V2 Composite Solar Spectral Irradiance Data Product

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Introduction

- Project goal is to improve and extend composite solar spectral irradiance (SSI) data set created by *DeLand and Cebula* [2008] (V1).

- New irradiance data sets are needed to extend this product from July 2005 to the present.

- This presentation will review the development of a new SBUV/2 data set for the V2 composite SSI product.

- Examples of the preliminary merged V2 composite SSI product will be shown.

- Reconciling different data sets at transition points (both spectral and temporal) is a remaining issue.

Timeline of New SSI Data

Spectral Solar Measurements for V2 Composite SSI Product
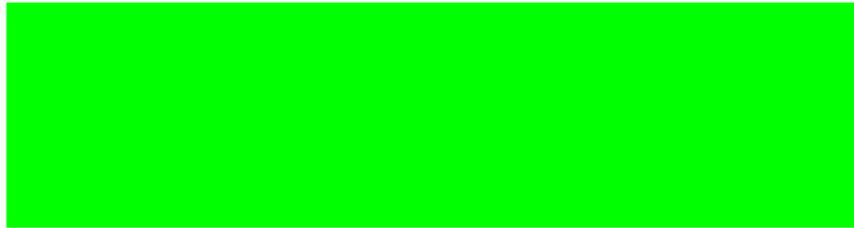
# Additional SBUV/2 Irradiance Data

- NOAA-16 daily spectra (170-400 nm) cover Mar 2001 – Sep 2007 [+ spring 2008] before significant orbit drift issues appear (shadowing of solar diffuser).

- Use same long-term correction approach as applied to NOAA-9 and NOAA-11 in V1 composite SSI data set:
  - Use UARS SUSIM reference spectra in place of SSBUV flights as absolute reference
  - Create "Day 1" ratio between NOAA-16 and SUSIM to remove calibration bias
  - Compare concurrent NOAA-16 observations to reference spectra on selected dates to establish benchmarks for correction
  - Create smooth fits (wavelength, time) for degradation function to correct SBUV/2 data
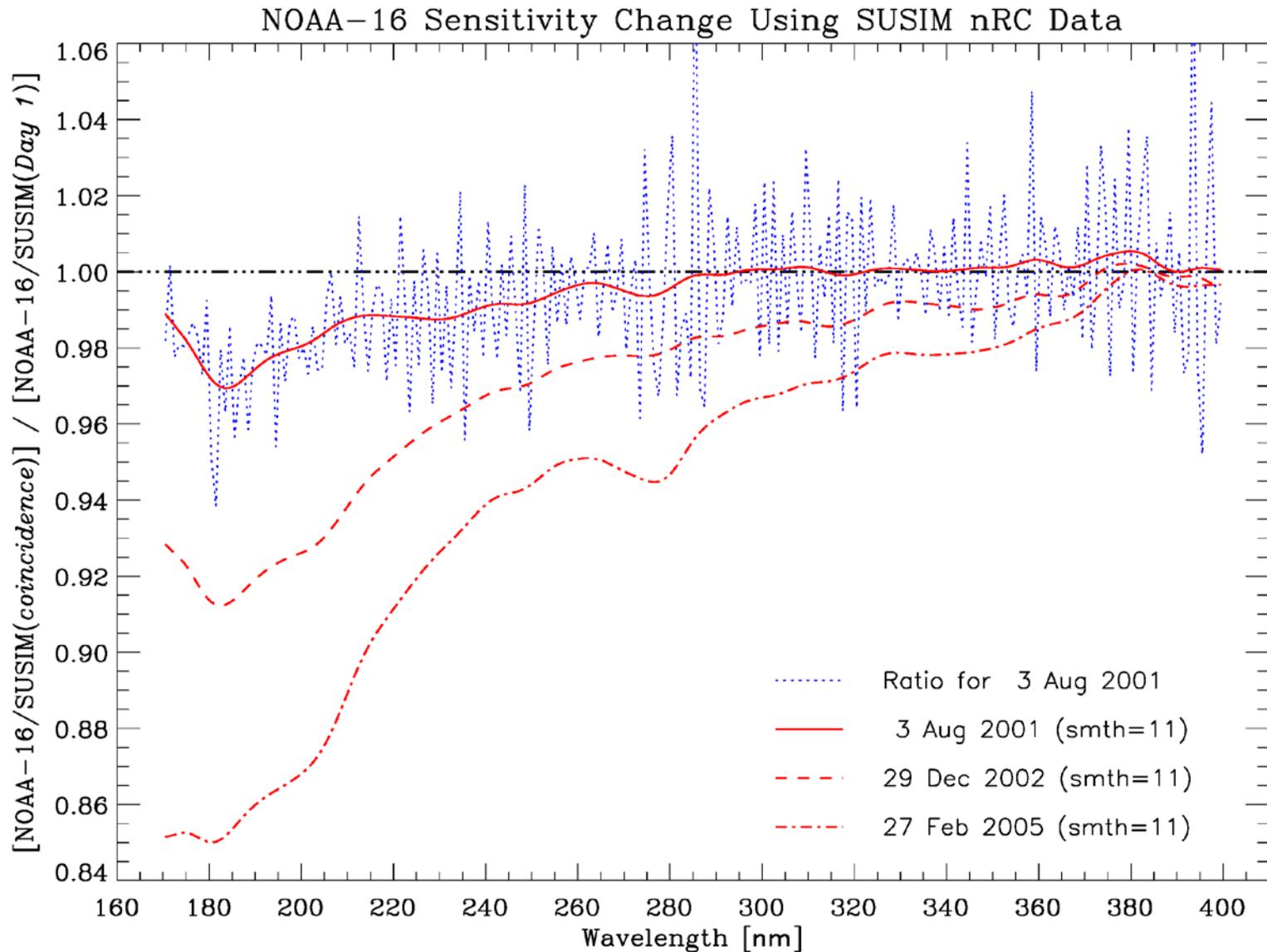
SUSIM Solar Change Estimates

