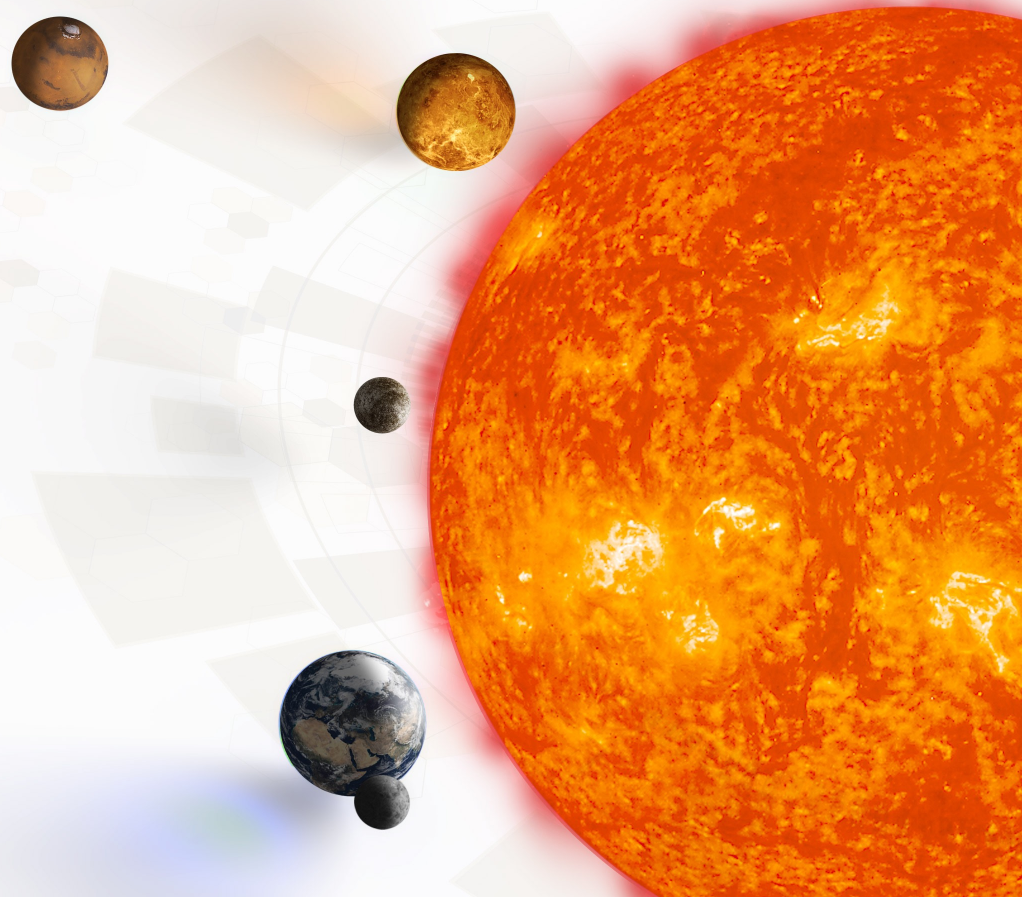
Laboratory for Atmospheric and Space Physics
University of Colorado **Boulder**

Rocket-EVE Calibration

Flight 36.389

Rita Borelli



Why SURF and Rocket Calibrations?

- Inverse equations for the MEGS algorithms
  - the responsivity equation using SURF calibration measurements:

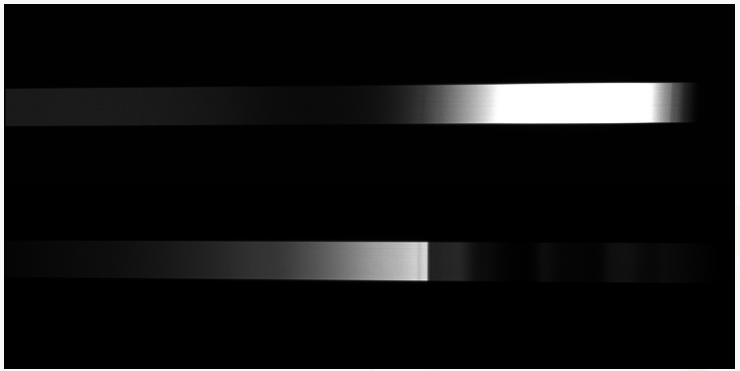
$$R_{\mathrm{SURF}}(\cancel{i, j, E_{\mathrm{beam}}, \mathrm{filter}, \alpha, \beta}) = \frac{\mathrm{signal}_{\mathrm{measured}}}{\mathrm{irradiance}_{\mathrm{synchrotron}}} = \frac{\frac{1}{n}\sum_{k=1}^{n} \frac{C'_k(i,j,t,E_{\mathrm{beam}},\mathrm{filter},\alpha,\beta)}{I_{\mathrm{SURF}}(t)}}{F_{\mathrm{SURF}}(i,j,E_{\mathrm{beam}},\alpha,\beta) A_{\mathrm{slit}} \Delta\lambda(i,j)}$$

  - the irradiance equation for solar observations using the responsivity calculated from SURF
- A range of experiments to characterize the other contributing factors
- The long-term MEGS-B degradation correction is based on a proxy model from three rocket spectra

