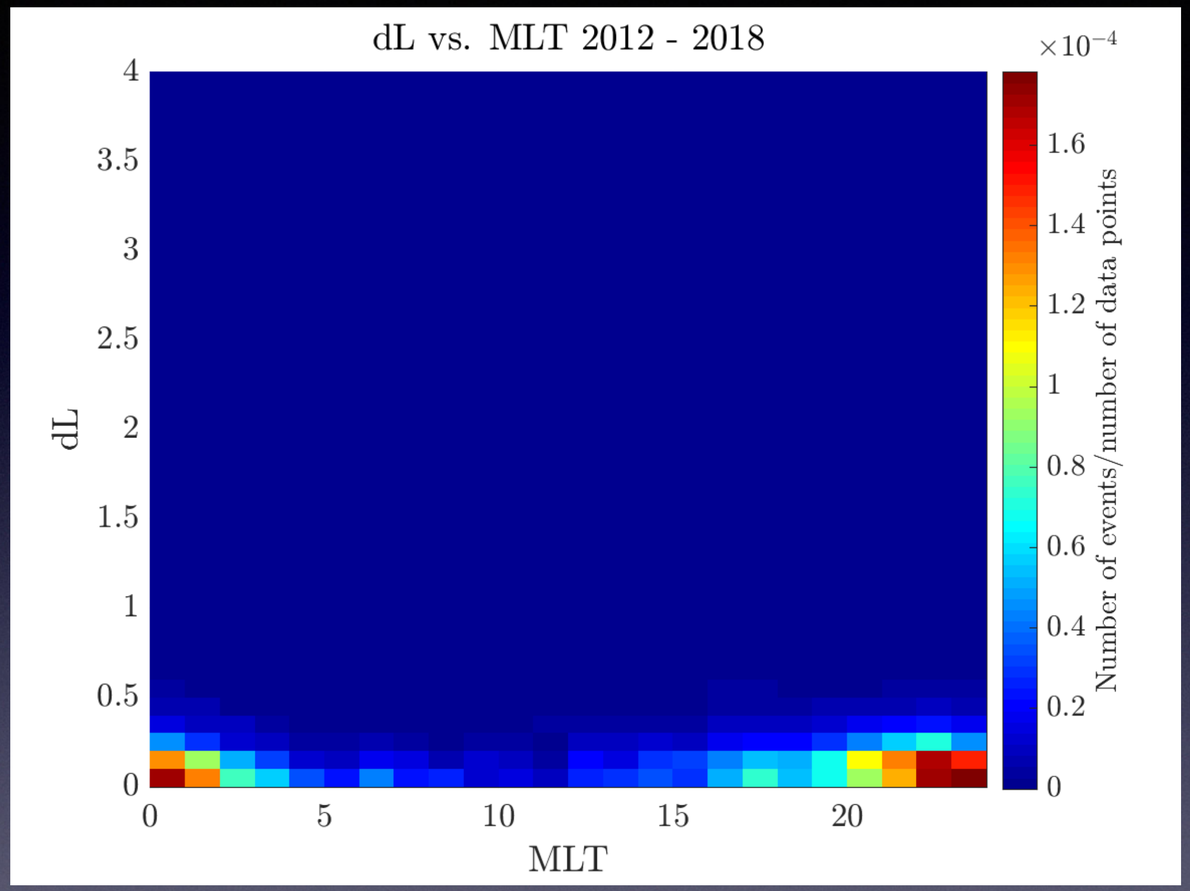


Gasque, et al.