UARS SUSIM Solar Change for *NEW* Reference Calibrations
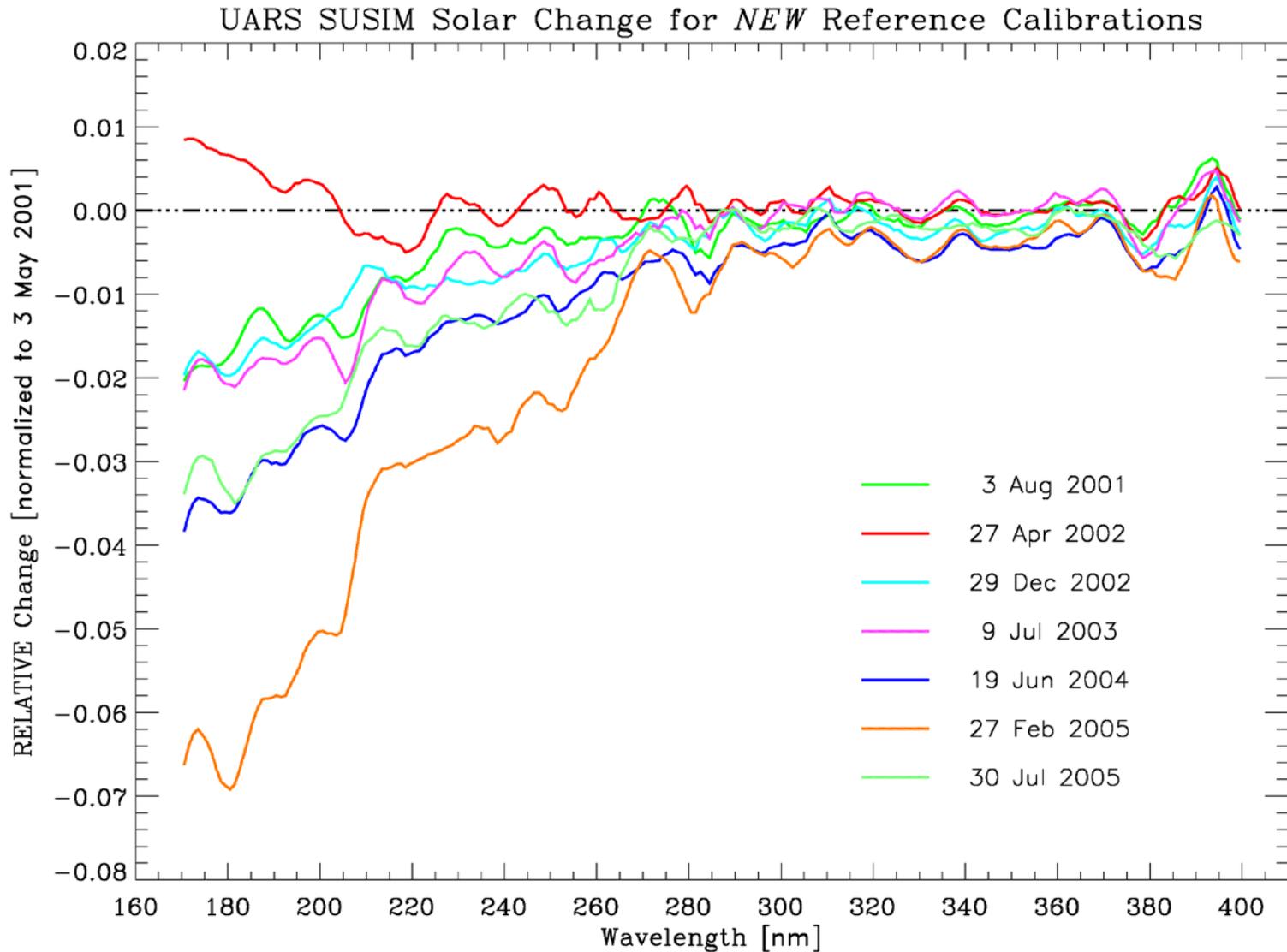
NOAA-16 "Day 1" Ratio *vs.* SUSIM
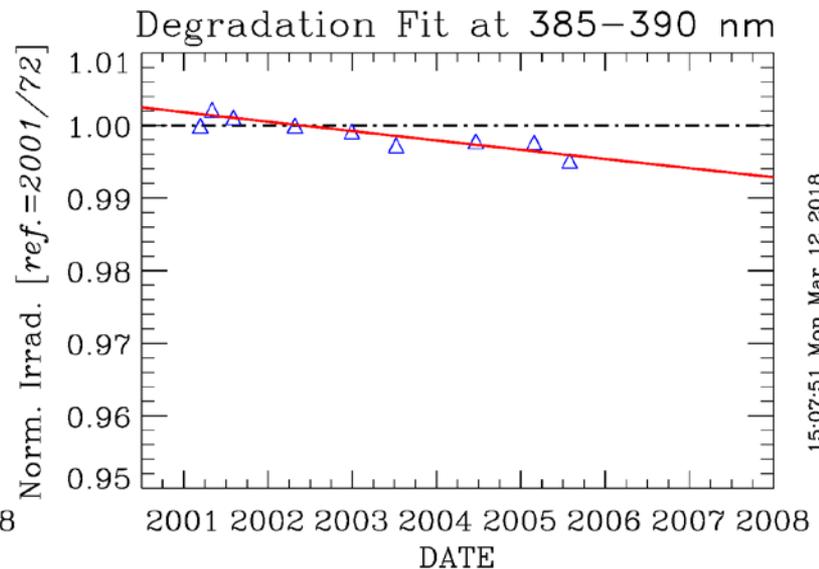