R.A. Hock, P.C. Chamberlin, T.N. Woods, D. Crotser, F.G. Eparvier, D.L. Woodraska, E.C. Woods, *Extreme Ultraviolet Variability Experiment (EVE) Multiple EUV Grating Spectrographs (MEGS): Radiometric Calibrations and Results*

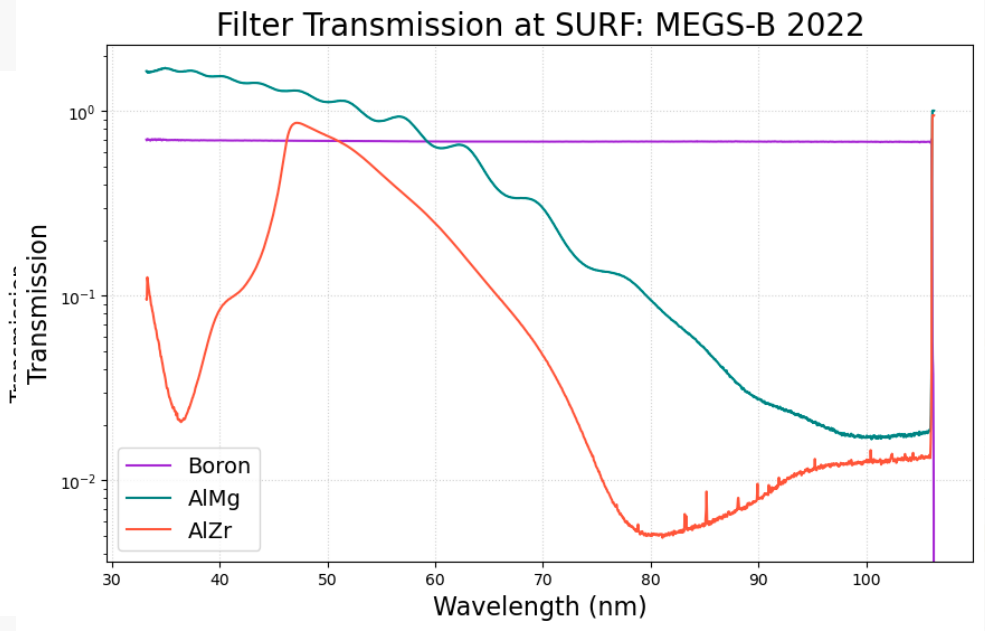
SURF MEGS Images

MEGS-A



MEGS-B

SURF Experiments & Analysis



A range of experiments to characterize the other contributing factors

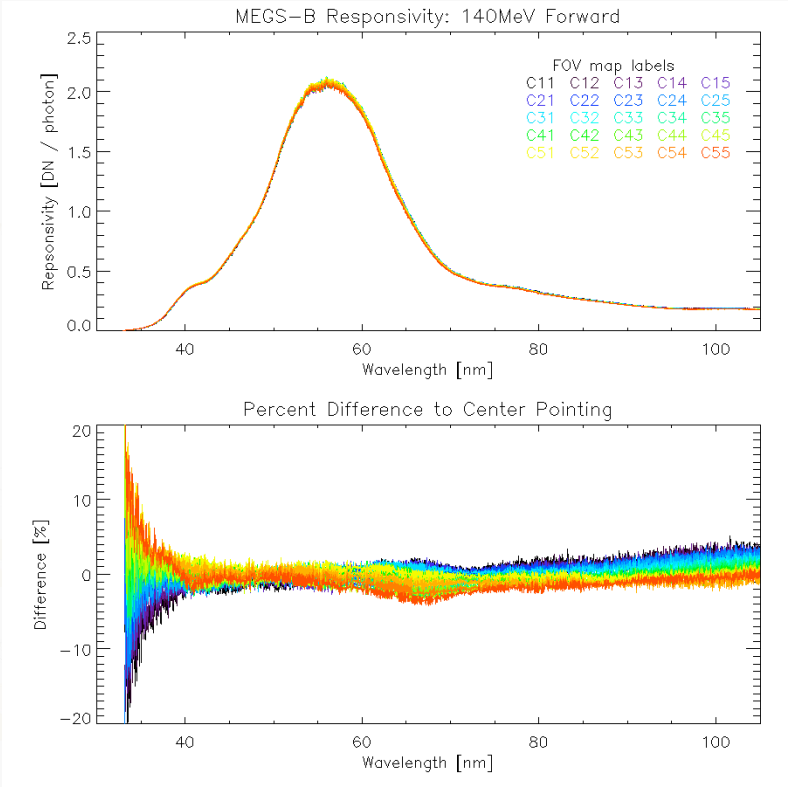
- **higher order contributions**
- **evaluation of wavelength scale**
- field of view effectss

R.A. Hock, P.C. Chamberlin, T.N. Woods, D. Crotser, F.G. Eparvier, D.L. Woodraska, E.C. Woods, *Extreme Ultraviolet Variability Experiment (EVE) Multiple EUV Grating Spectrographs (MEGS): Radiometric Calibrations and Results*

B.L. Henke, E.M. Gullikson, and J.C. Davis, *X-ray interactions: photoabsorption, scattering, transmission, and reflection at E=50-30000 eV, Z=1-92*, Atomic Data and Nuclear Data Tables **54** no.2, 181-342 (July 1993).