Comparison: Delta-L vs. MLT



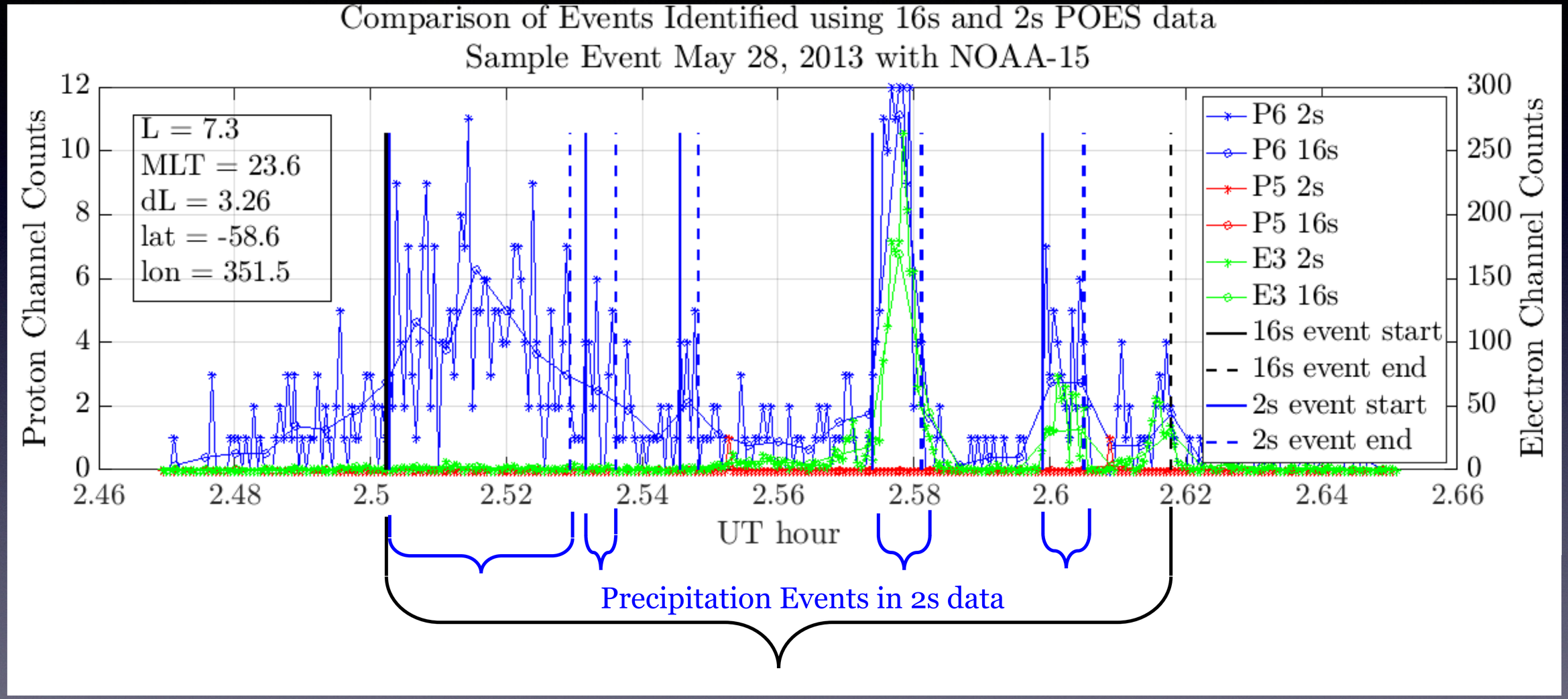
Shekhar, et al., 2017



Gasque, et al.