Irradiance Bias: NOAA−16 SBUV/2 (3/13/2001) *vs.* UARS SUSIM (5/3/2001)
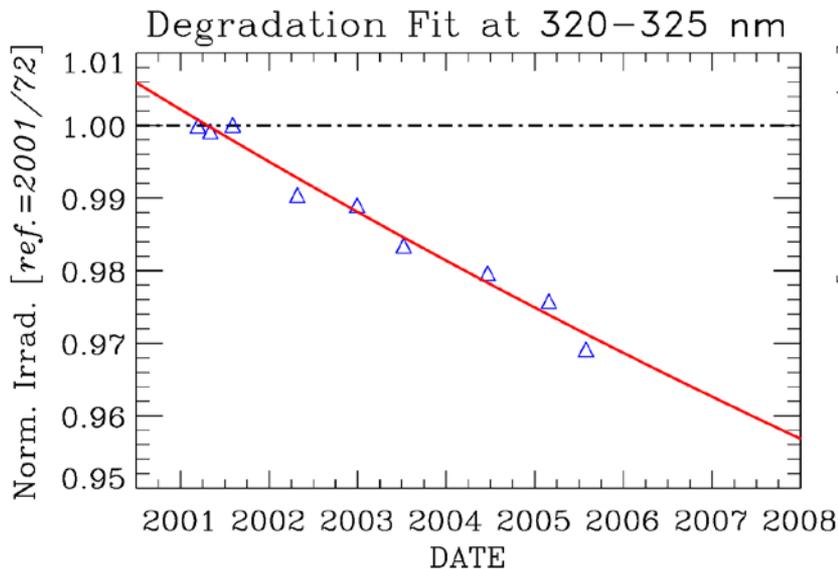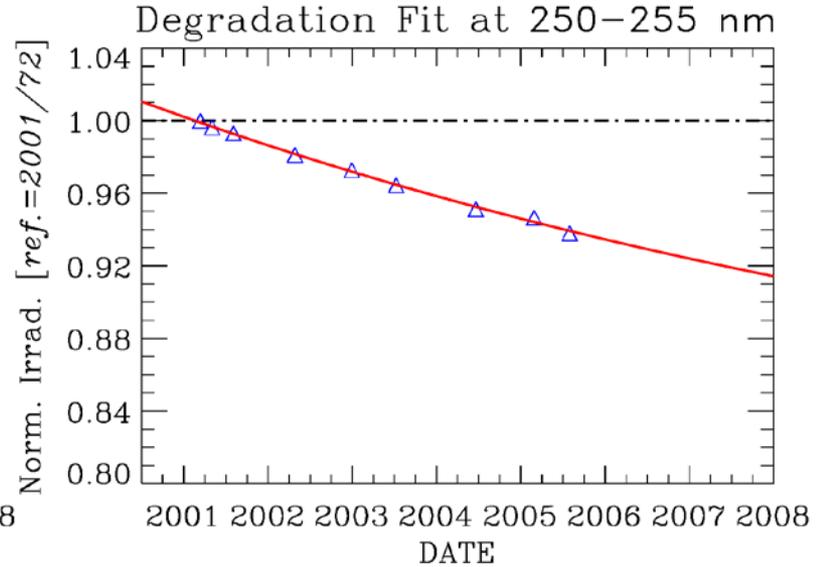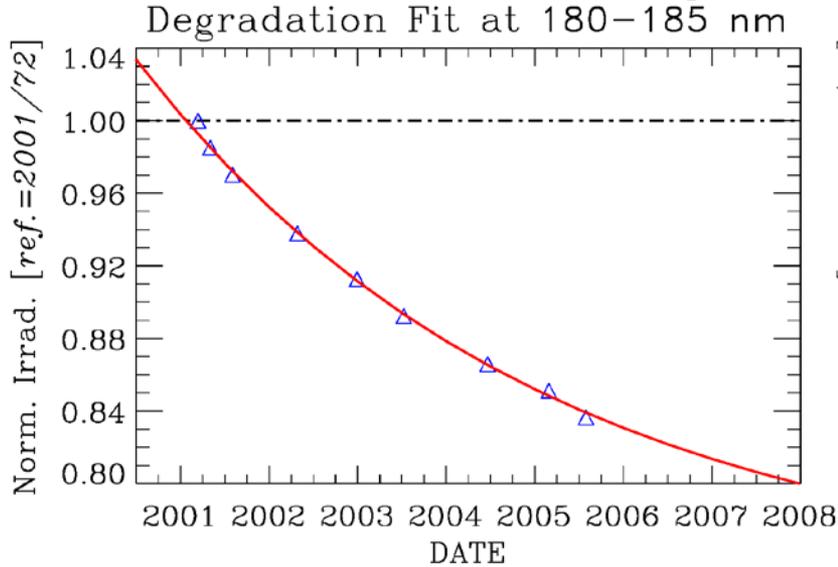
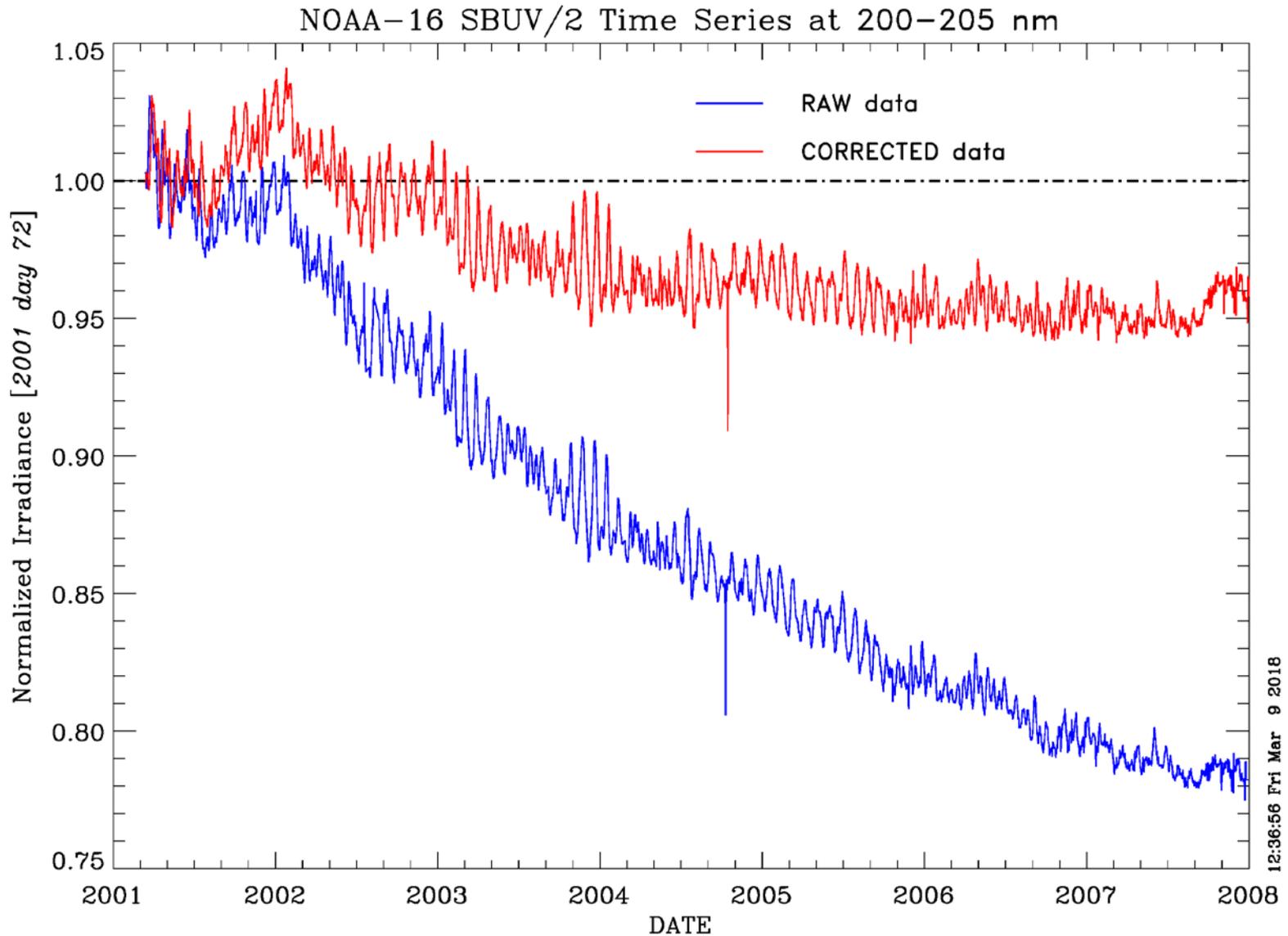Raw data

