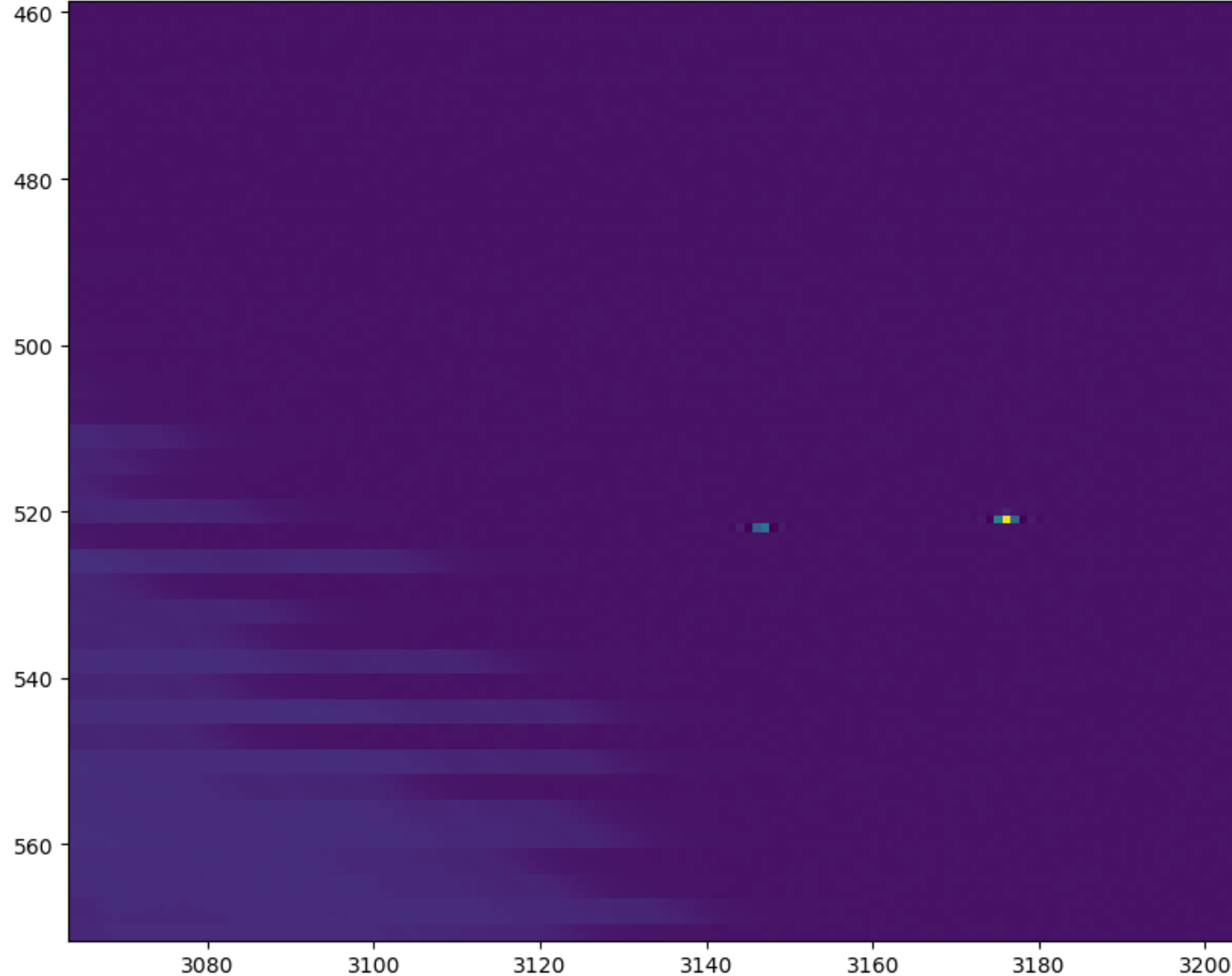


# MERCURIAL CALIBRATION FOR IR SENSORS (SEVIRI)

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UNIVERSITÄT HAMBURG / EUMETSAT