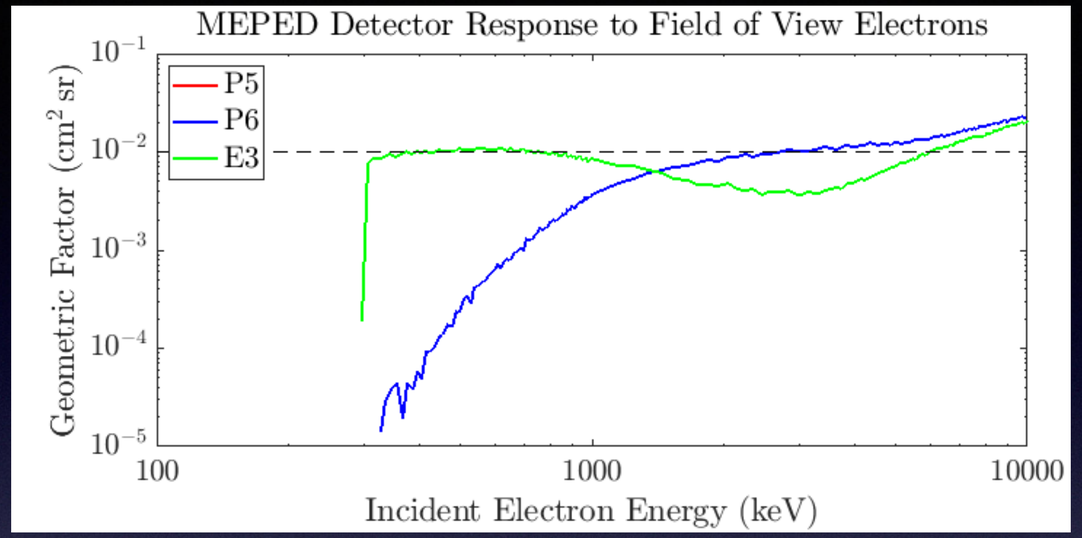
- New results do no show the broad events near midnight.
- Result of difference in time resolution?

