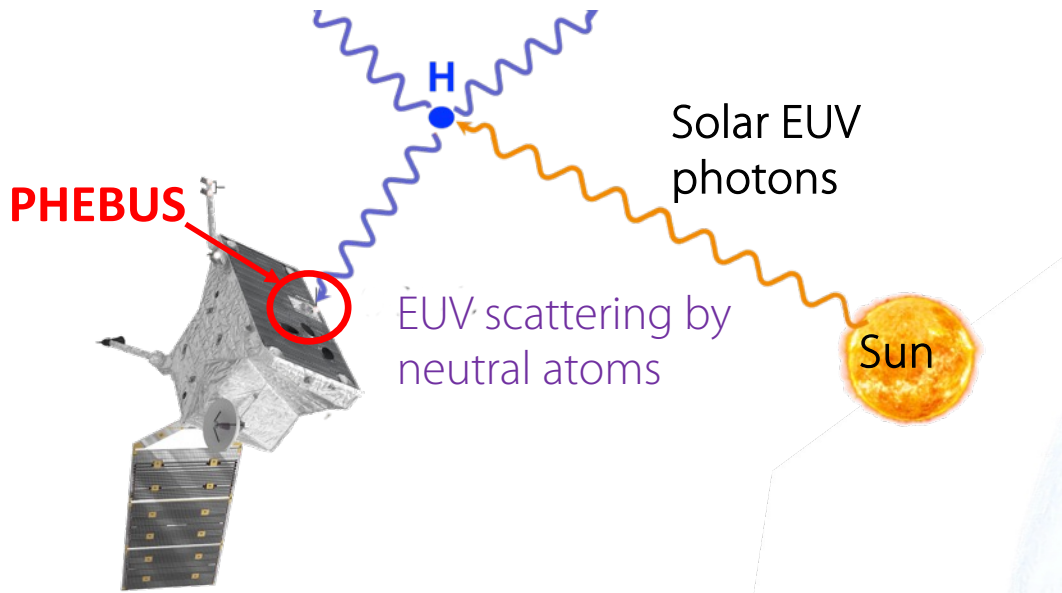




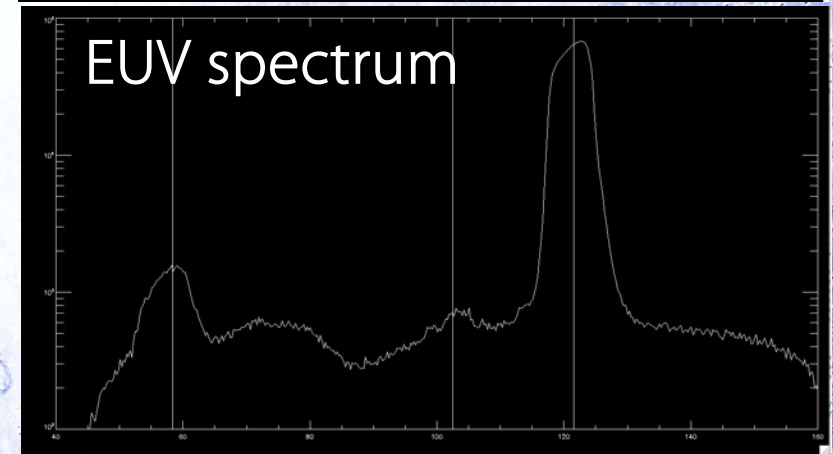
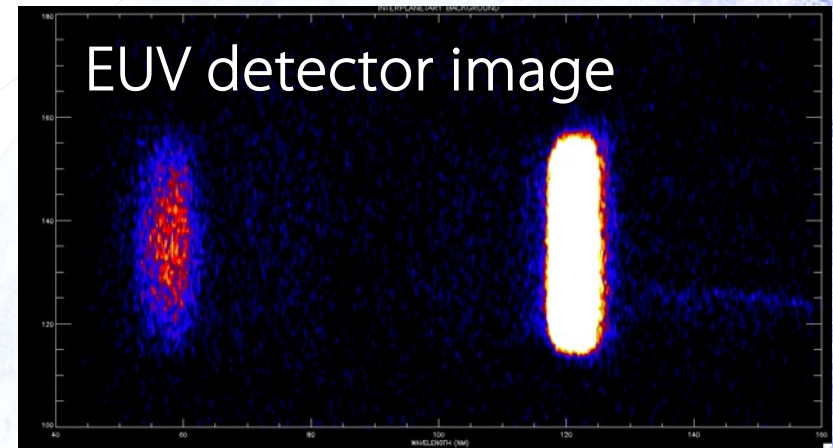
- PHEBUS/EUV detector operations
- BepiC Mercury SB#1 overview
- Instrument calibration @ He 58.4 nm
  - Solar Fluxes & Excitation Rates
  - Mariner 10 & PHEBUS calibration based on Interplanetary He
- Results & Discussion