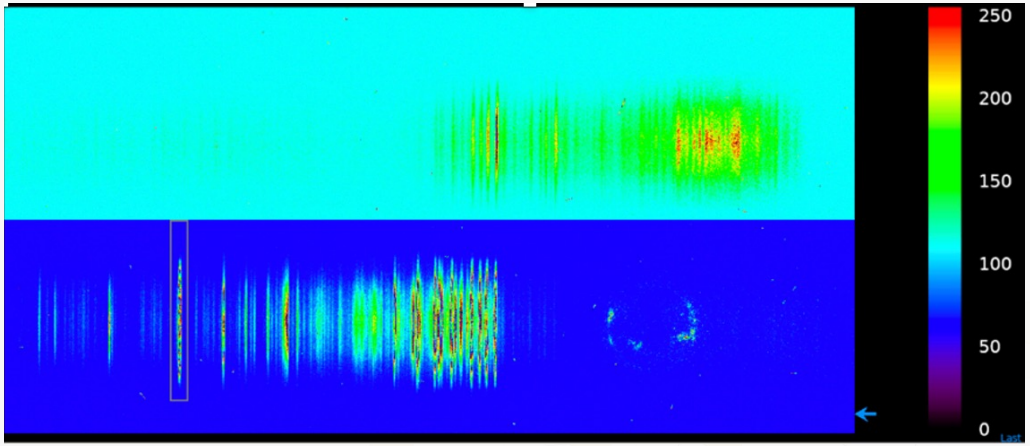
SURF Experiments & Analysis

- A range of experiments to characterize the other contributing factors
  - higher order contributions
  - evaluation of wavelength map
  - **field of view effects**



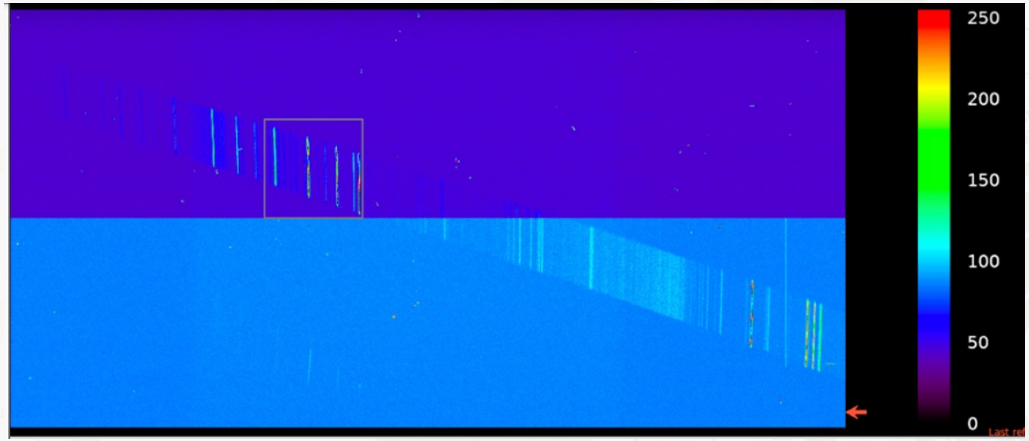

AFT
FORWARD
shutter door open
LASP
Laboratory for Atmospheric and Space Physics
University of Colorado Boulder
NASA Sounding Rocket Launch 36.389 (2023-05-03)
Solar Dynamics Observatory Extreme Ultraviolet Variability Experiment Calibration