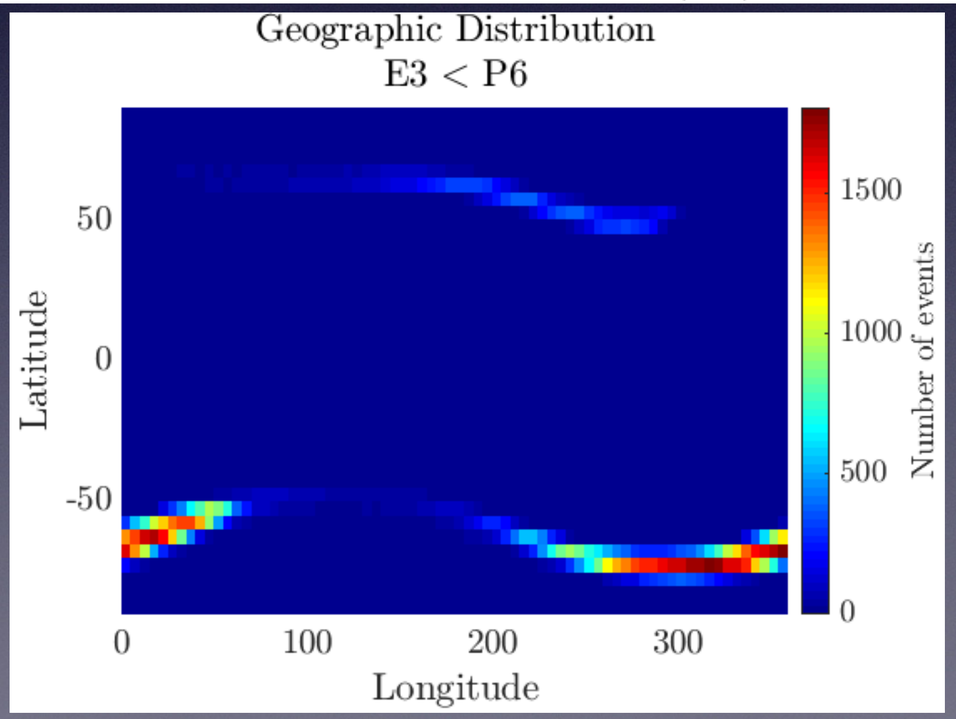
Event Comparison 2s vs. 16s

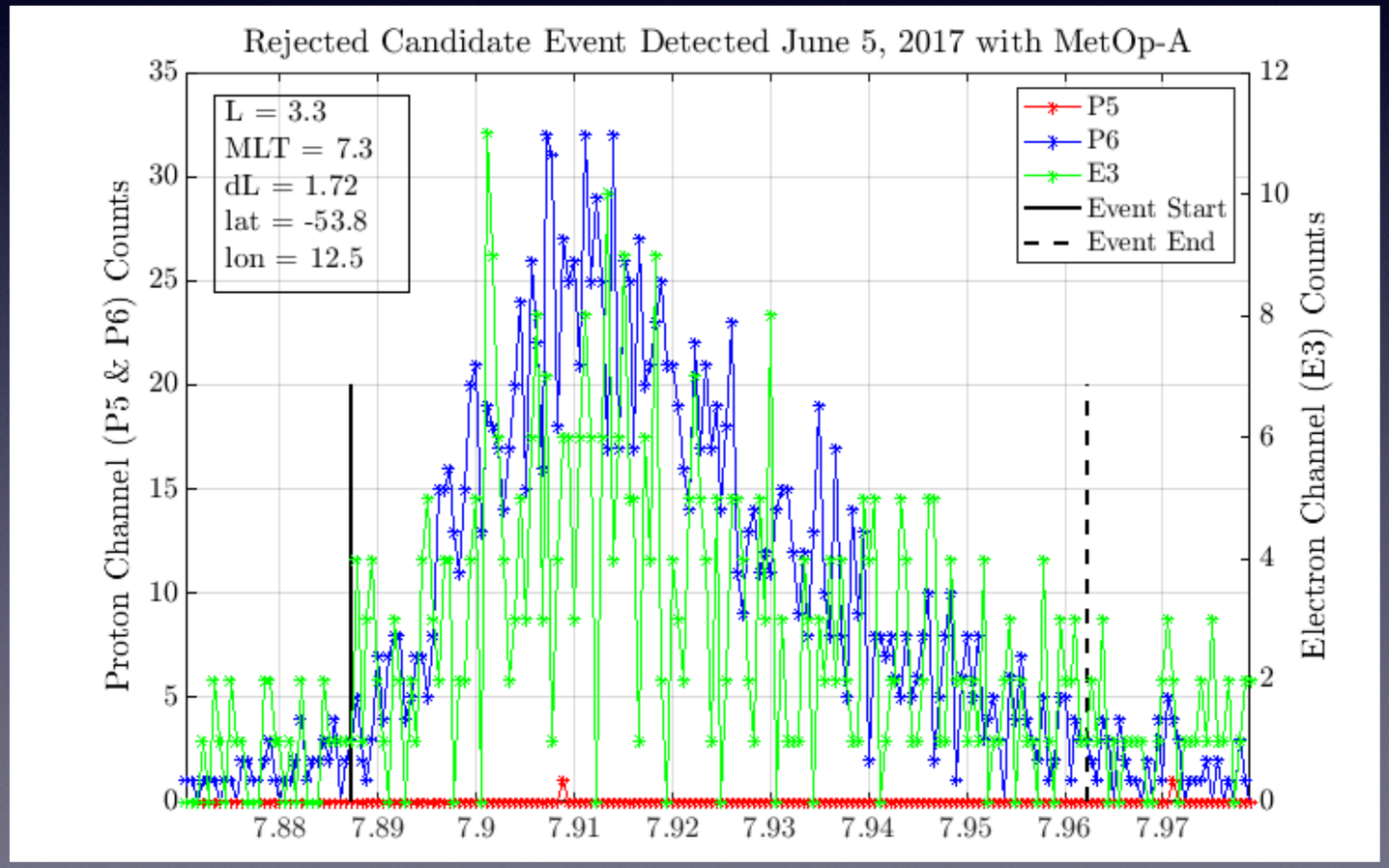


- Suggests more spatial structure for the midnight events?