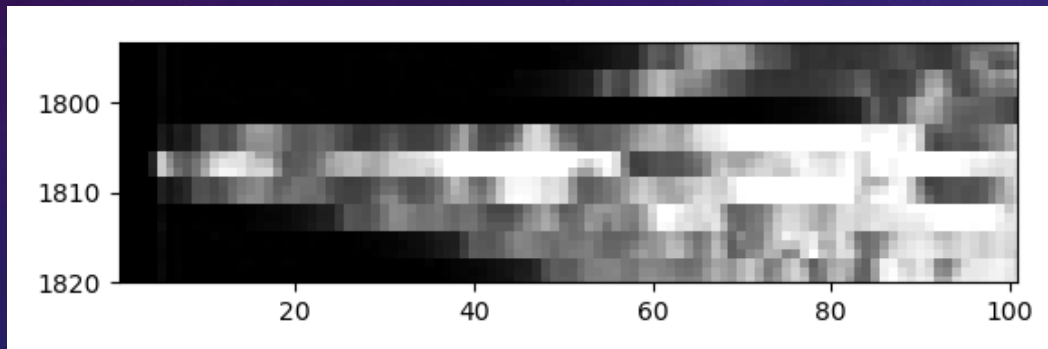
## RAW IMAGE OF SEVIRI ON METEOSAT-10 WITH MERCURY CLOSE TO EARTH

- The image of Mercury was on 2016/03/14, 23:30, near the border between two scan lines.
- The scan lines are shifted by dozens of pixels.
- Mercury is not present in the level 1.5 products.