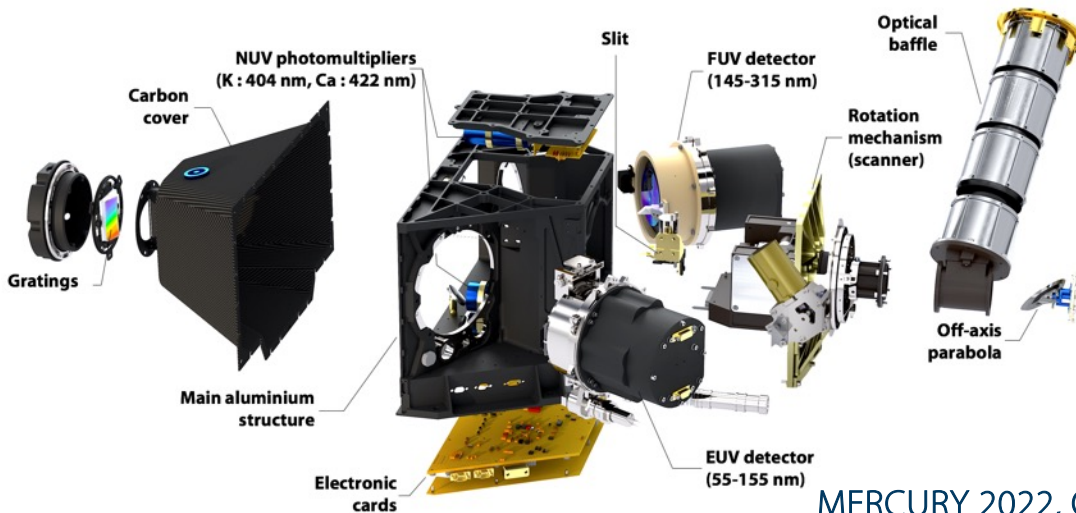
# PHEBUS EUV detector



In slit-less mode



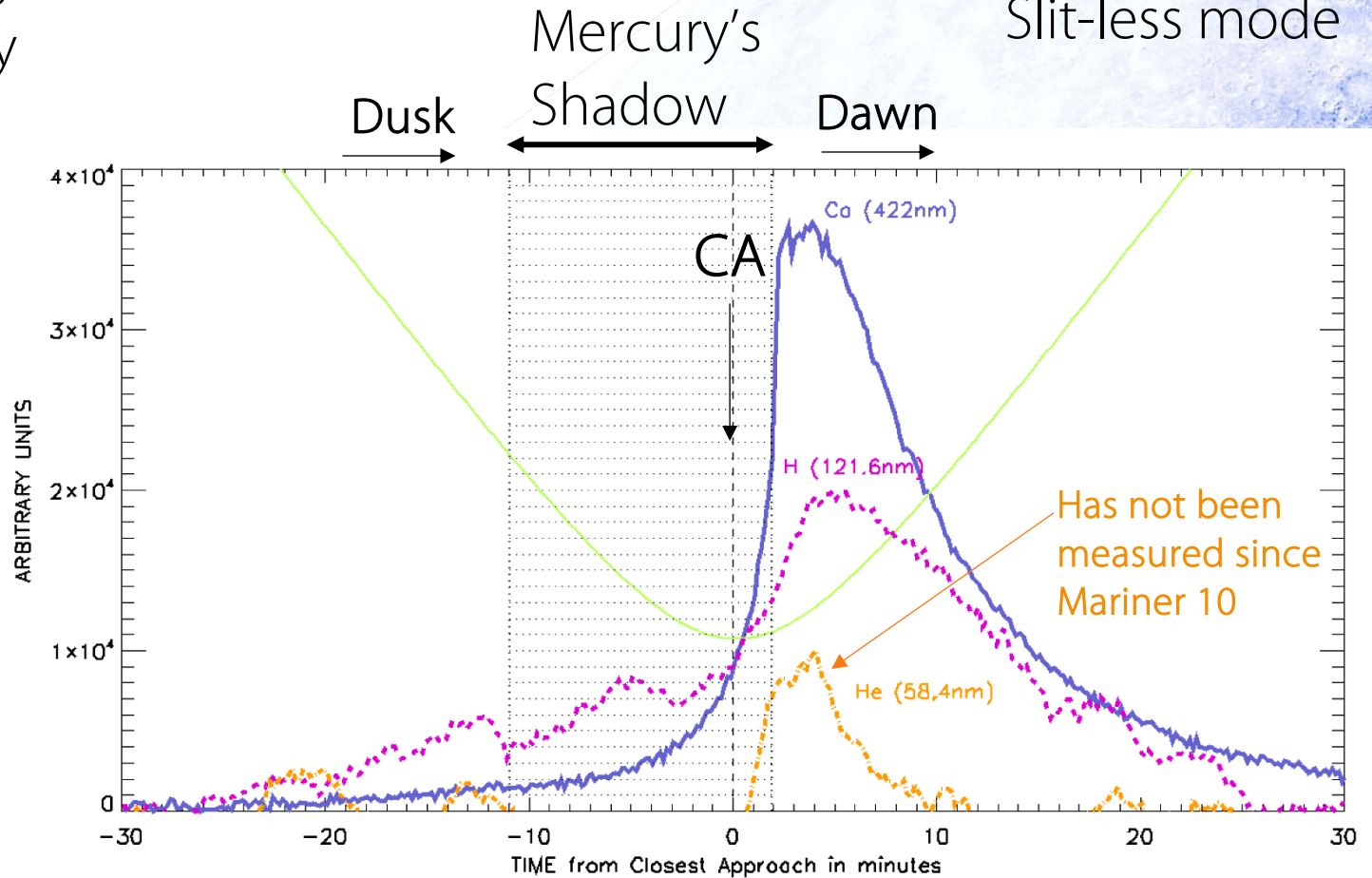
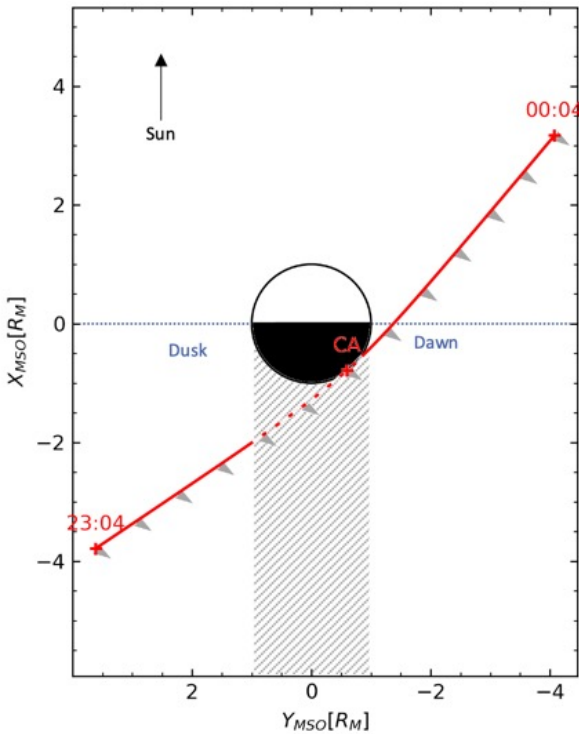
He 58.4 nm      H Ly- $\beta$  102.5 nm      H Ly- $\alpha$  121.6 nm



# BepiC Mercury SB#1 overview

Observation Geometry  
(see yesterday's talk by R. Robidel)

HV = 3.4 kV  
Slit-less mode



# Calibration @ He 58.4 nm

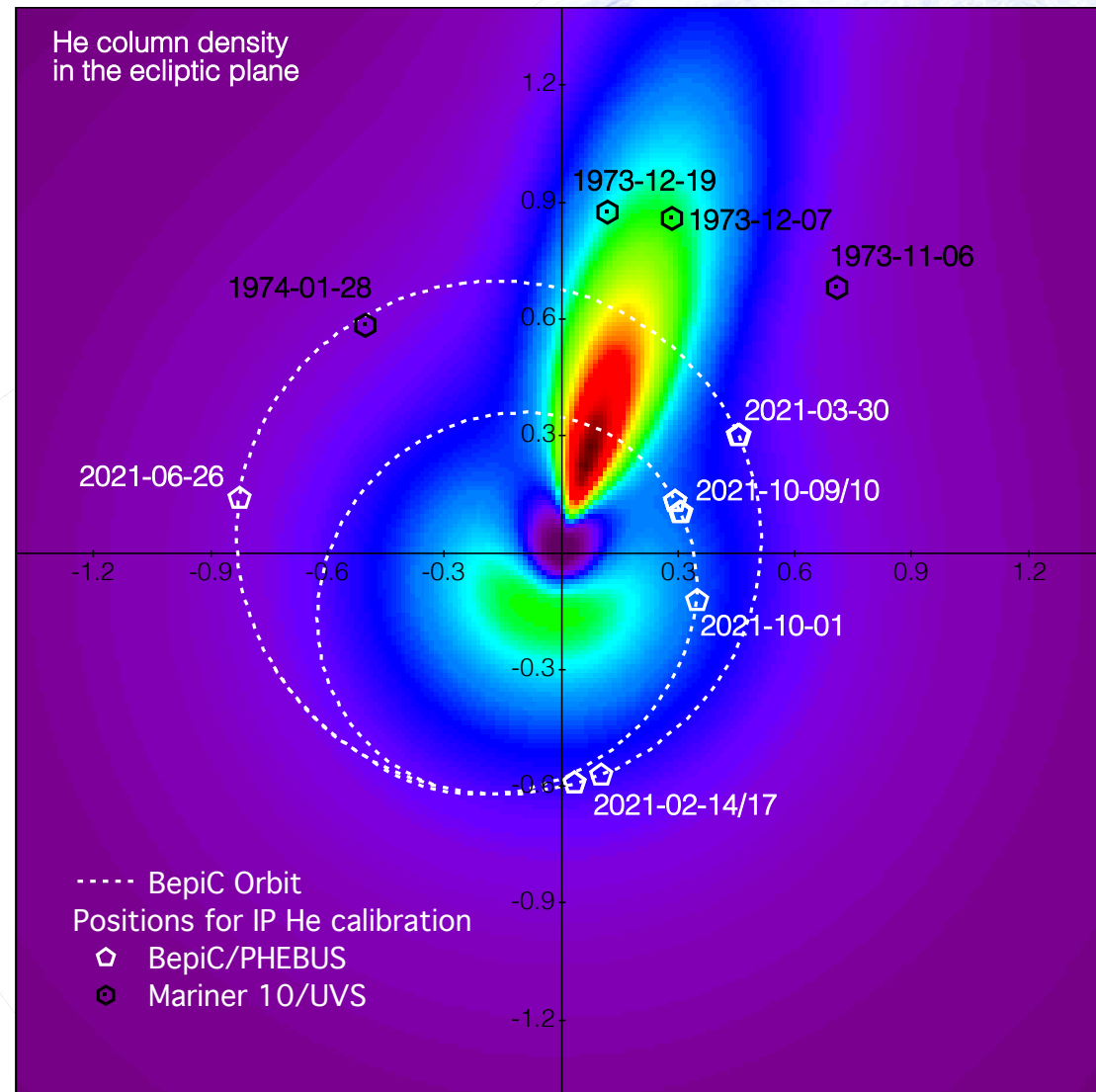
Based on IP He data & model:

-Model developed to fit the EUVE & SOHO/UVCS IP He data (Lallement et al., 2004).

-Compatible with an interstellar  $n_{\text{He}} = 0.02 \text{ cm}^{-3}$ , the SOHO/CDS solar fluxes and derived excitation rate at 1 AU.

-Mariner 10/UVS data:  
4 roll observations ('73 -'74)

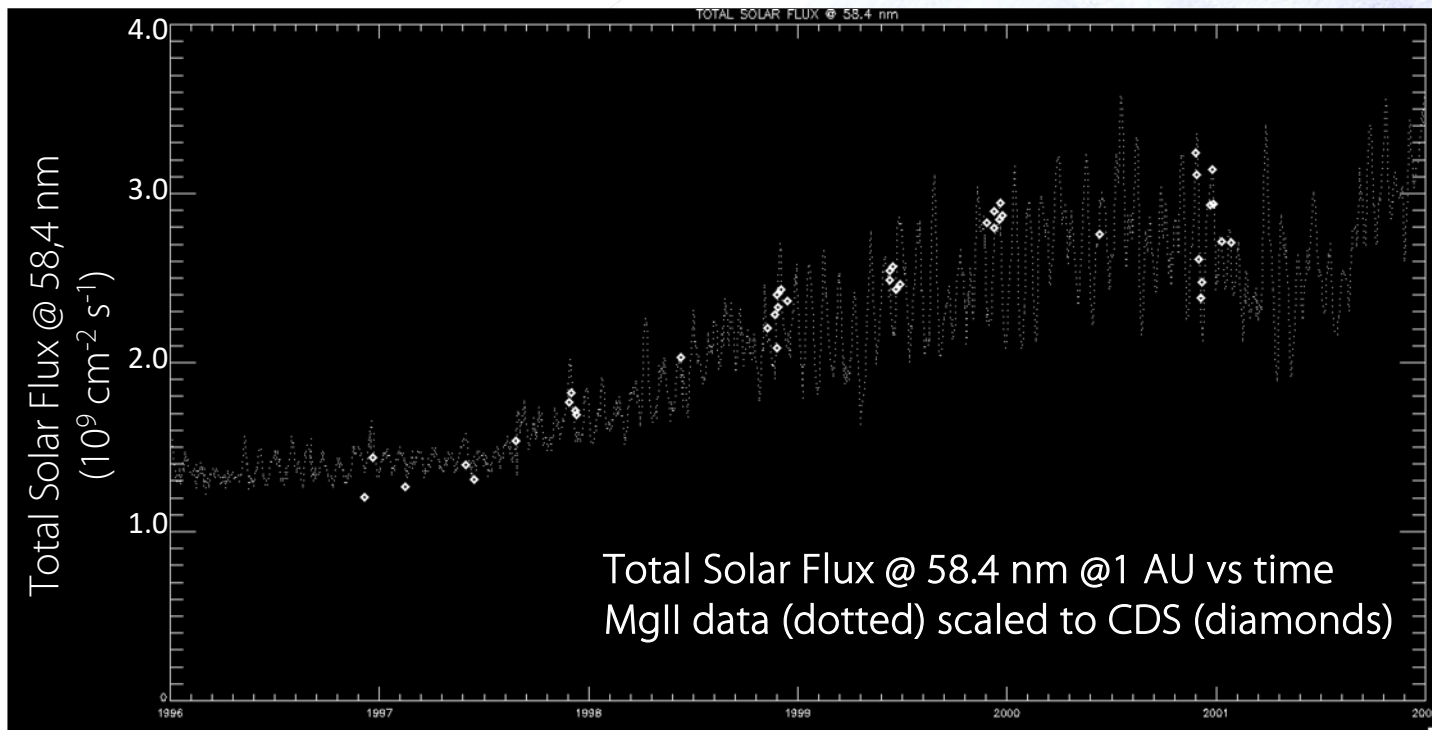
-BepiC/PHEBUS data:  
14 pointed observations (2021)