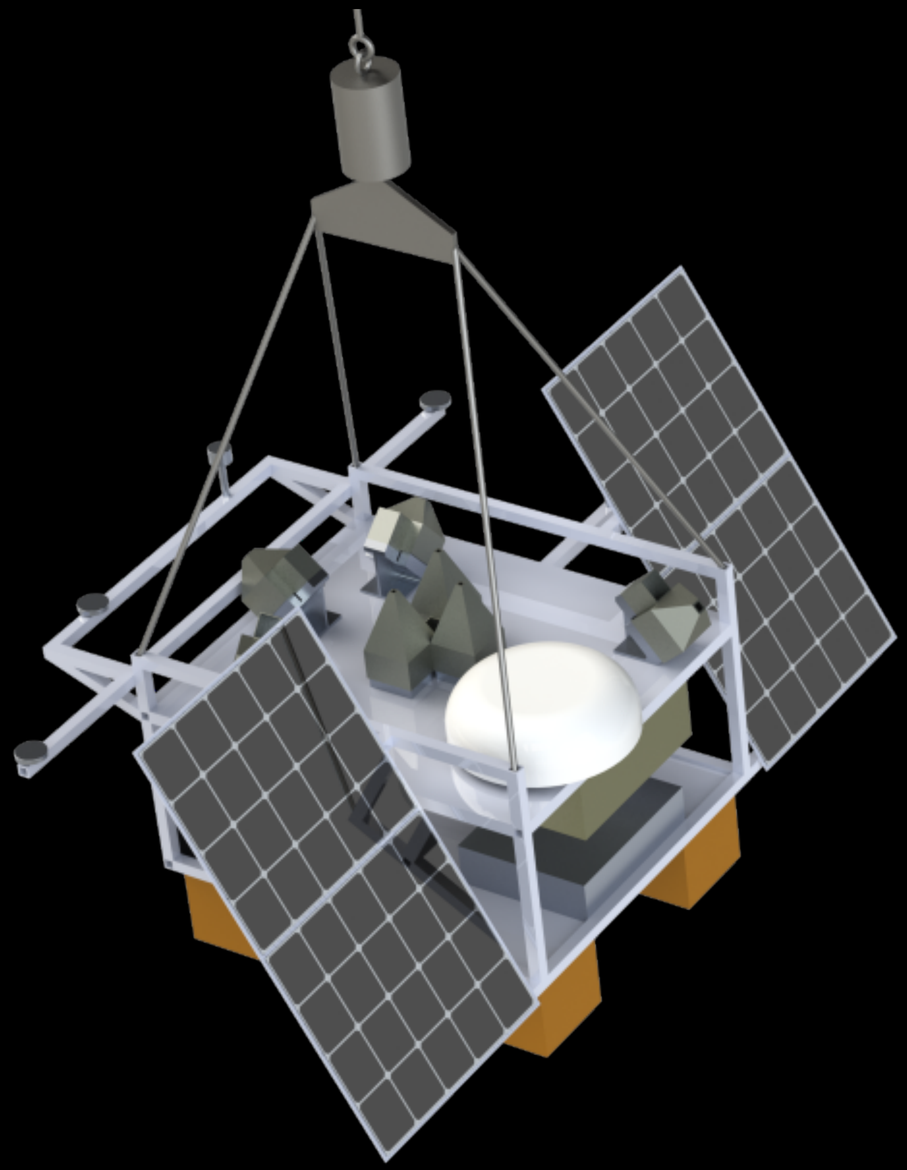
Events with E3 < P6





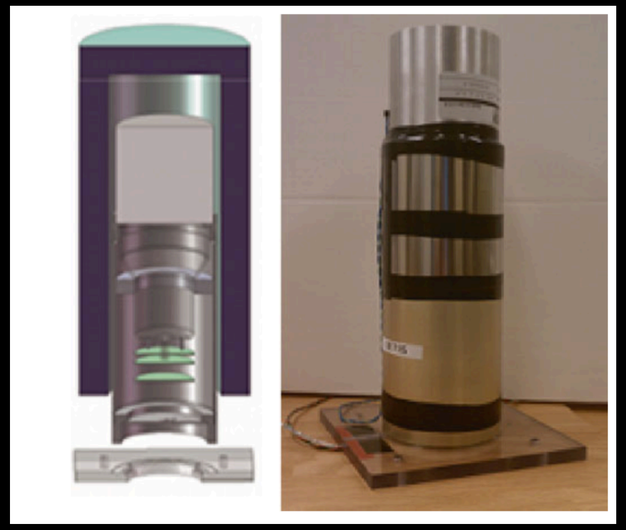


Balloon Observations of Microburst Scales (BOOMS)