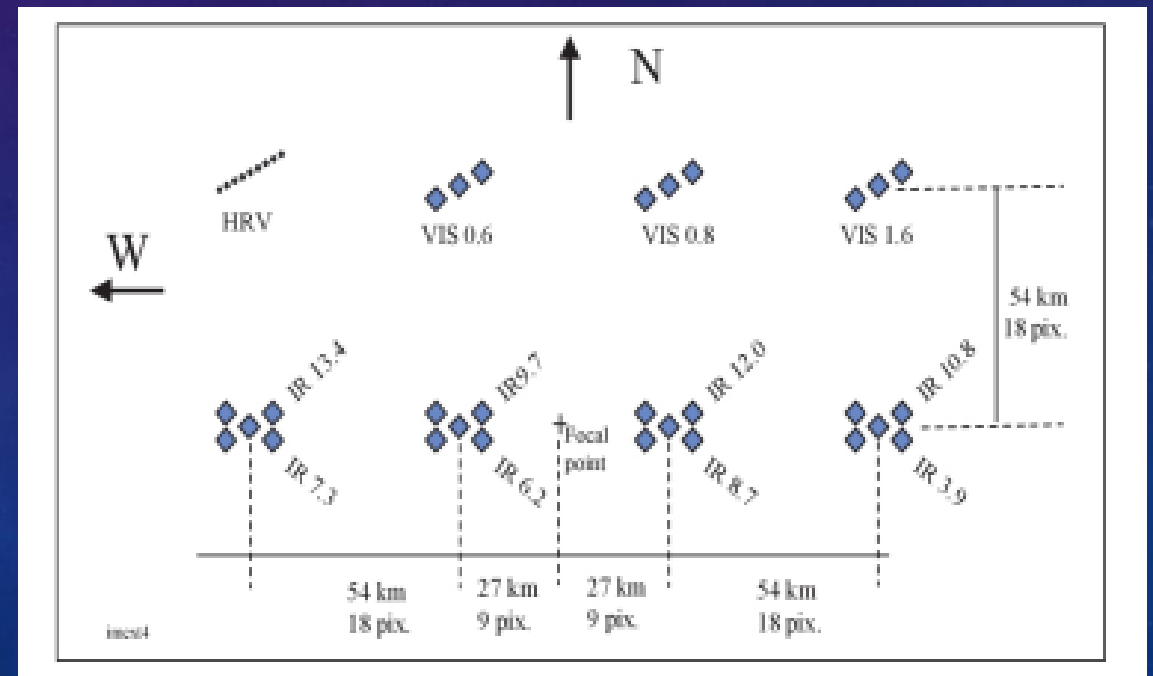


# OCCASIONAL SHIFTS BETWEEN SCAN LINES OF SEVIRI AND PROCESSING ARTIFACTS (I)

Earth's limb in raw data (WV073):  
One scan line shifted too far.

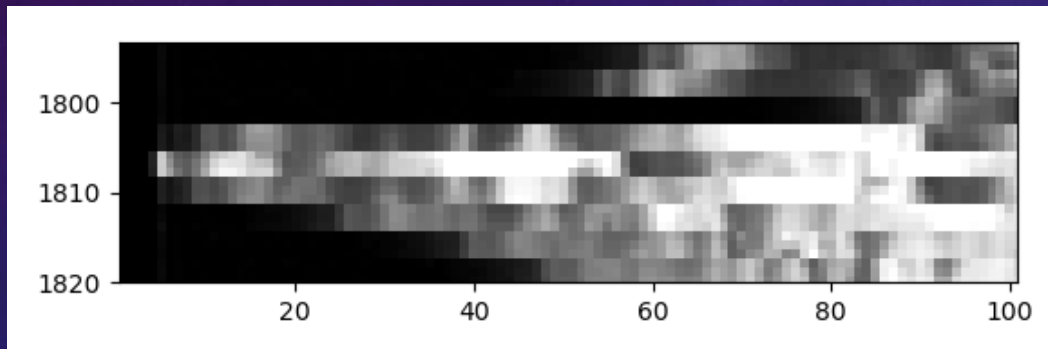


SEVIRI focal planes apparent layout

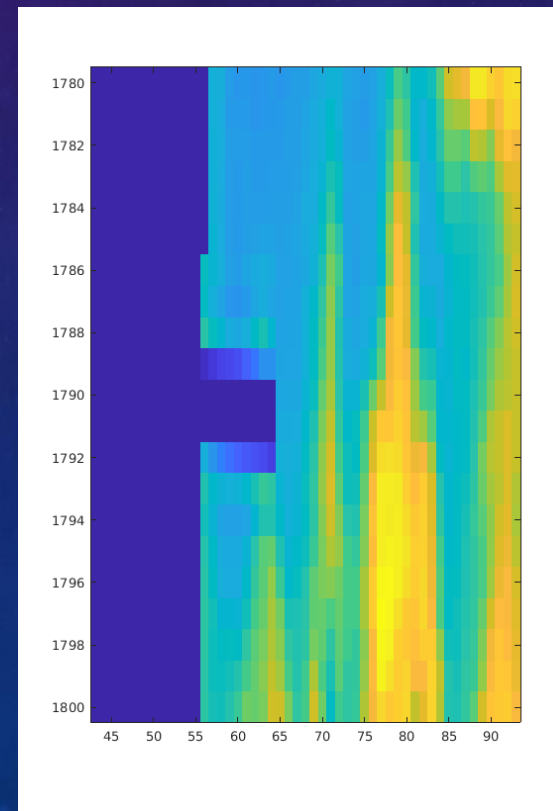


# OCCASIONAL SHIFTS BETWEEN SCAN LINES OF SEVIRI AND PROCESSING ARTIFACTS (II)

Earth's limb in raw data (WV073):  
One scan line shifted too far.