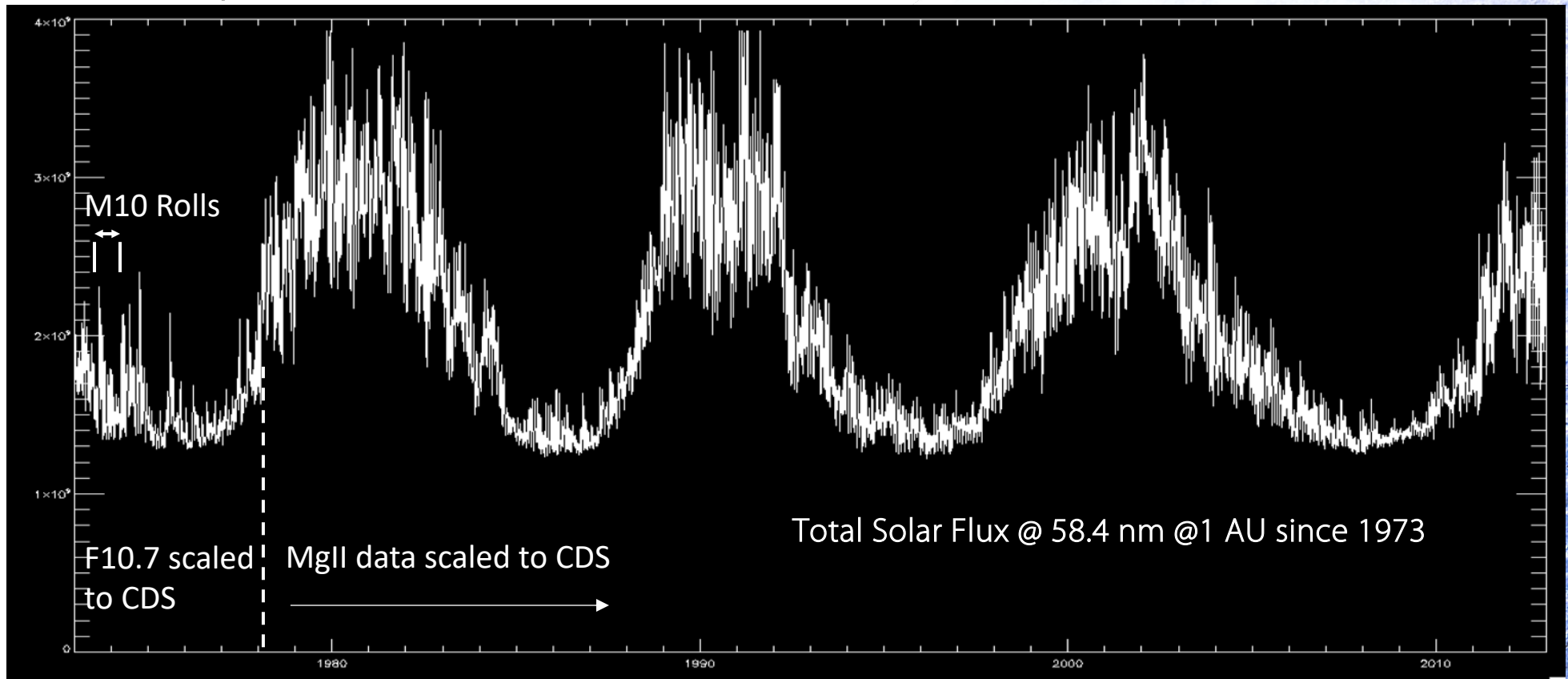
# Excitation rate @ 58.4 @ 1 AU

- $g = F(\lambda_0) \sigma_\lambda$
- $\sigma_\lambda = 8.34 \cdot 10^{-16} \text{ cm}^2 \text{ \AA}$
- $F(\lambda_0)$  solar flux at the center of the line ( $\text{cm}^{-2} \text{ s}^{-1} \text{ \AA}^{-1}$ ):
  - from SOHO/CDS total solar flux data from 1997 to 2001 (McMullin et al. 2004)
  - Assuming a line FWHM = 0.136  $\text{\AA}$  (SOHO/SUMER - no cycle dependence observed)
- Used by the ISSI Bern helium team (Lallement et al. 2004)

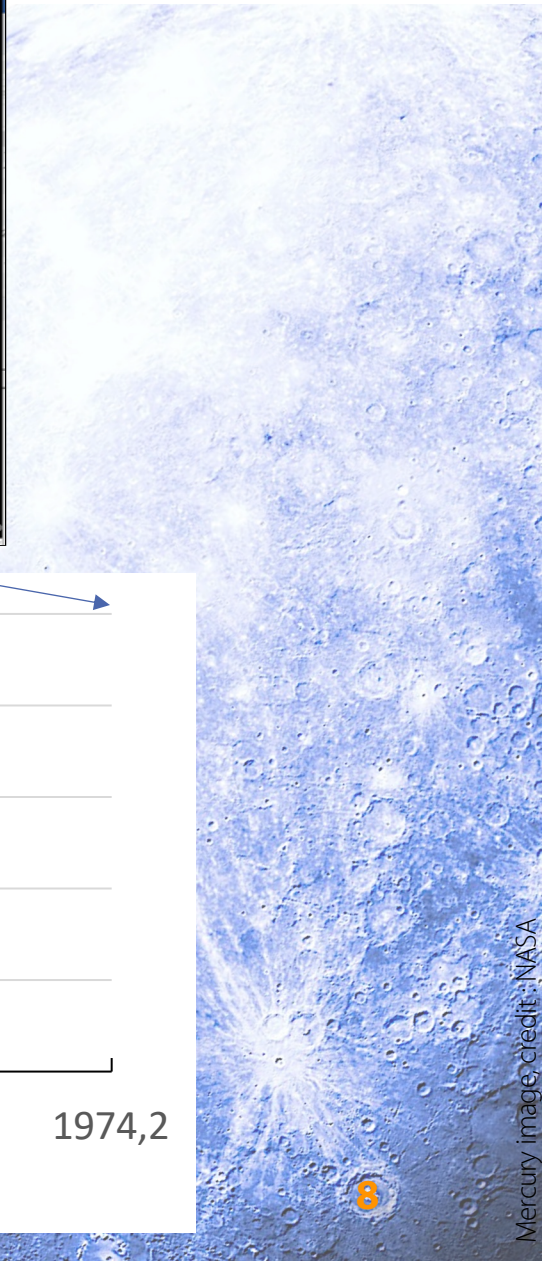
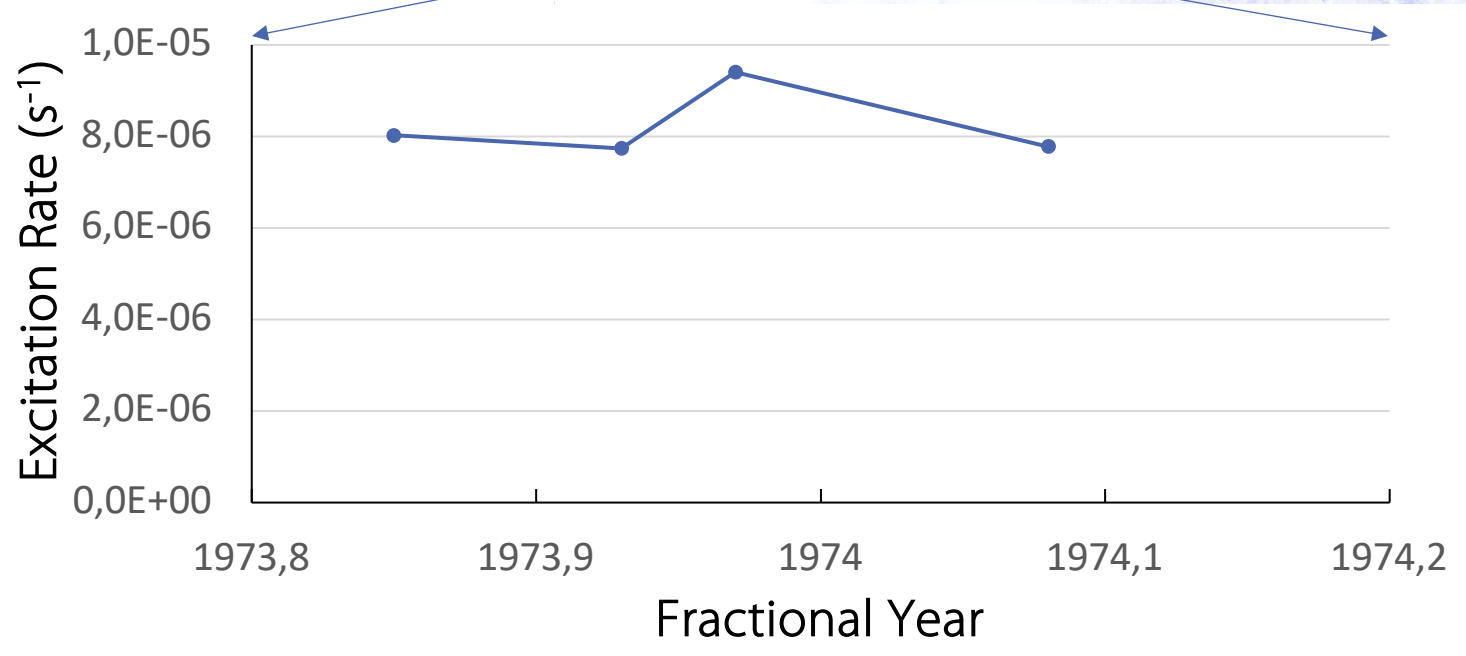
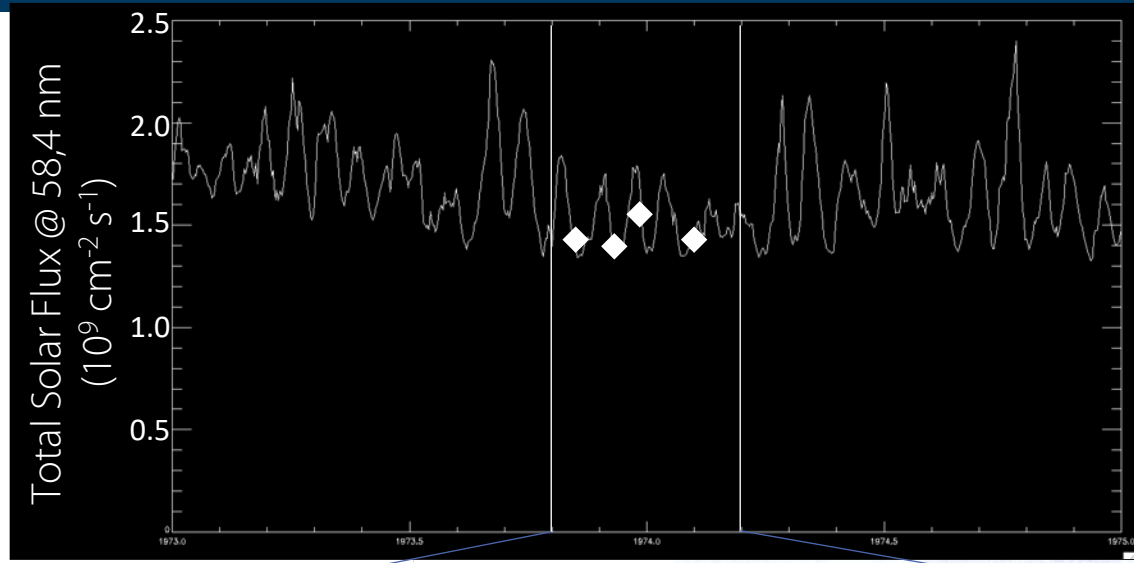