Rocket-EVE Quick-look MEGS Images

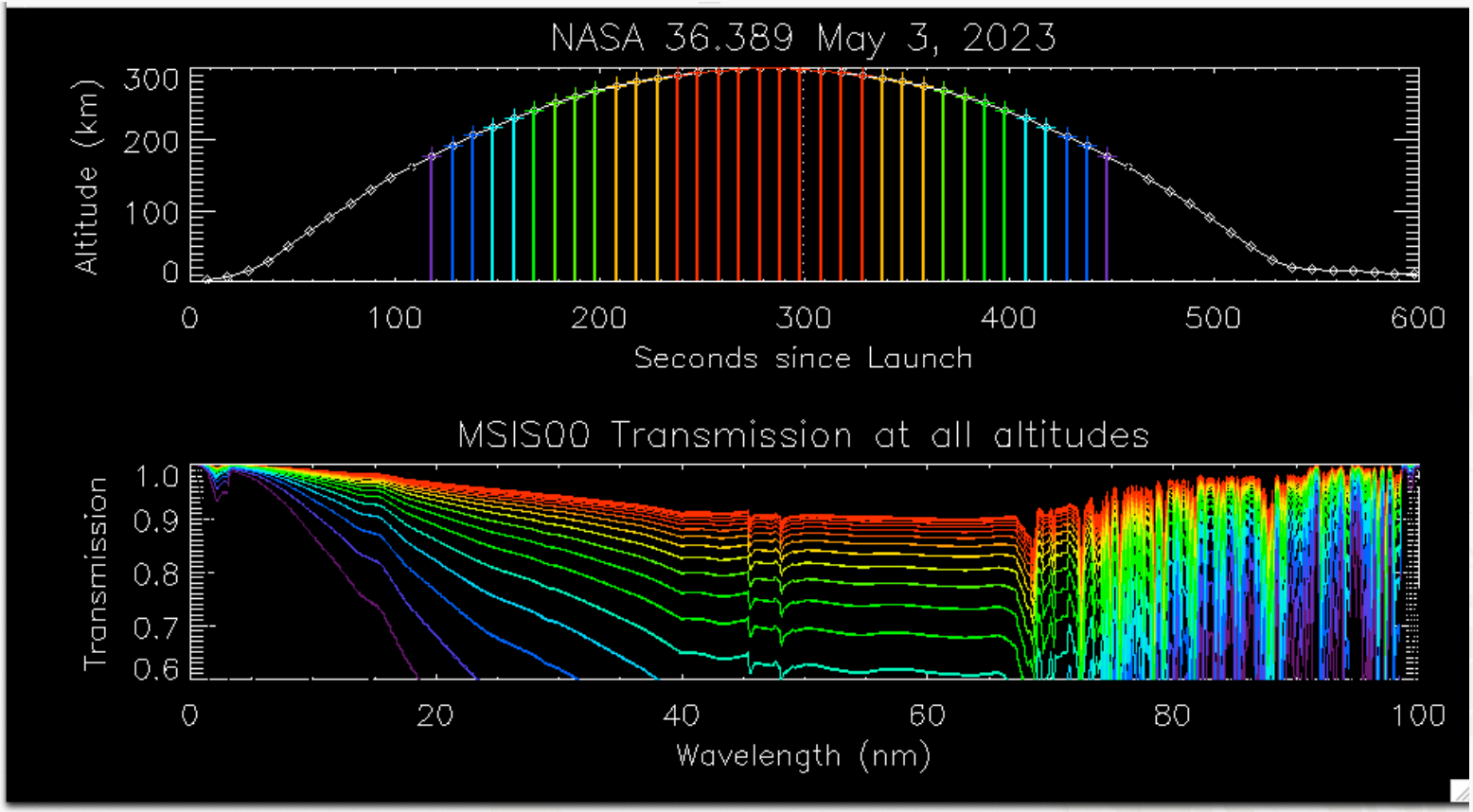


MEGS-A ⇧

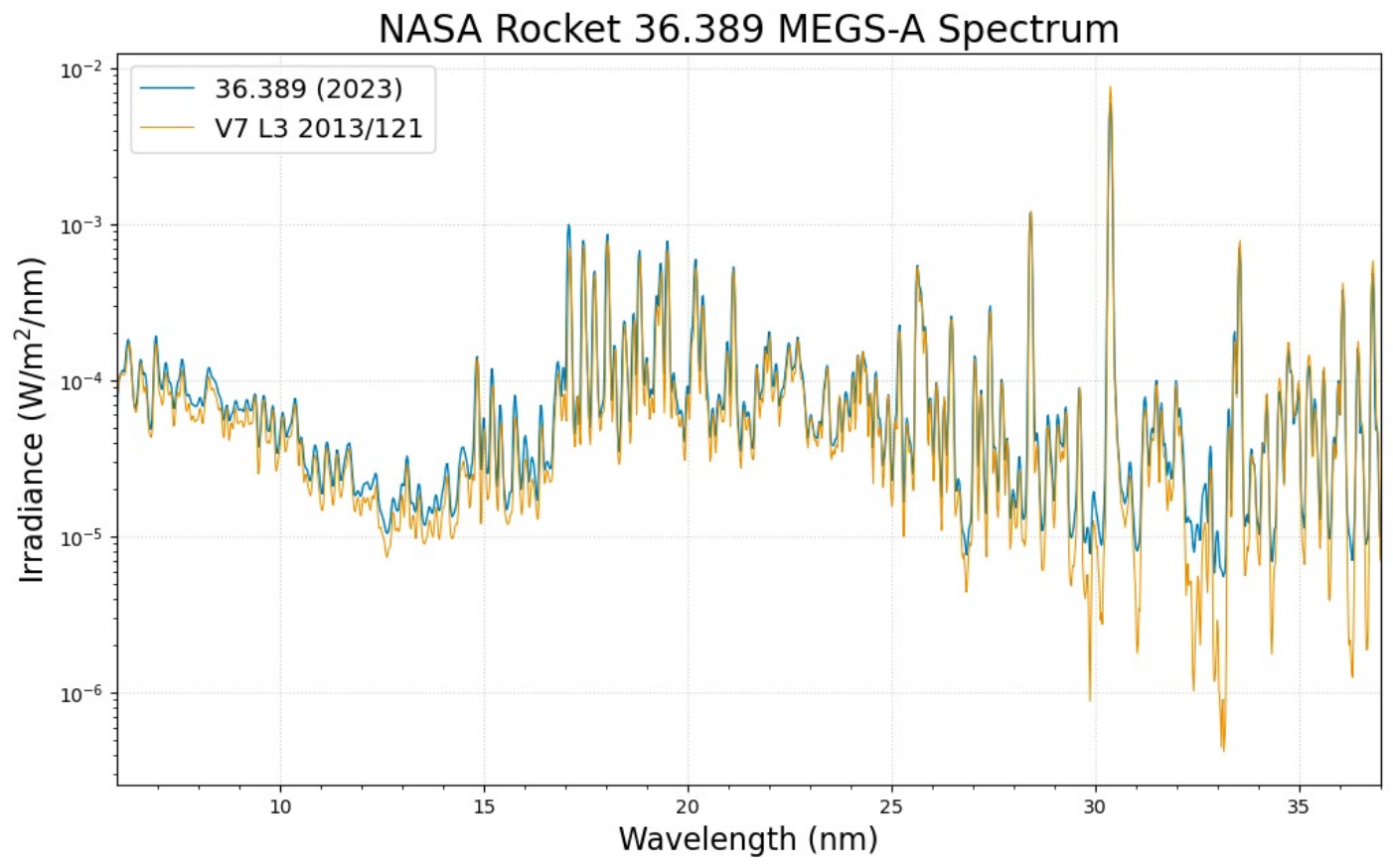
⇩ MEGS-B