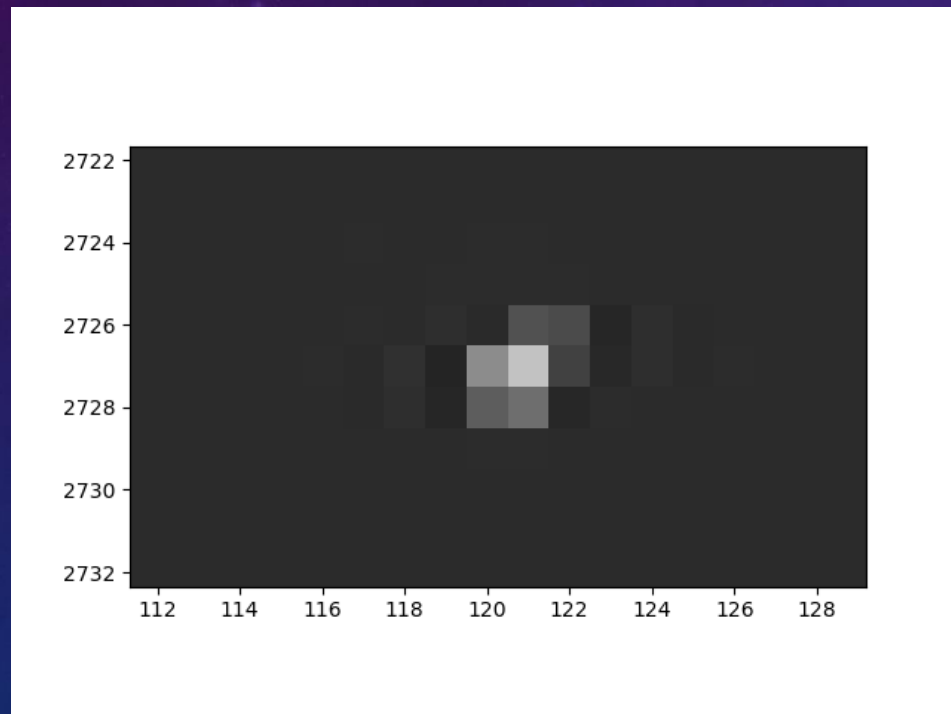


Earth's limb in Level 1.5 (WV073):  
Nine detector lines are affected.