# Excitation rate @ 58.4 nm @ 1 AU

Total flux for 1973, from extrapolated MgII and F10.7 data scaled to SOHO/CDS



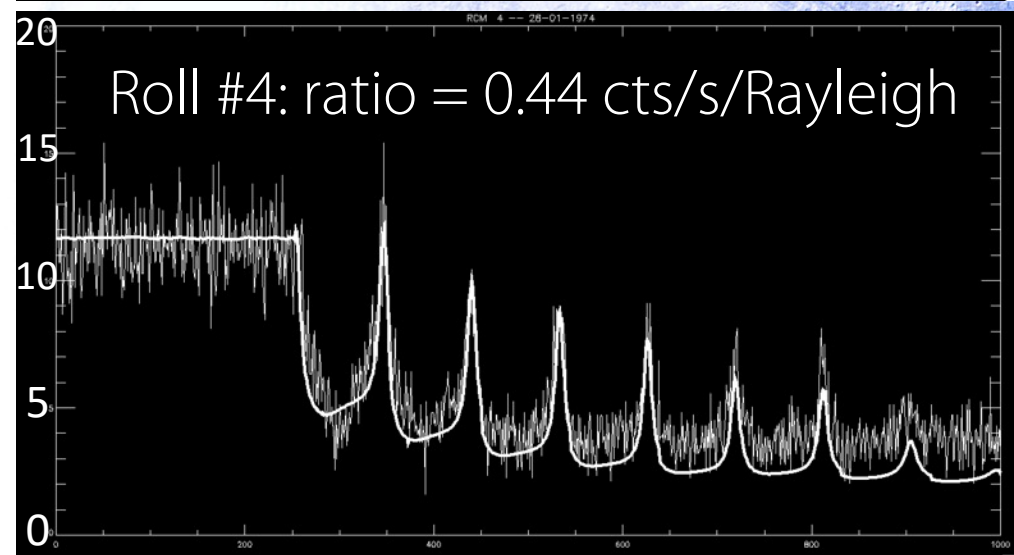
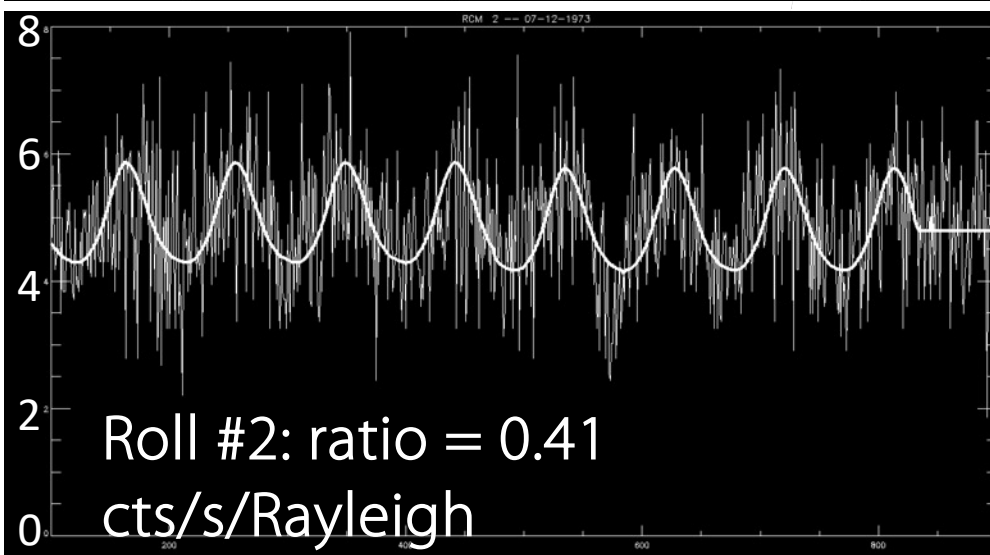
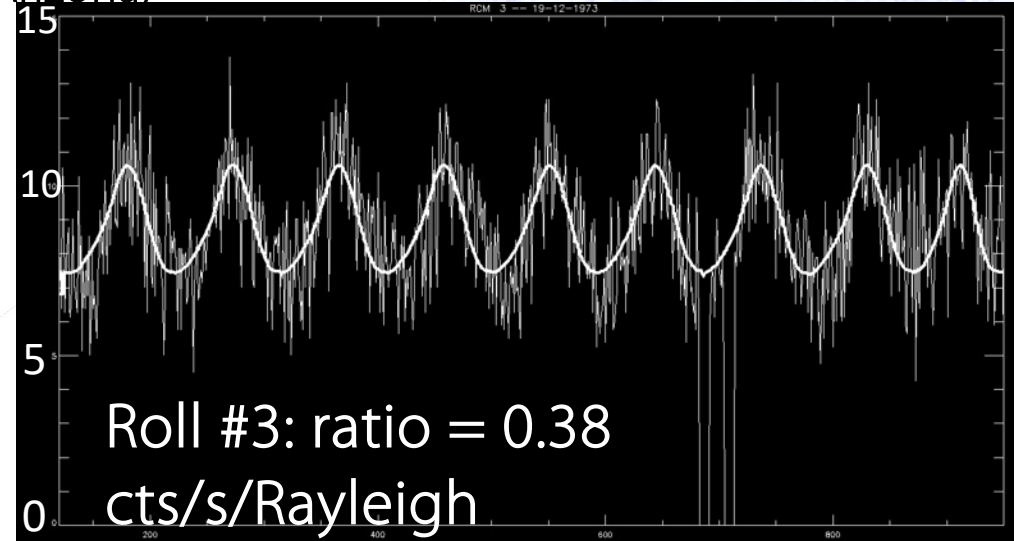
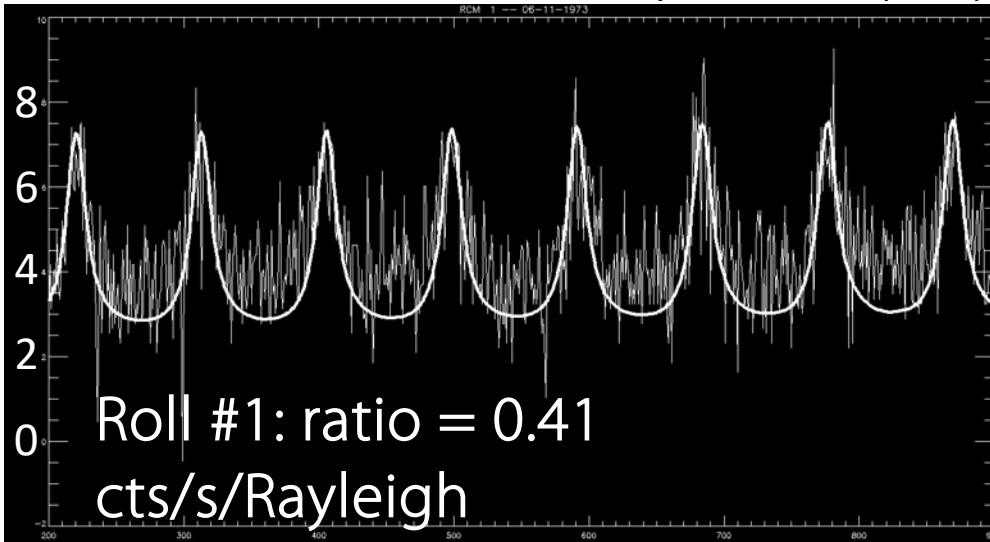
# Mariner 10/UVS Excitation Rates