Smoothing = 5
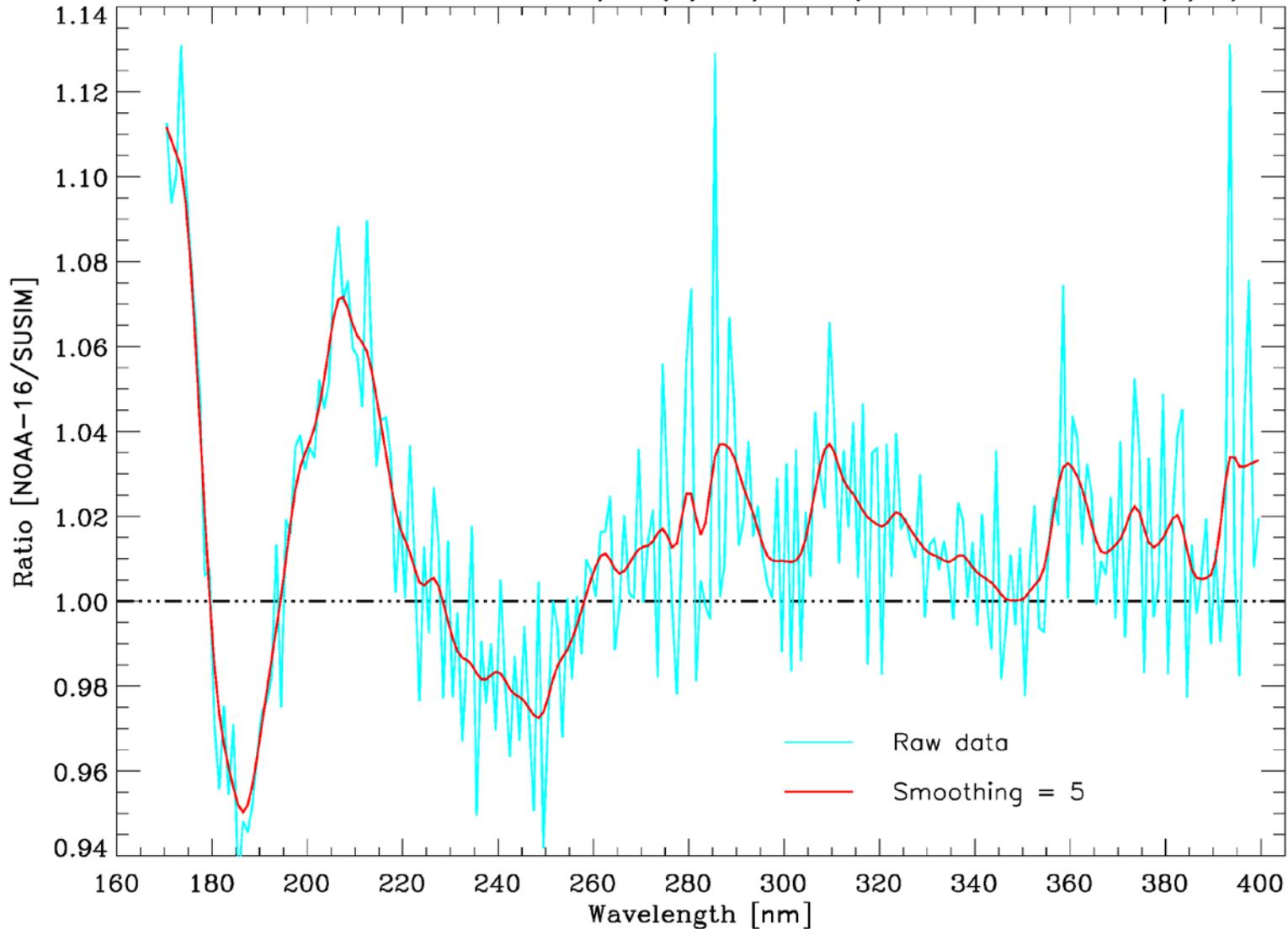
NOAA-16 Coincident Ratio *vs*. SUSIM
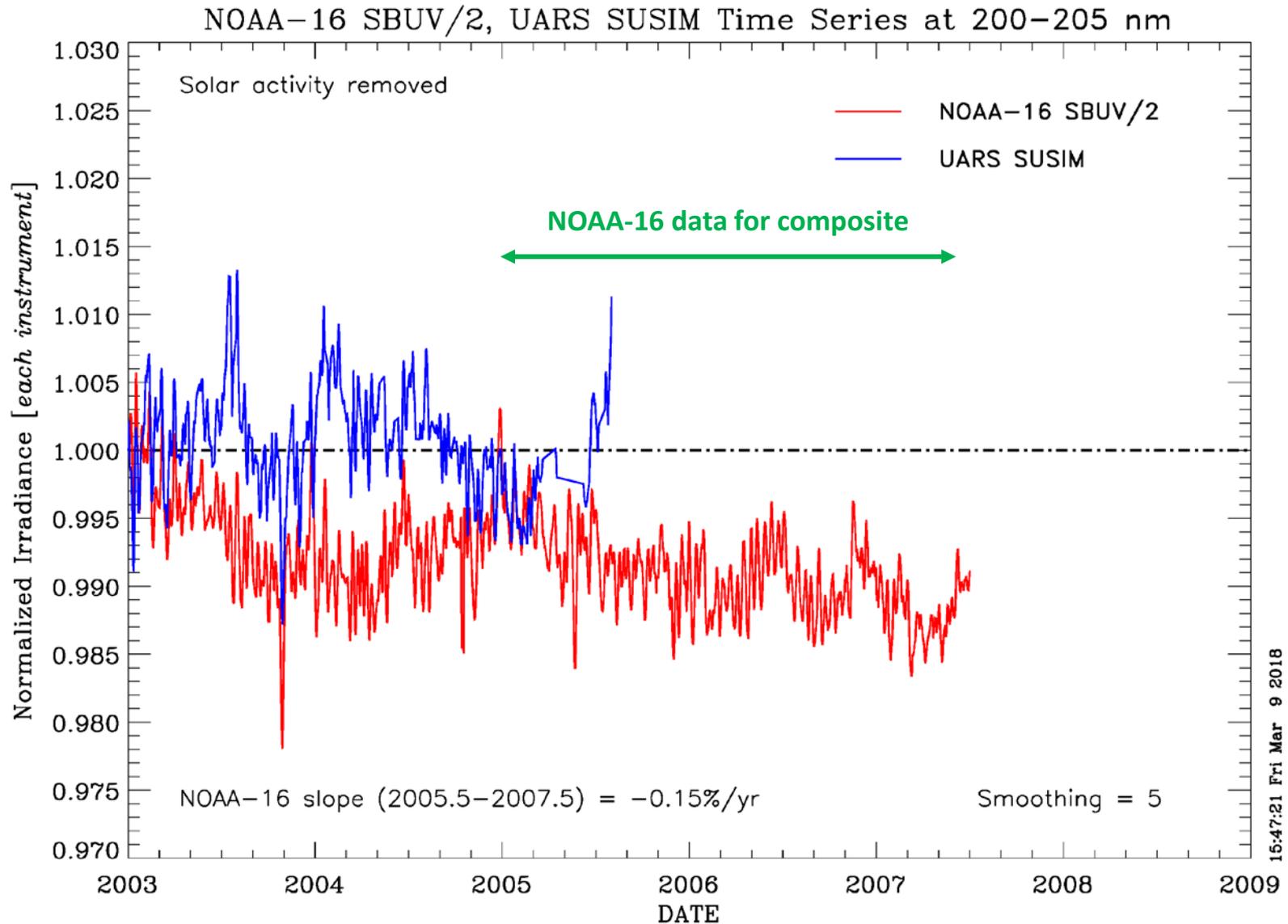
NOAA-16 Degradation Fit – samples