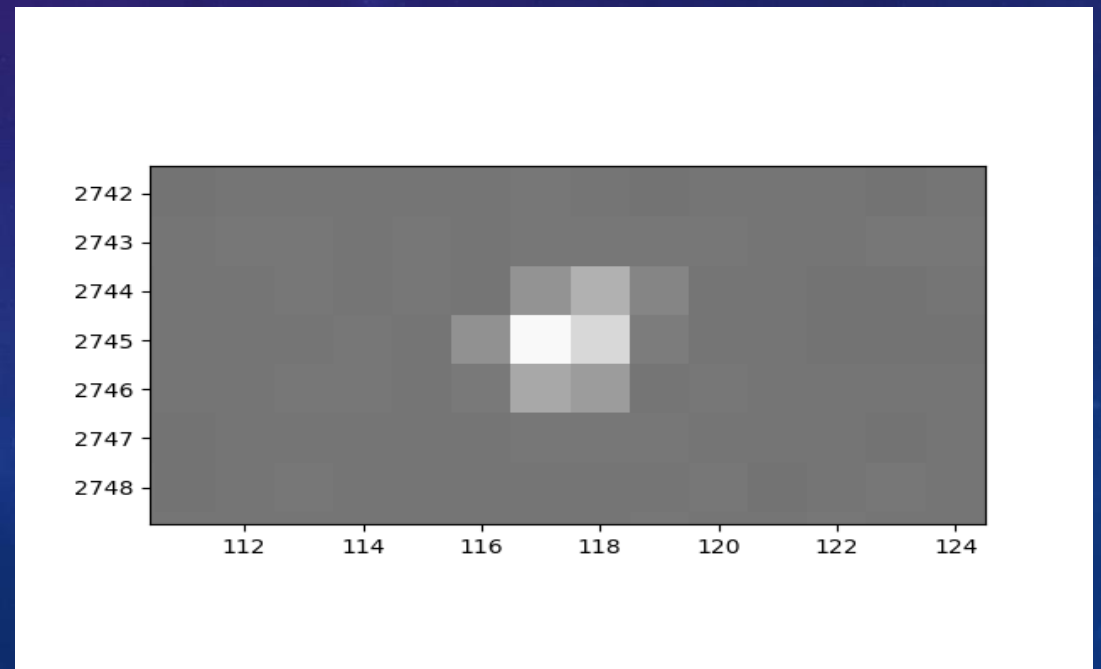


# CHANNEL CO-REGISTRATION WITH SEVIRI

Venus with Meteosat-10 at  $0.635 \mu\text{m}$   
on 5/15, 2017, position N to S: 2727.1

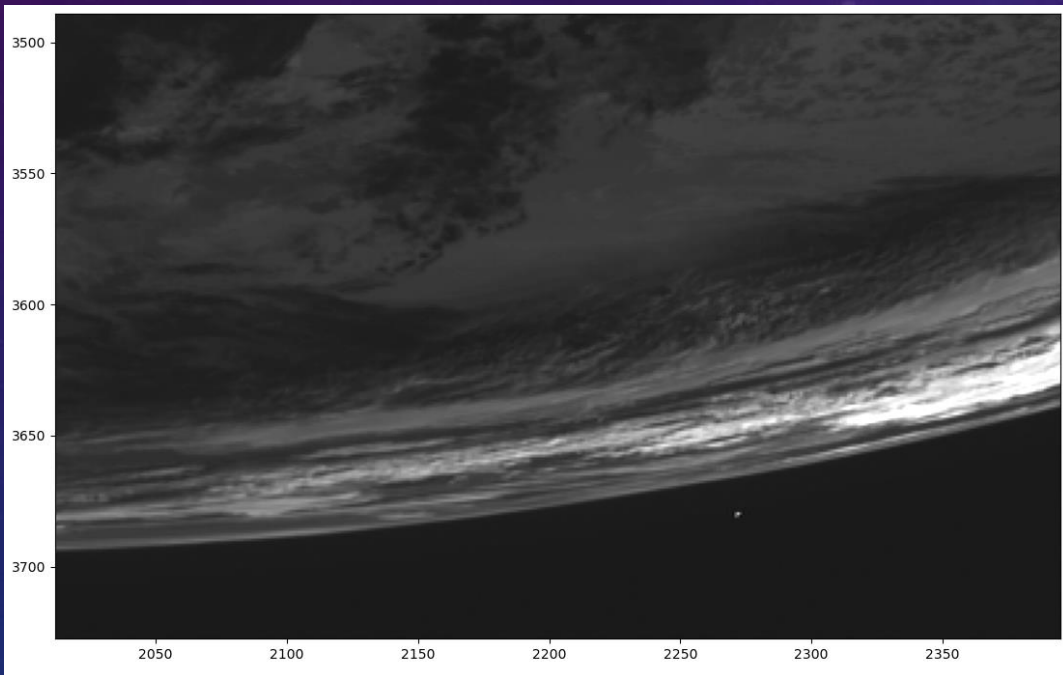


Venus at  $8.7 \mu\text{m}$  is at the position  
2745.0, offset is 18 pixels between  
the focal planes.