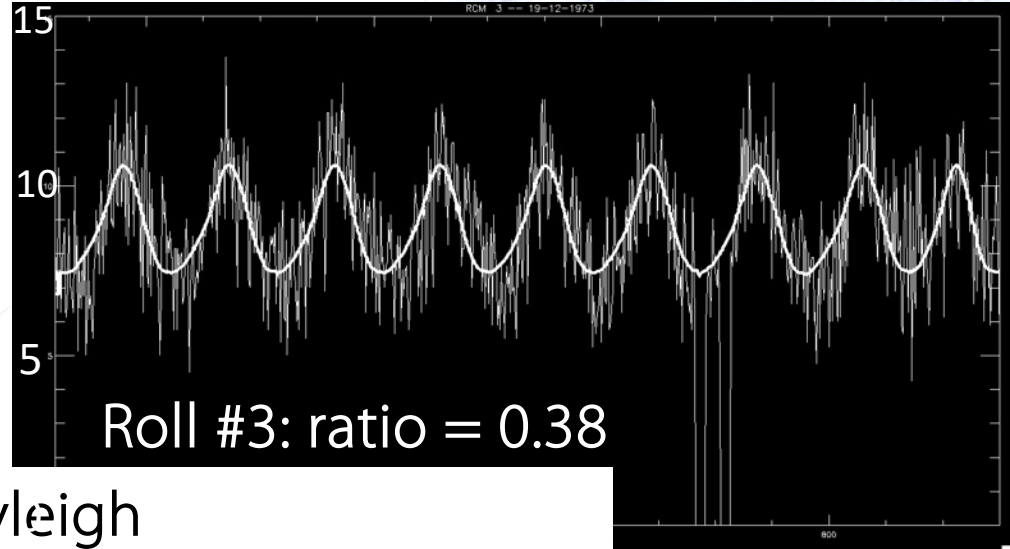
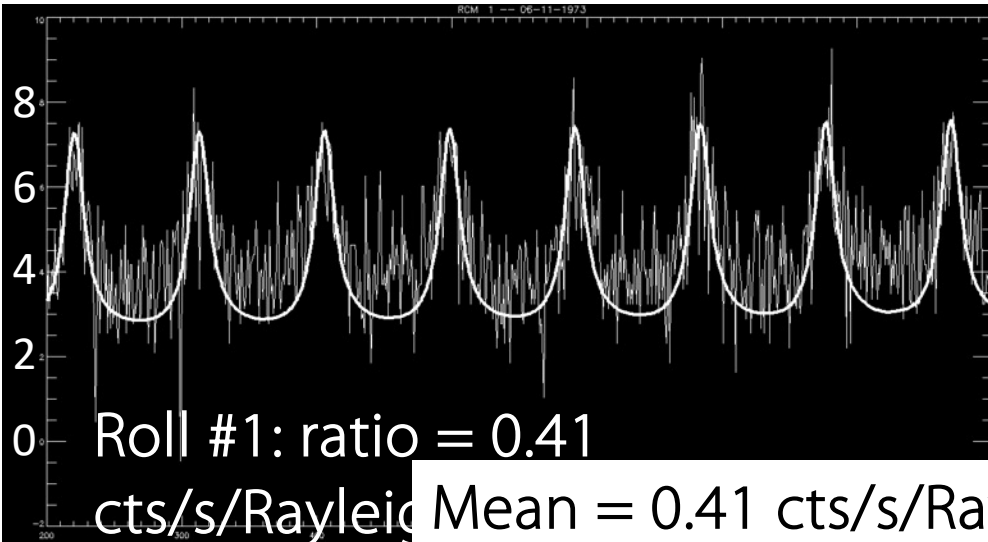