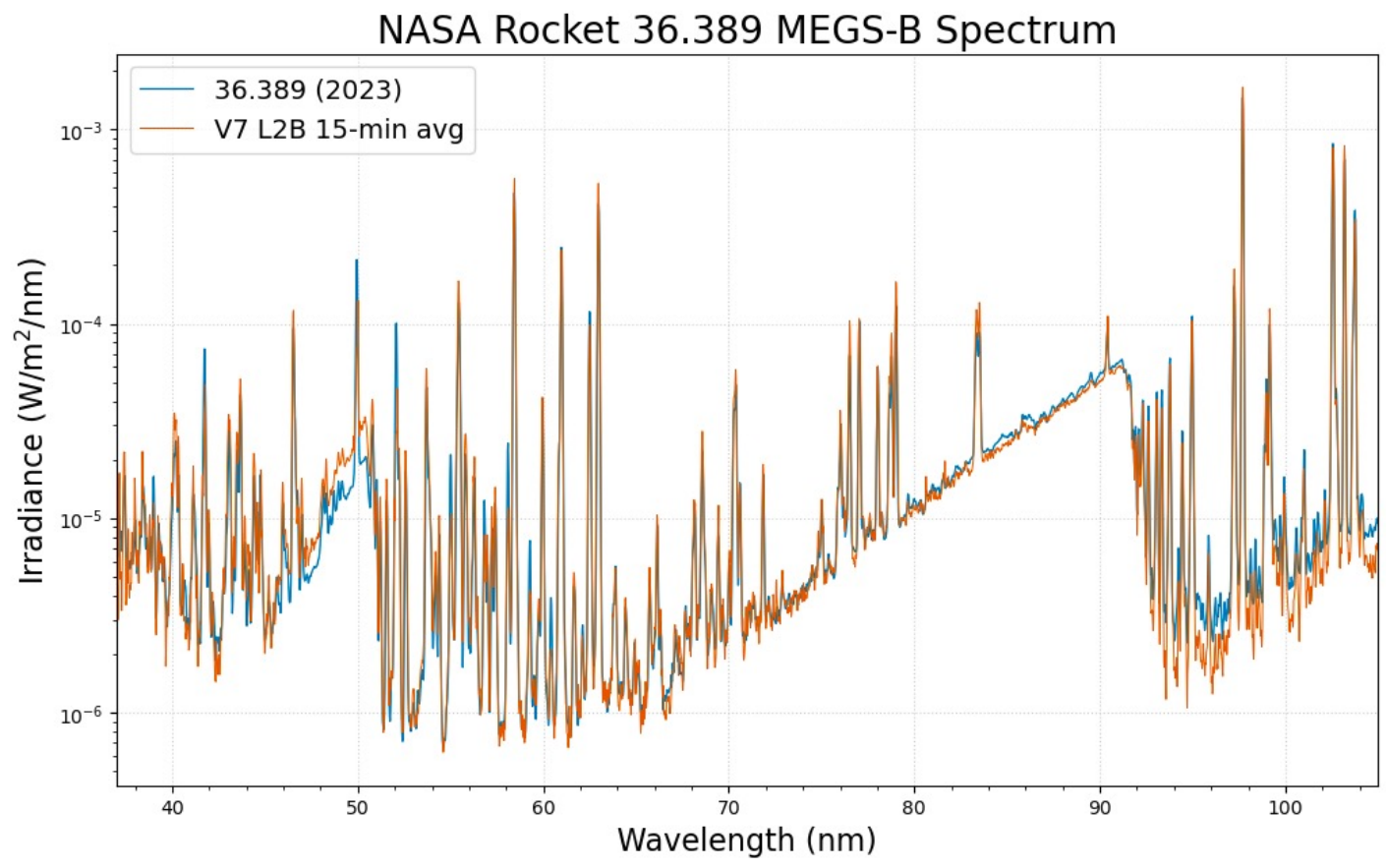
Rocket-EVE 36.389 Flight Profile



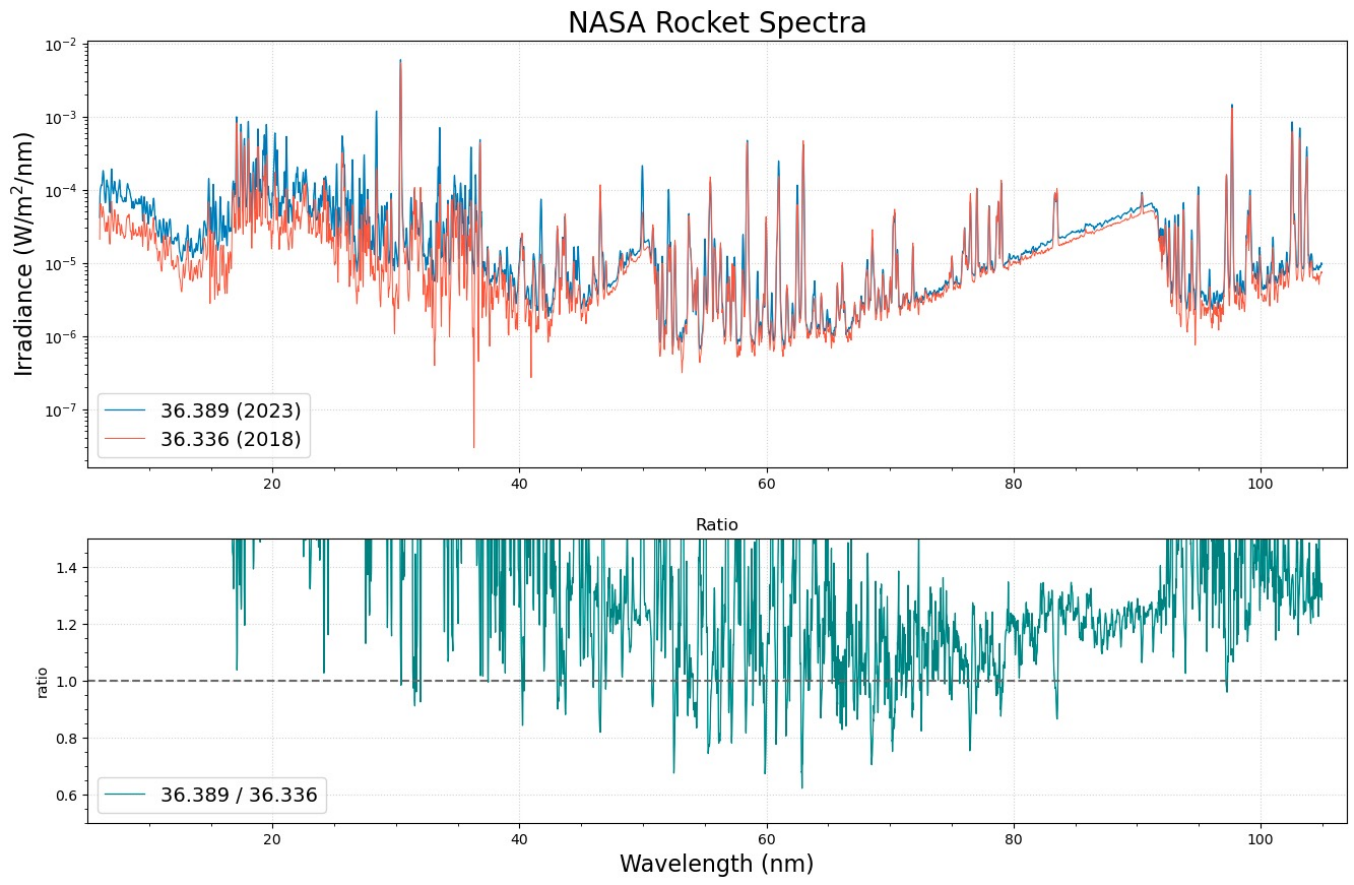
MEGS-A Spectrum