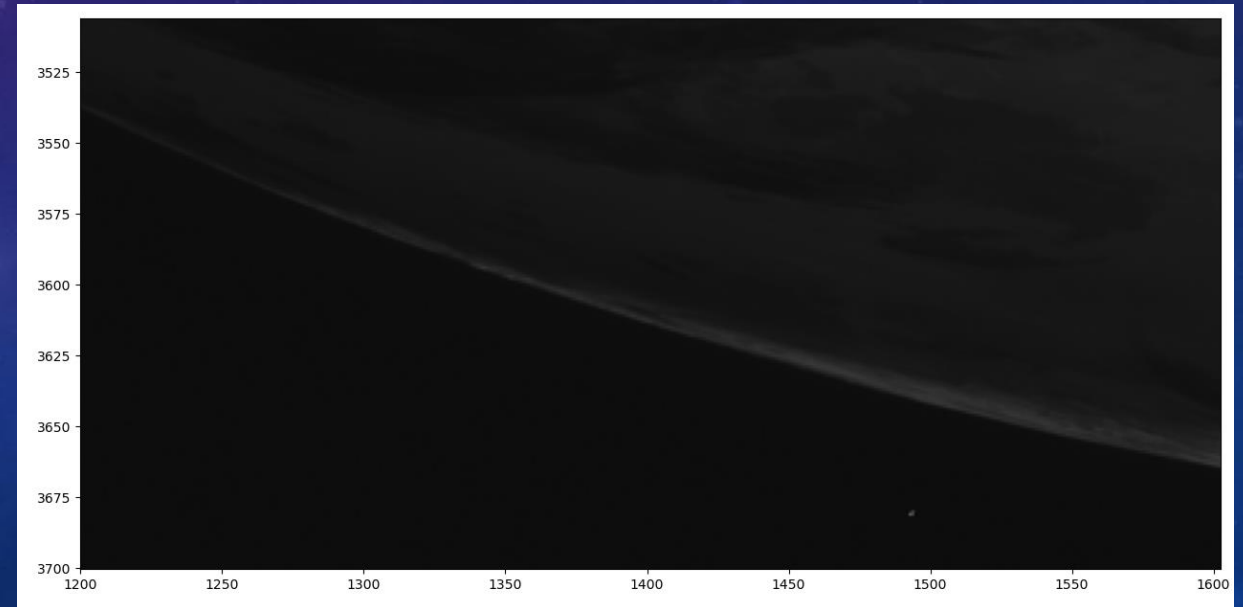


# FIVE CONSECUTIVE OBSERVATIONS OF MERCURY (I)

Mercury with Meteosat-10 at 3.92  $\mu\text{m}$   
on 5/15, 2017, 22:15



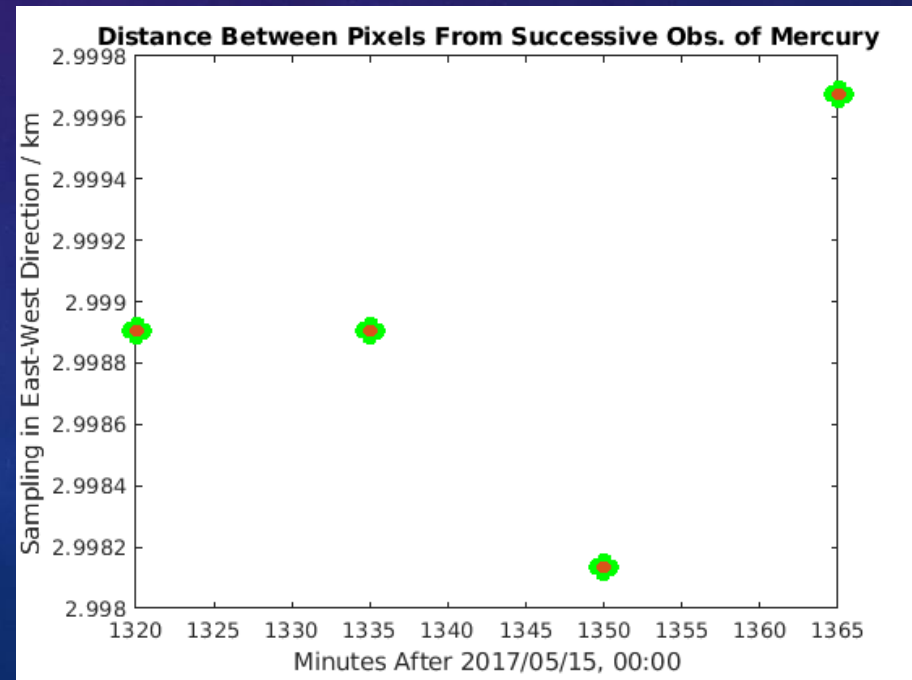