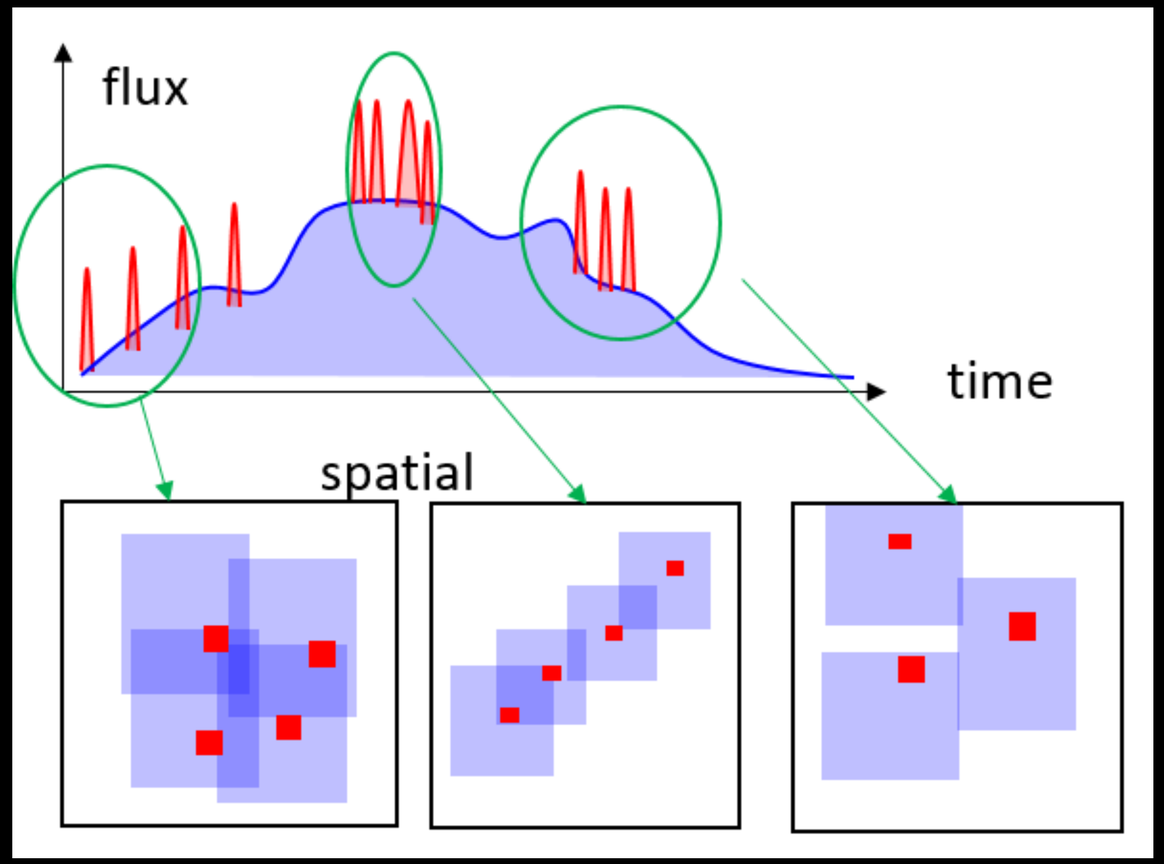
- Balloons are essentially stationary on microburst timescales => Ideal platform.
- Imager heritage from MAXIS and BARREL
- BARREL Spectrometers for high energies
- Gondola heritage from COSI and GRIPS
- Launch from Kiruna, Sweden in 2022

MAXIS Imager



BARREL Spectrometer

Balloon Observations of Microburst Scales (BOOMS)



- PI: John Sample
- BOOMS is designed to look at the small scale and provide the first ever imaging of fast (~100ms) precipitation presumably due to wave particle interactions
- Will also be capable of imaging duskside precipitation