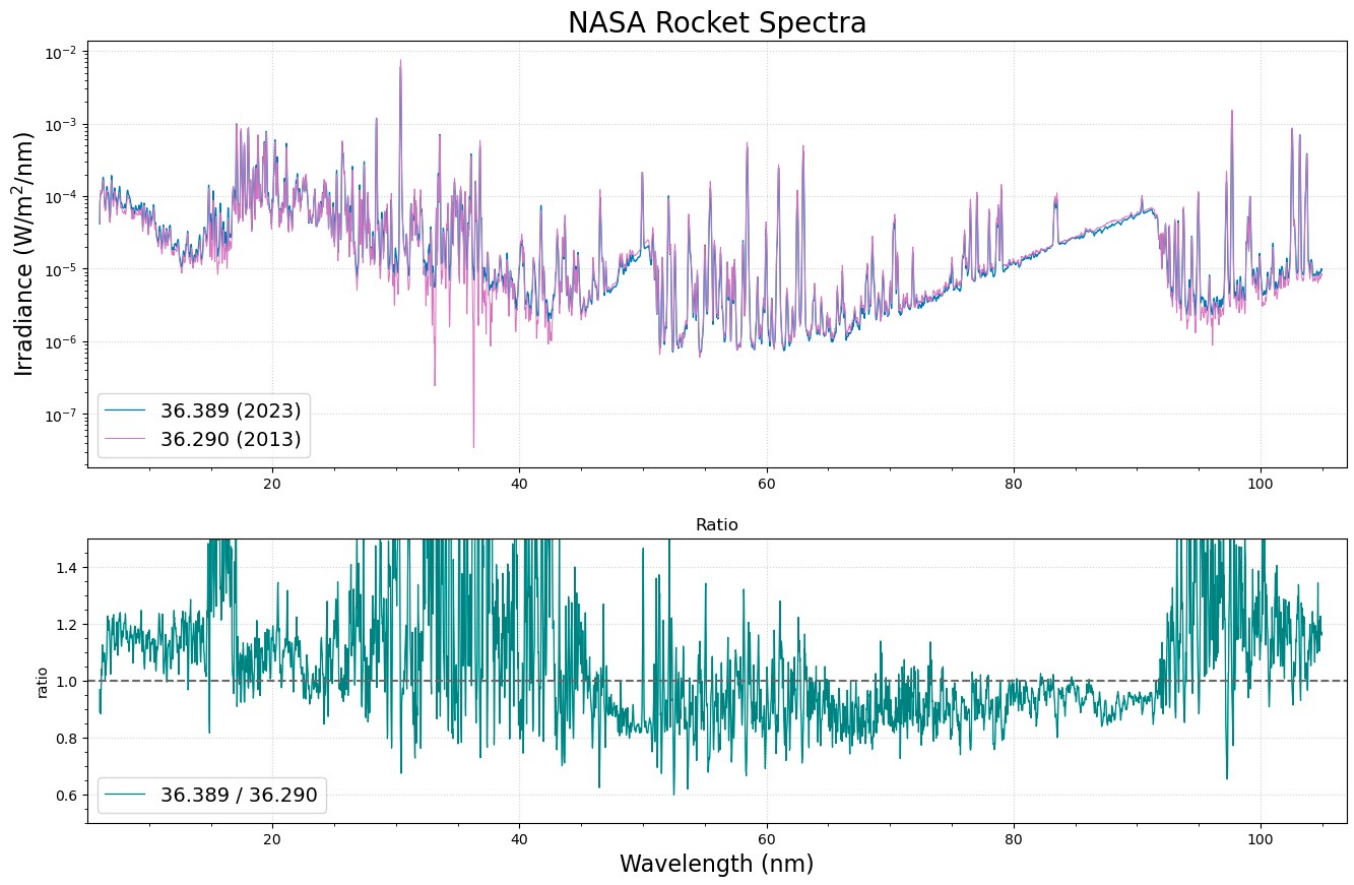
MEGS-B Spectrum



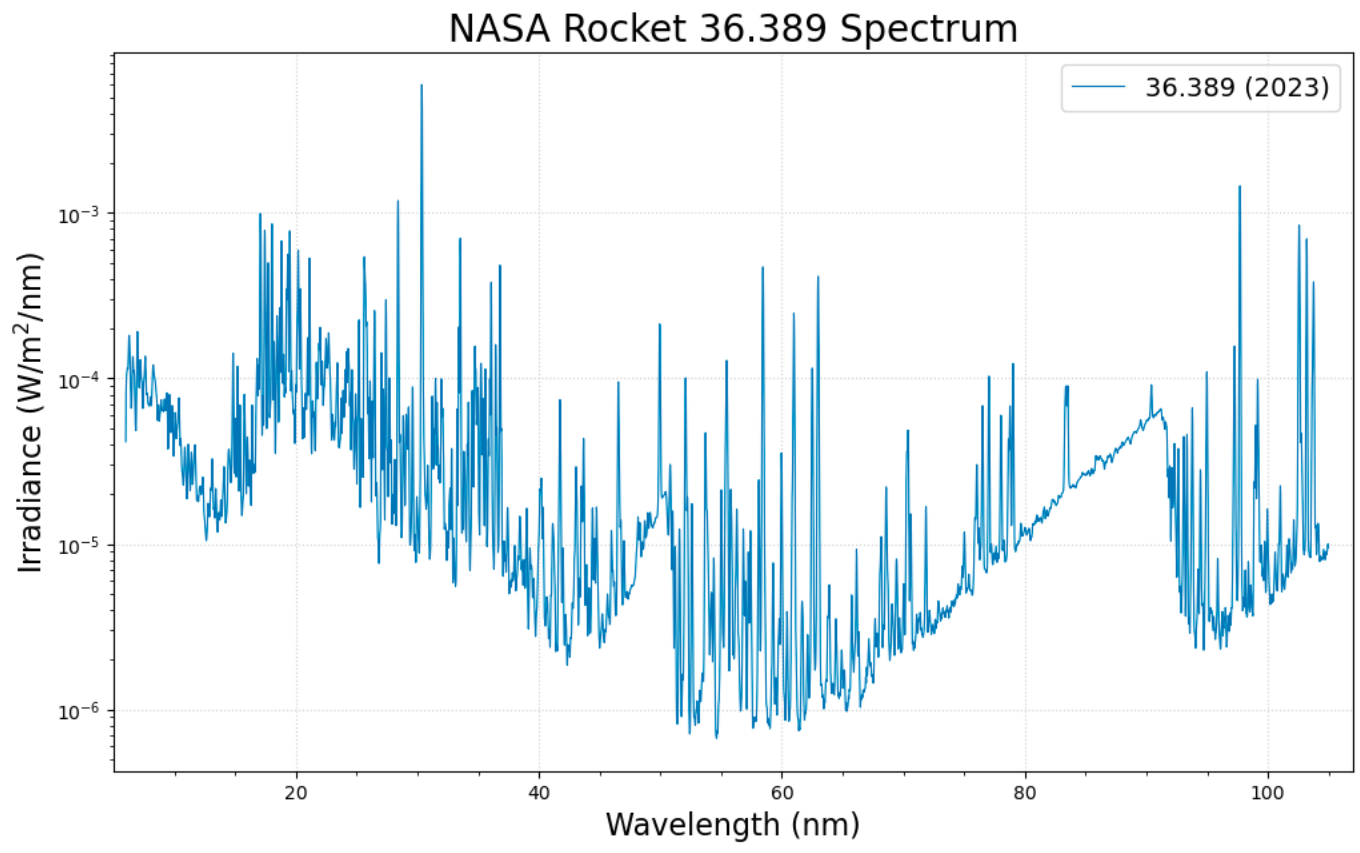
Comparison of Rocket Spectra



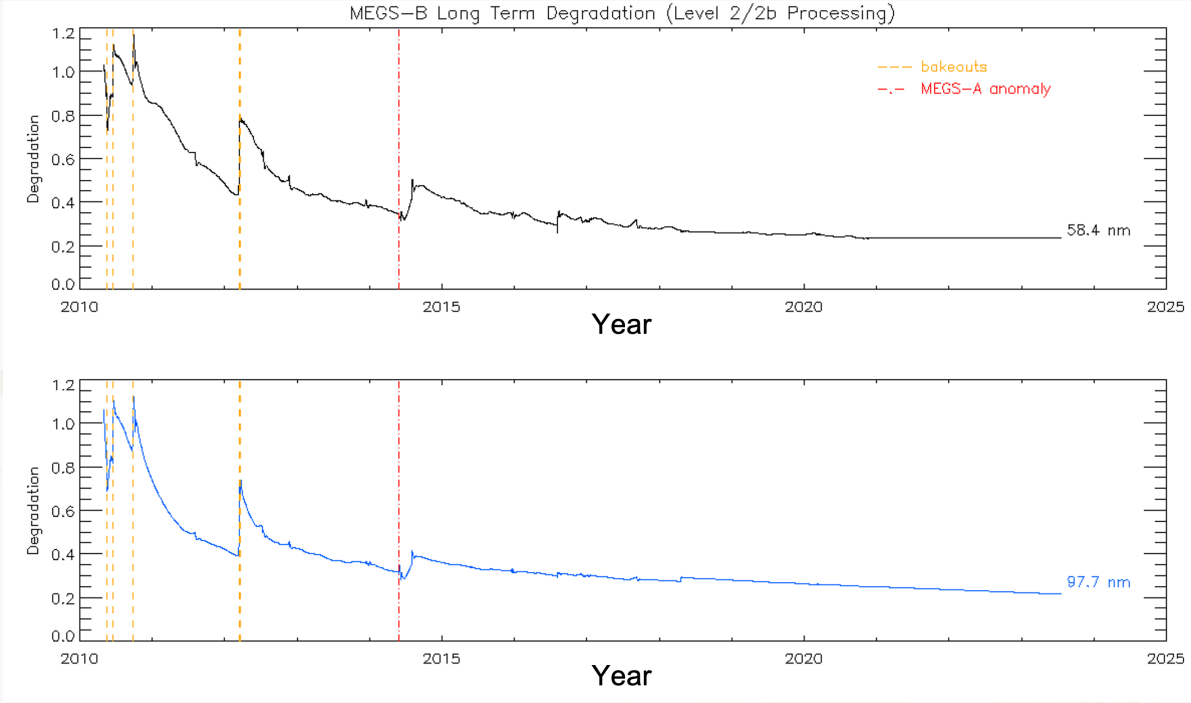