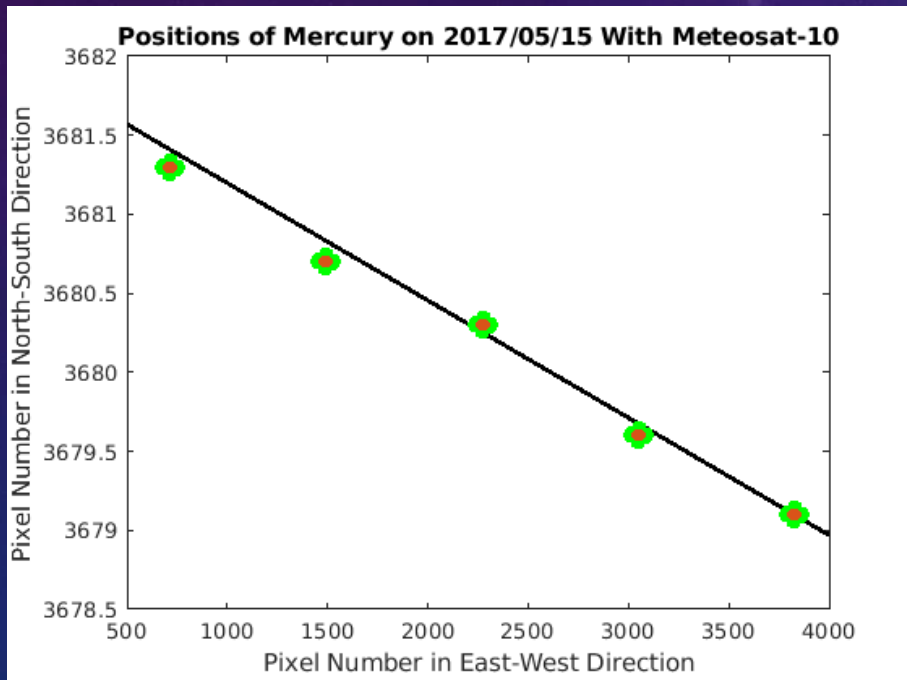
Mercury at 22:30



# FIVE CONSECUTIVE OBSERVATIONS OF MERCURY (II)

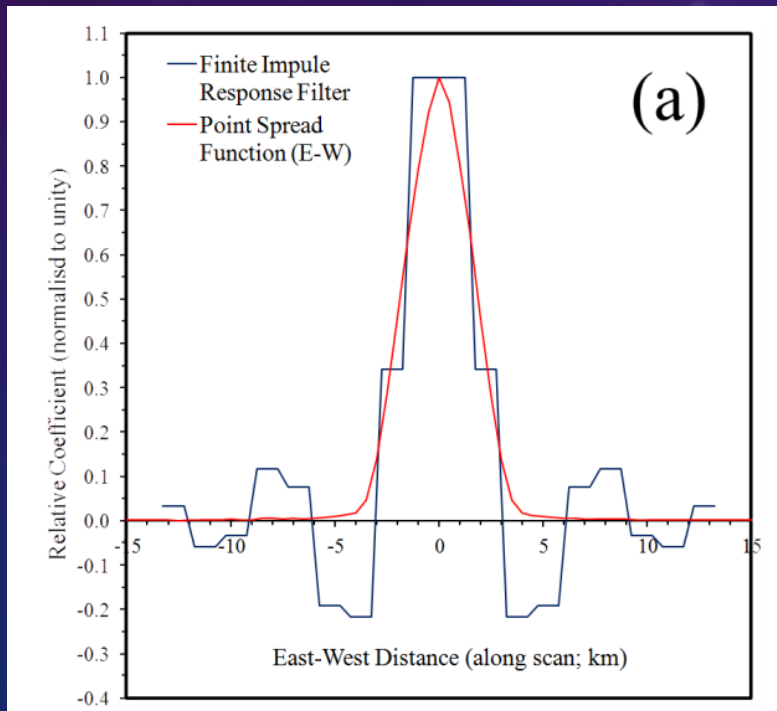
Movement of Mercury in North-South direction agrees with Observation.