NOAA−16 SBUV/2 Degradation: CURVEFIT fit to SUSIM Ratios
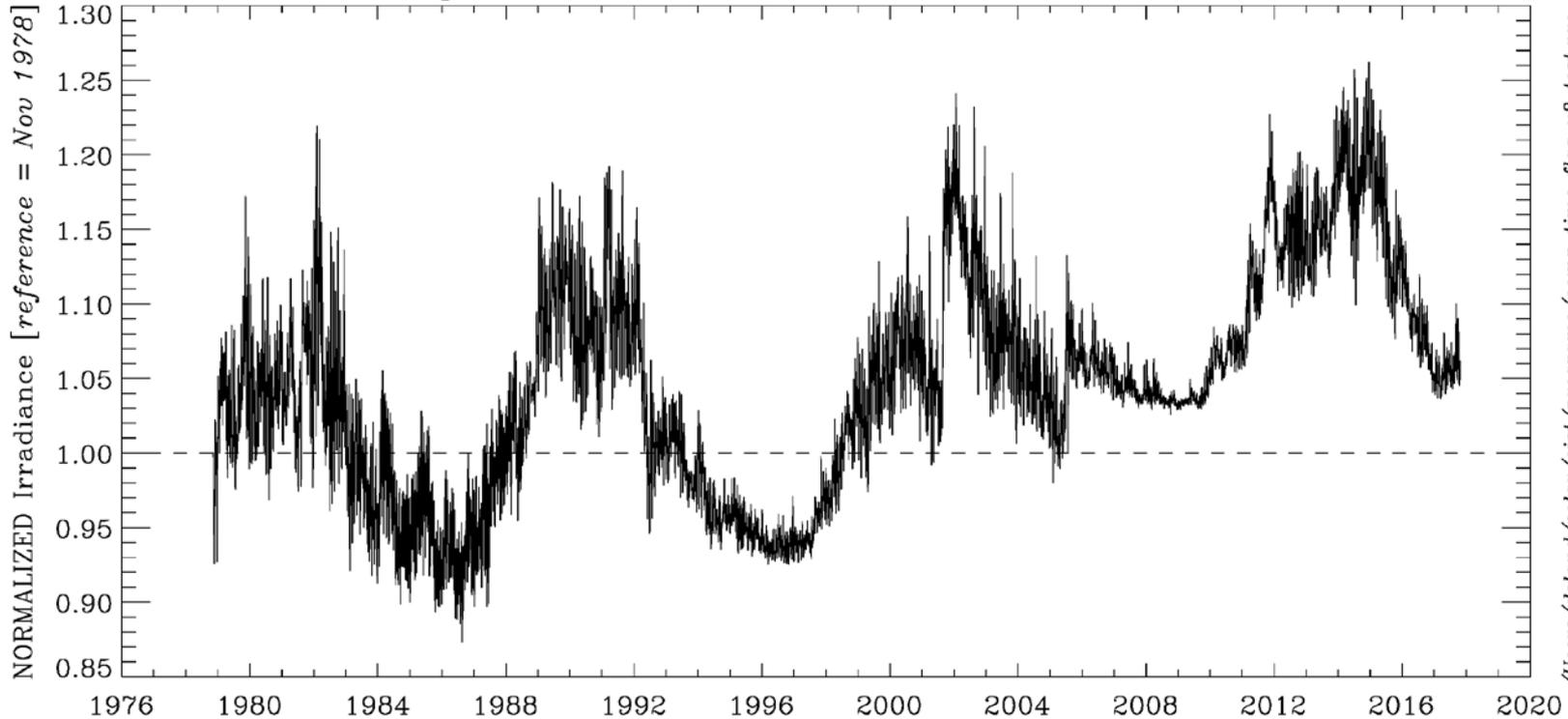
NOAA-16 Time Series – 200-205 nm

NOAA-16 SBUV/2 Time Series at 200-205 nm

NOAA-16 vs. SUSIM – 200-205 nm

NOAA-16 SBUV/2, UARS SUSIM Time Series at 200-205 nm

Structure of V2 Composite SSI Product

- Start using NOAA-16 data in March 2005 to help fill SUSIM data gaps near end of mission.