Comparison of Rocket Spectra



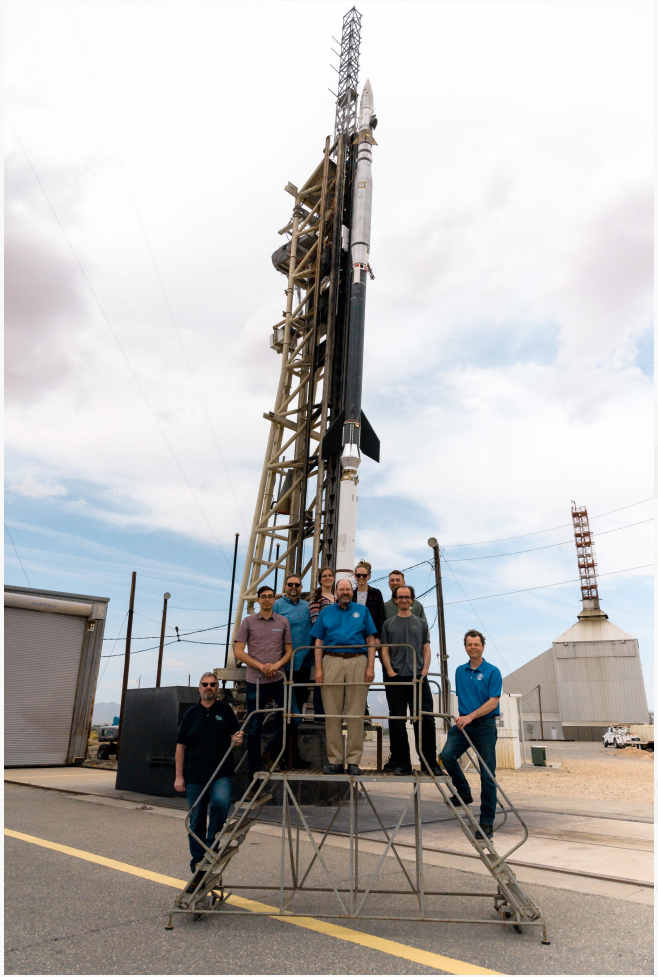
Rocket-EVE 36.389 Spectrum



MEGS-B long term degradation



$$E = E_0 \cdot \left[1 + c_{ST} \cdot \left[\frac{P - < P >_N}{P_0}\right] + c_{LT} \cdot \left[\frac{< P >_N}{P_0} - 1\right]\right]$$



Questions?