# Mariner 10/UVS calibration

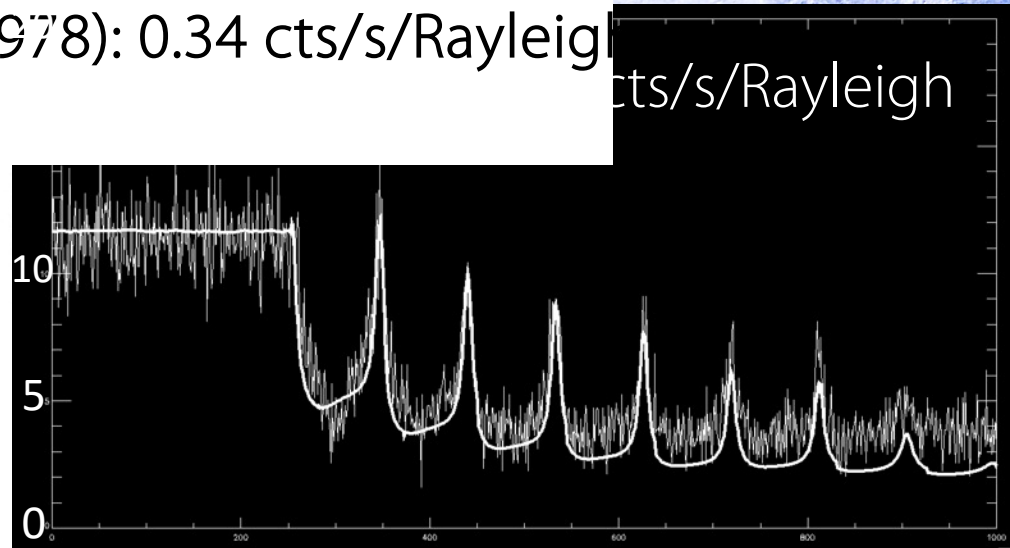
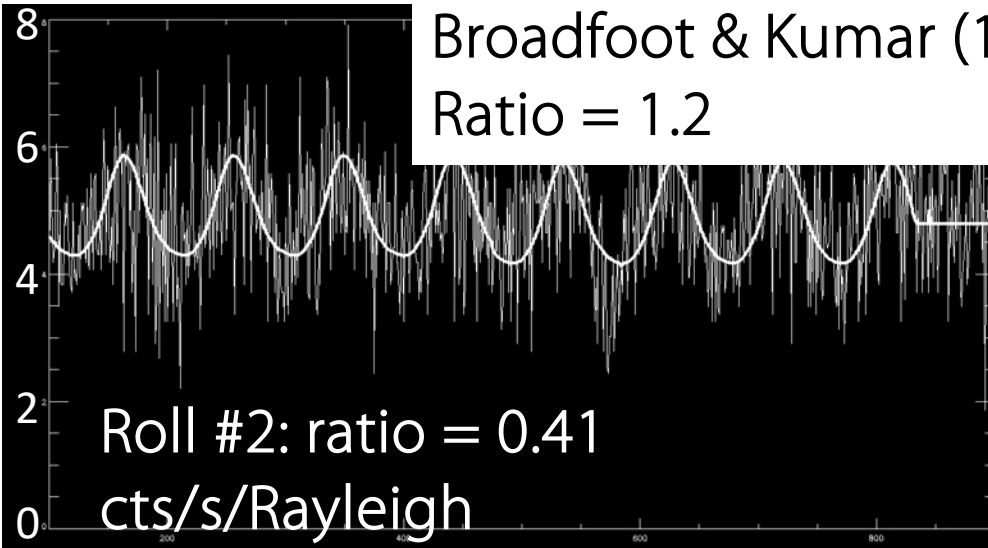
Data from NASA SSDC Archive (T. Forrester, LPL, Arizona)



# Mariner 10/UVS calibration

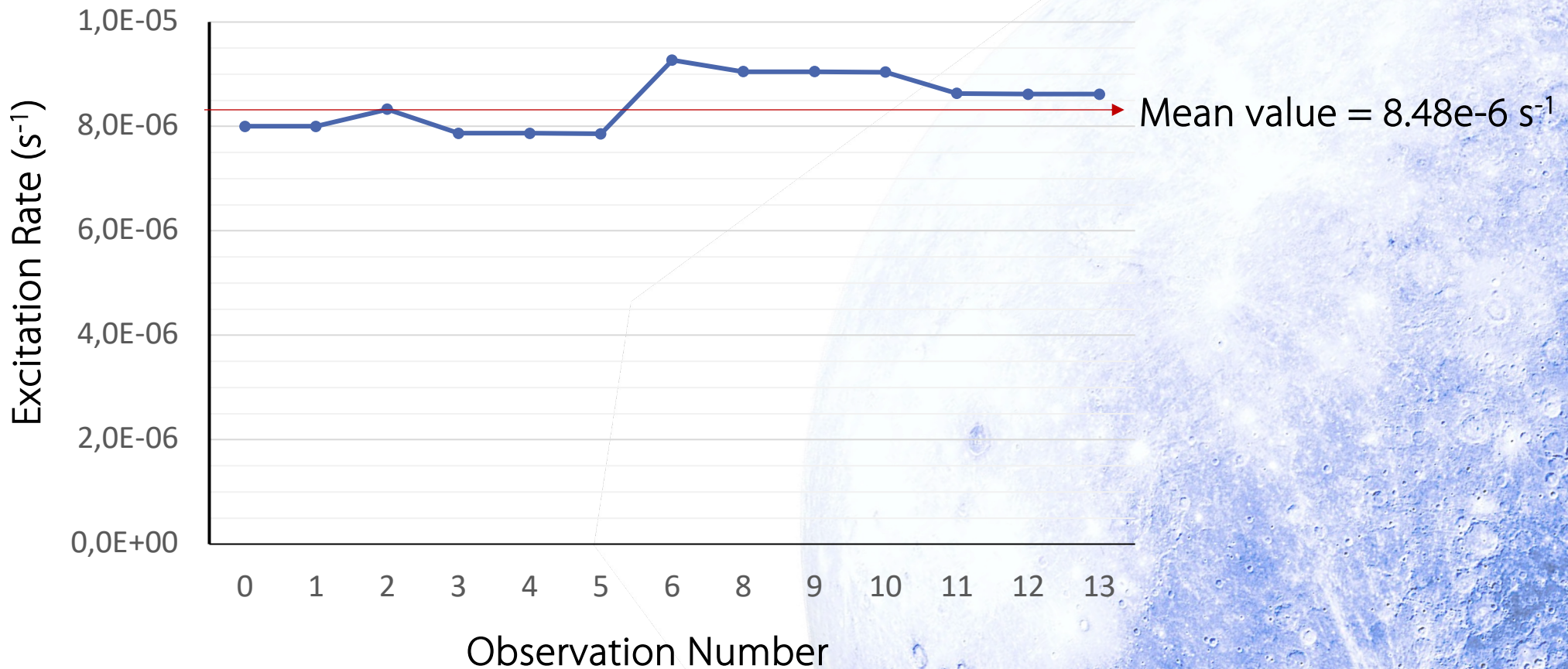


Mean = 0.41 cts/s/Rayleigh  
 Broadfoot & Kumar (1978): 0.34 cts/s/Rayleigh  
 Ratio = 1.2