Sampling is accurate within a fraction of a % over one hour.

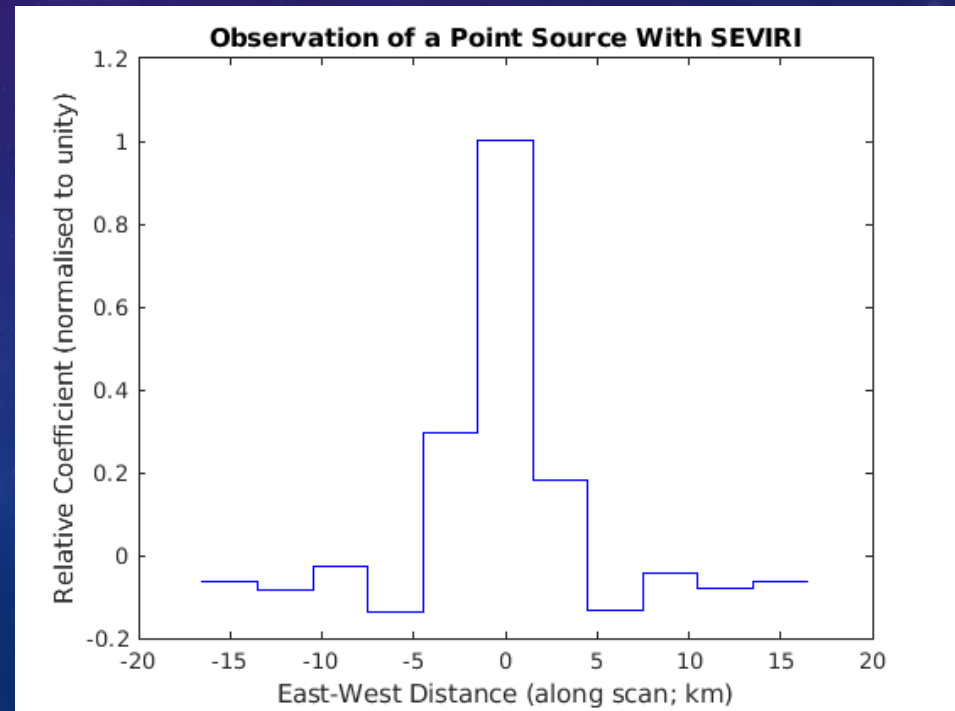


# FIR FUNCTION APPLIED TO LEVEL 1.0 DATA

The E-W point spread function of SEVIRI and the finite impulse response



The normalised counts from a point source in the E-W direction





# SUMMARY

- Channel Co-Registration
  - Nain & Mueller (2019): Inter-channel residual error of 0.9 km → correction of pointing table needed
  - Our result: Inter-channel residual error  $\leq 0.3$  km → no need to change pointing table
  - Reason for discrepancy: systematic error in matching of VIS and IR channels? MSG-3 different from MSG-4?
- Optical Properties of the Array
  - Tilt of array against equator is less than  $0.016^\circ$ .
  - Sampling for narrow channels is 2.9989 km in East-West direction,  $1 \sigma$  uncertainty is 33 cm s.s.p.
- Point Spread Function
  - Qualitative agreement between measured counts from a point source and simulated PSF + FIR (Wooster et al., 2015)

# CONCLUSIONS

Observations of Mercury and Venus in the edges of the FOV of imagers on geostationary satellites are useful for characterising

- Channel co-registration
- Sampling distance with high accuracy
- Orientation of array relative to equator
- Point spread function (all channels)

Occasionally shifts of up to 100 pixels between scan lines were observed in the raw data.

Check of photometric calibration with Mercury and Venus requires calibration coefficients or at least counts from CRS.