- Transition to OMI data in January 2007.

- Fill gaps at shorter wavelengths using proxy models and scaled Bremen composite Mg II index.

- *Fill data for 400-500 nm before OMI*?

Version 2 Composite Solar Spectral Irradiance Data Set: *Structure*
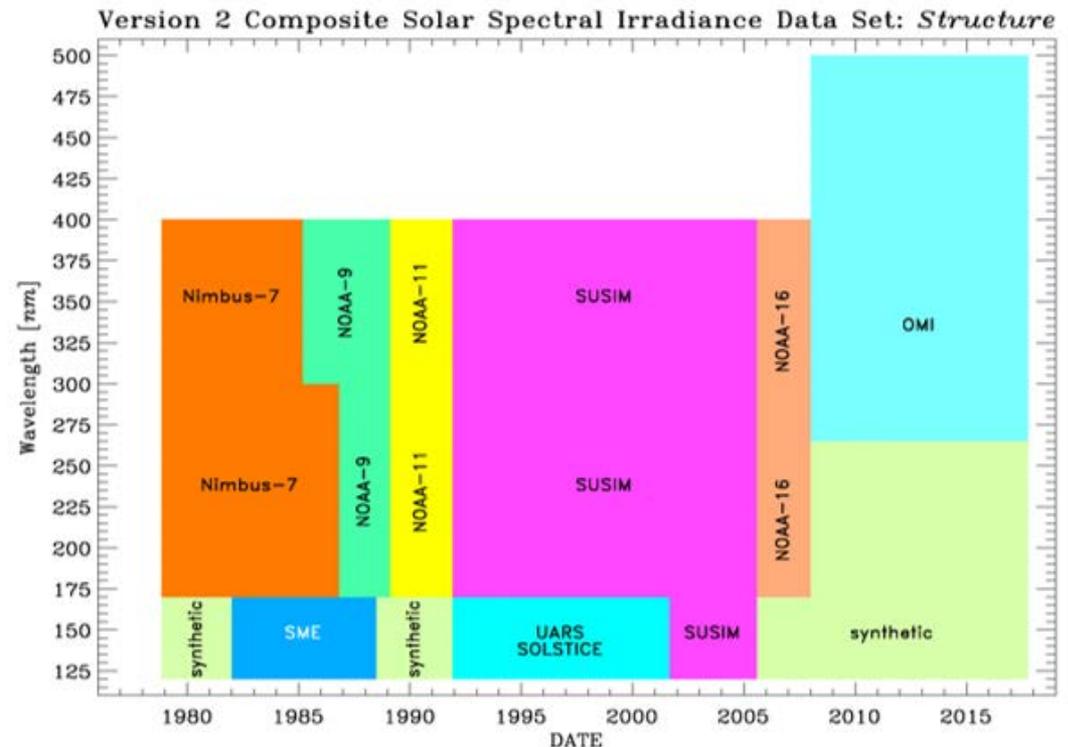
V2 Merged Data – 155 nm

V2 Composite Time Series: *155–155 nm*; Test Version = 2

V2 Merged Data – 230 nm
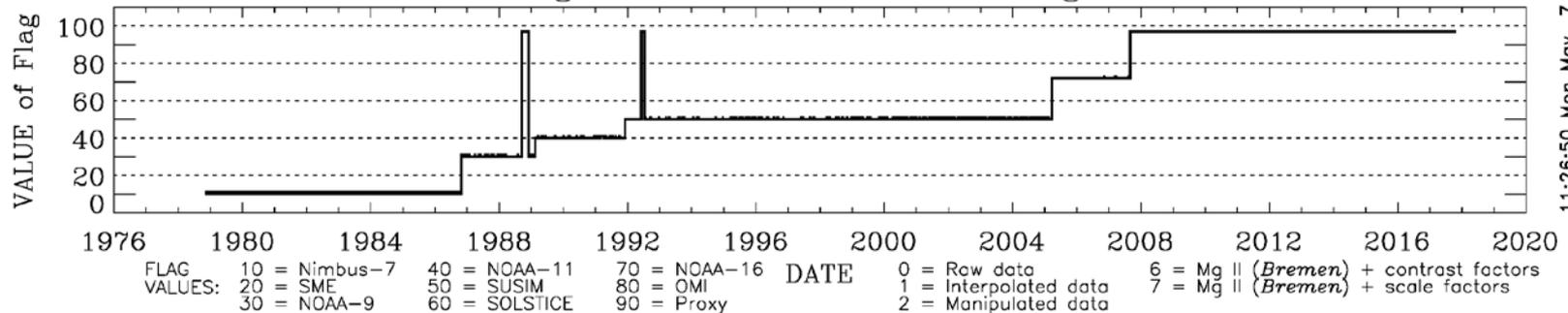
V2 Merged Data – 310 nm