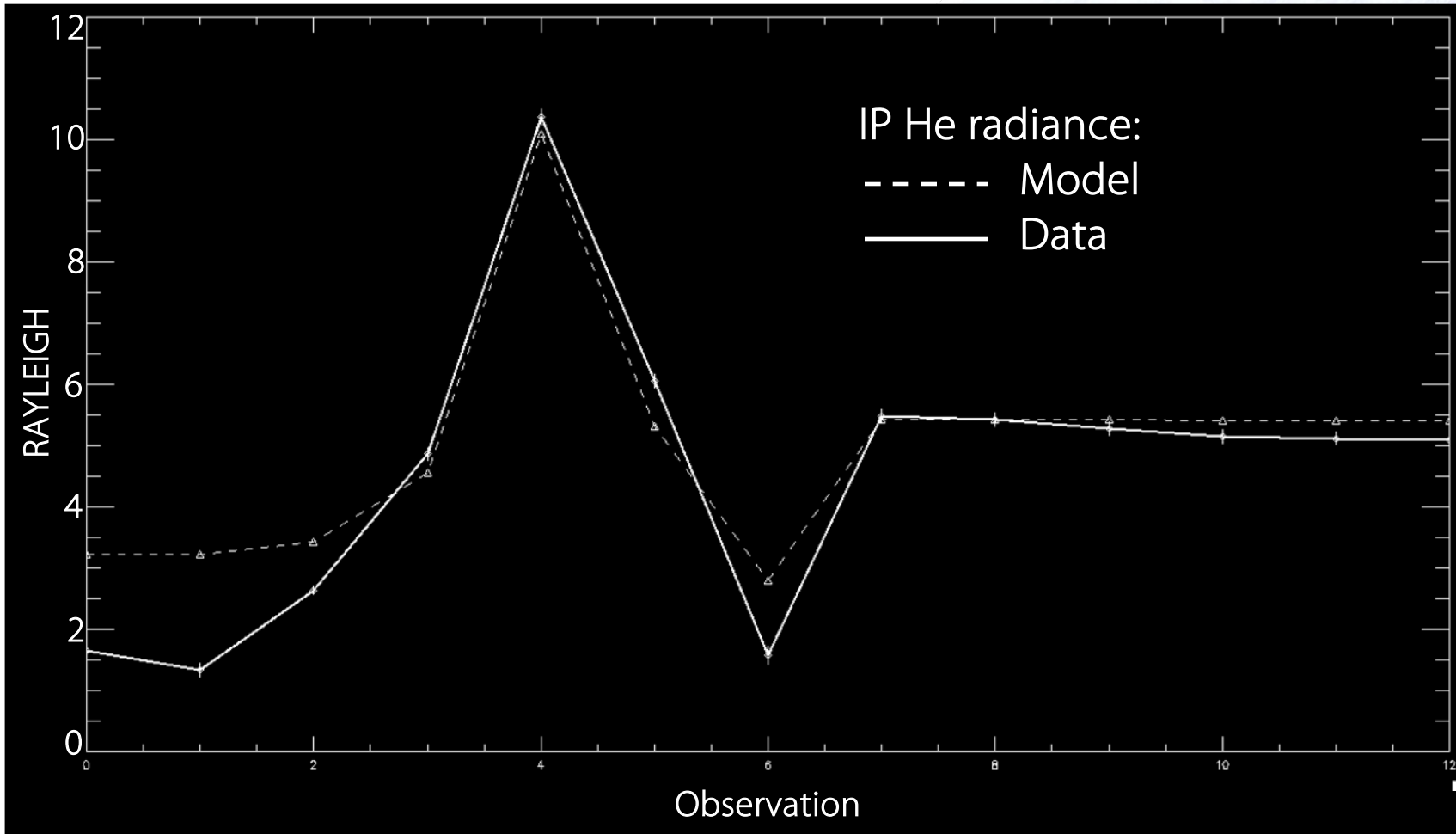
# PHEBUS Excitation Rates



From SOHO/CDS total fluxes

# PHEBUS calibration

Calibration Factor (@58.4 nm) = 1.2 cts /s /Rayleigh  
 Effective Area @ 58.4 nm (HV=3400 V) = 0.012 cm<sup>2</sup>

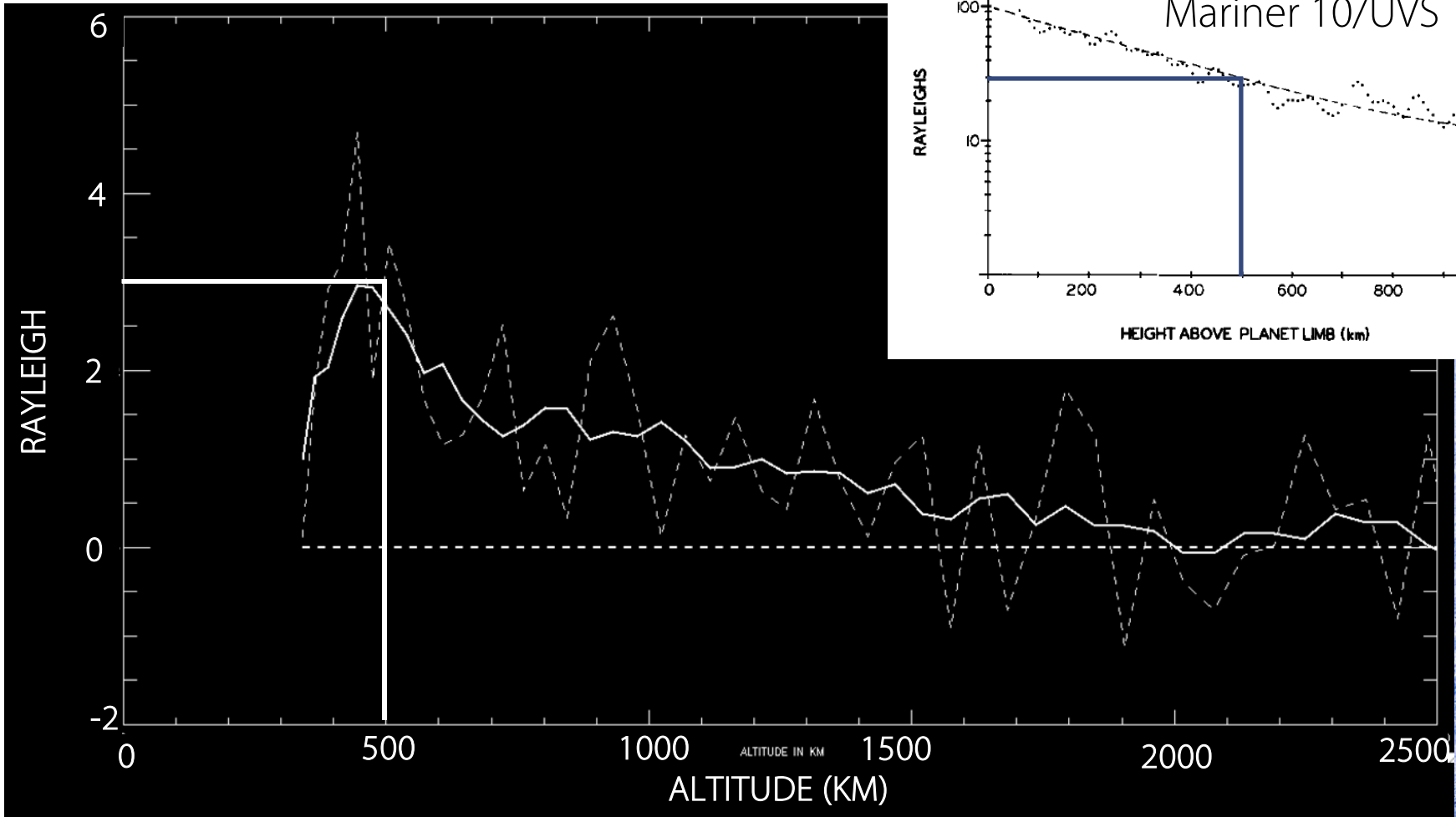






# He exospheric profile

$C_f = 1.2 \text{ cts /s /Rayleigh}$





# Summary & Conclusion

- ❑ Mariner 10/UVS found 25 - 30 R at 500 km (given small uncertainty of calibration)
- ❑ PHEBUS finds 3 R at 500 km ( $\pm 0.5$  R)
- ❑ We find a factor of 8-10 between PHEBUS and Mariner 10/UVS.
- ❑ Excitation rates, and calibration based on IP He for the two instruments are consistent
  
- ❑ Variability seems real, to be confirmed with future PHEBUS observations
- ❑ Analysis and comparison with exospheric models is ongoing