V2 Composite Time Series: *310–310 nm*; Test Version = 2
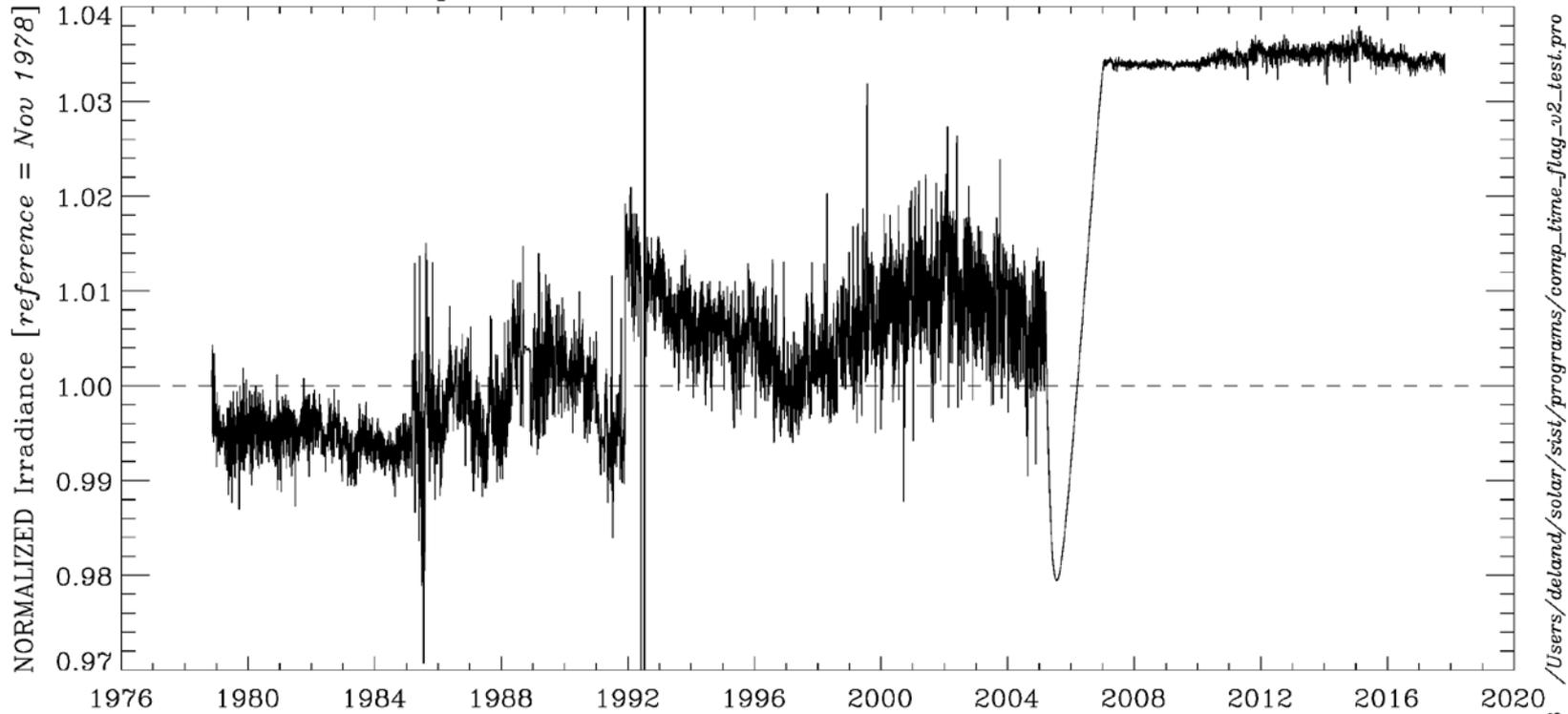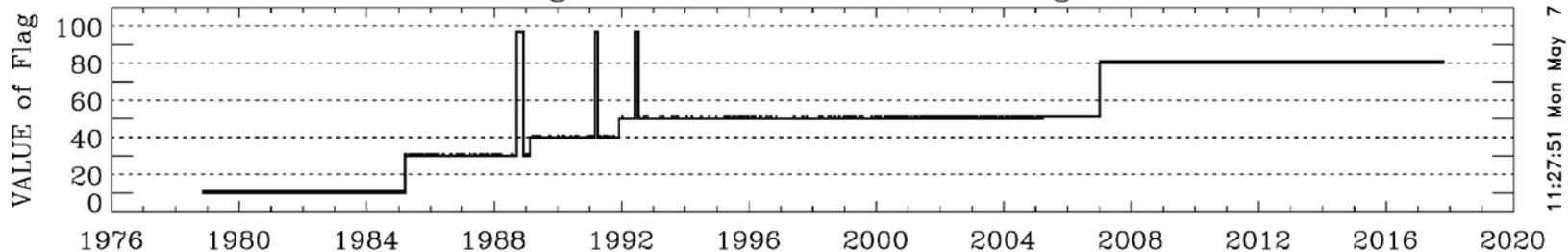
Source Flag for Data at FIRST Wavelength of Band

/Users/deland/solar/sist/programs/comp_time_flag_v2_test.pro

11:27:51 Mon May 7 2018

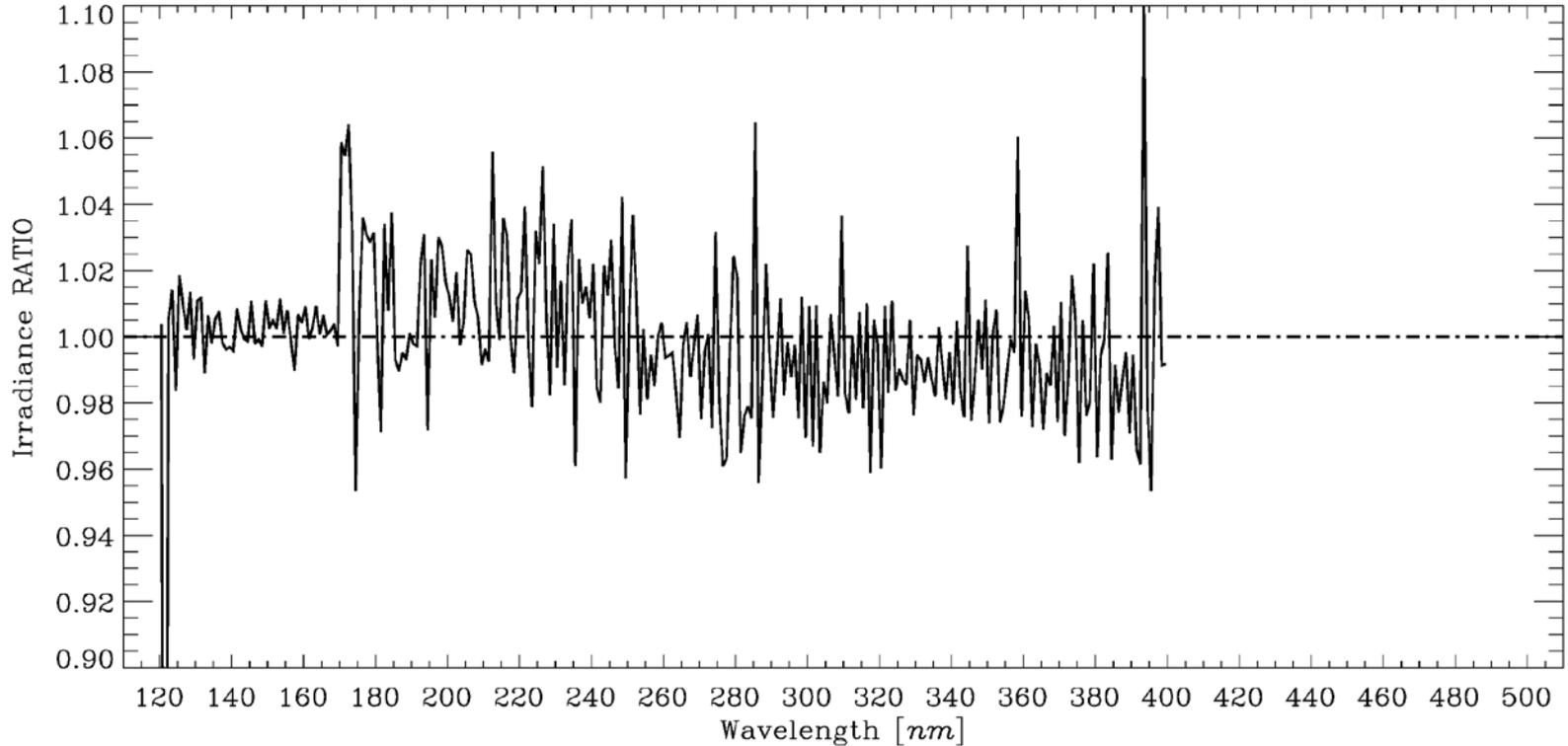| FLAG VALUES: | 10 = Nimbus-7 | 40 = NOAA-11 | 70 = NOAA-16 | 0 = Raw data | 6 = Mg II (*Bremen*) + contrast factors |
| | 20 = SME | 50 = SUSIM | 80 = OMI | 1 = Interpolated data | 7 = Mg II (*Bremen*) + scale factors |
| | 30 = NOAA-9 | 60 = SOLSTICE | 90 = Proxy | 2 = Manipulated data | |

V2 Merged Data – All Wavelengths

Difference between consecutive Normalized points in the X direction
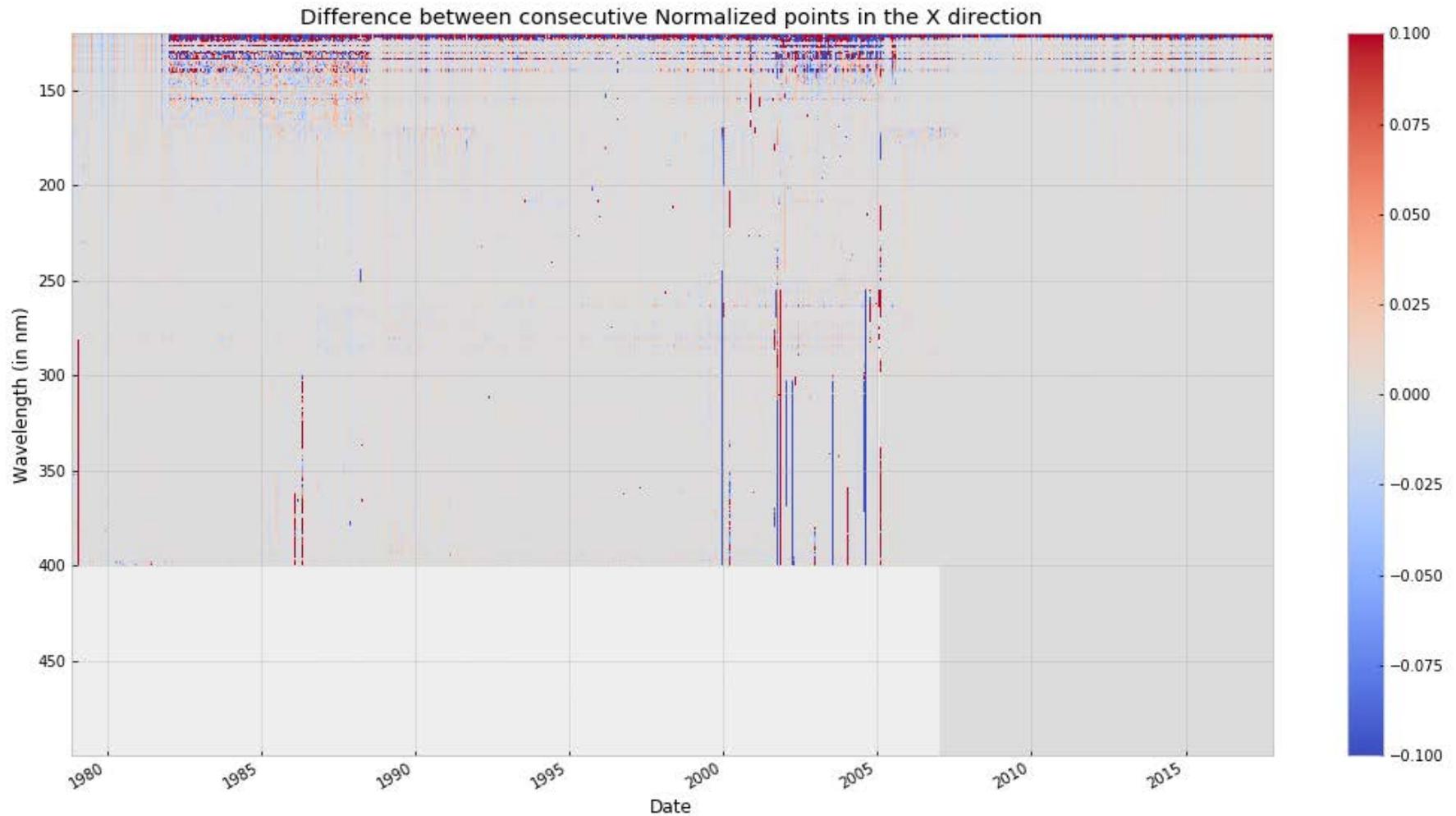
V2 Transition – Case 1

V2 Composite RATIO: 1991/333 *vs.* 1991/336

V2 Transition – Case 2

V2 Composite RATIO: 2005/079 *vs.* 2005/081

SOURCE FLAG for Data

Next Steps for Project

- Resolve offsets at transition locations.

- Ensure that interpolation for small gaps is handled correctly.

- Determine format for uncertainty estimates.

- Provide preliminary composite data set for comments.

- Complete manuscript for journal paper.