Degradation-Corrected Daily OMI Irradiances

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SSAI/NASA GSFC

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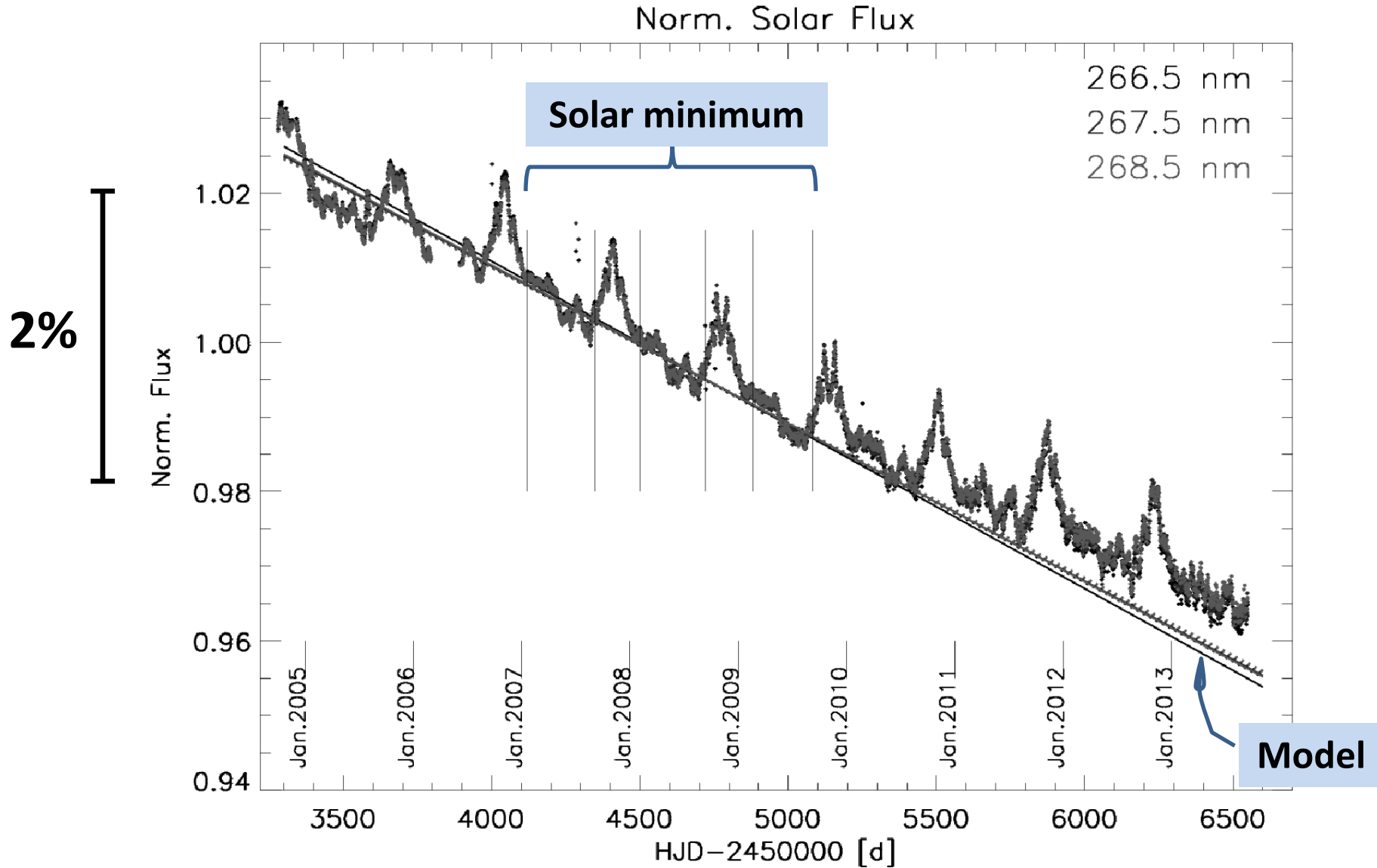
Ozone Monitoring Instrument (*OMI*)

- Main goal: atmospheric trace gases (O_3, SO_2, NO_2, etc.).
- Nadir-viewing, 'pushbroom' single monochromator with a 2-D CCD:
  - 264-504 nm   spectral range (2 UV and 1 Vis channel);
  - 0.4-0.6 nm   spectral resolution;
  - 30-60   simultaneous x-track FOVs.
- Once/day solar measurements:
  - 30-60 disk-integrated solar spectra (`Sun-as-a-star').
- **Very stable instrument; over the mission lifetime (2004-present):**
  - **3-8 %   change in the optical throughput;**
  - **< 0.01 nm   change in the wavelength registration.**
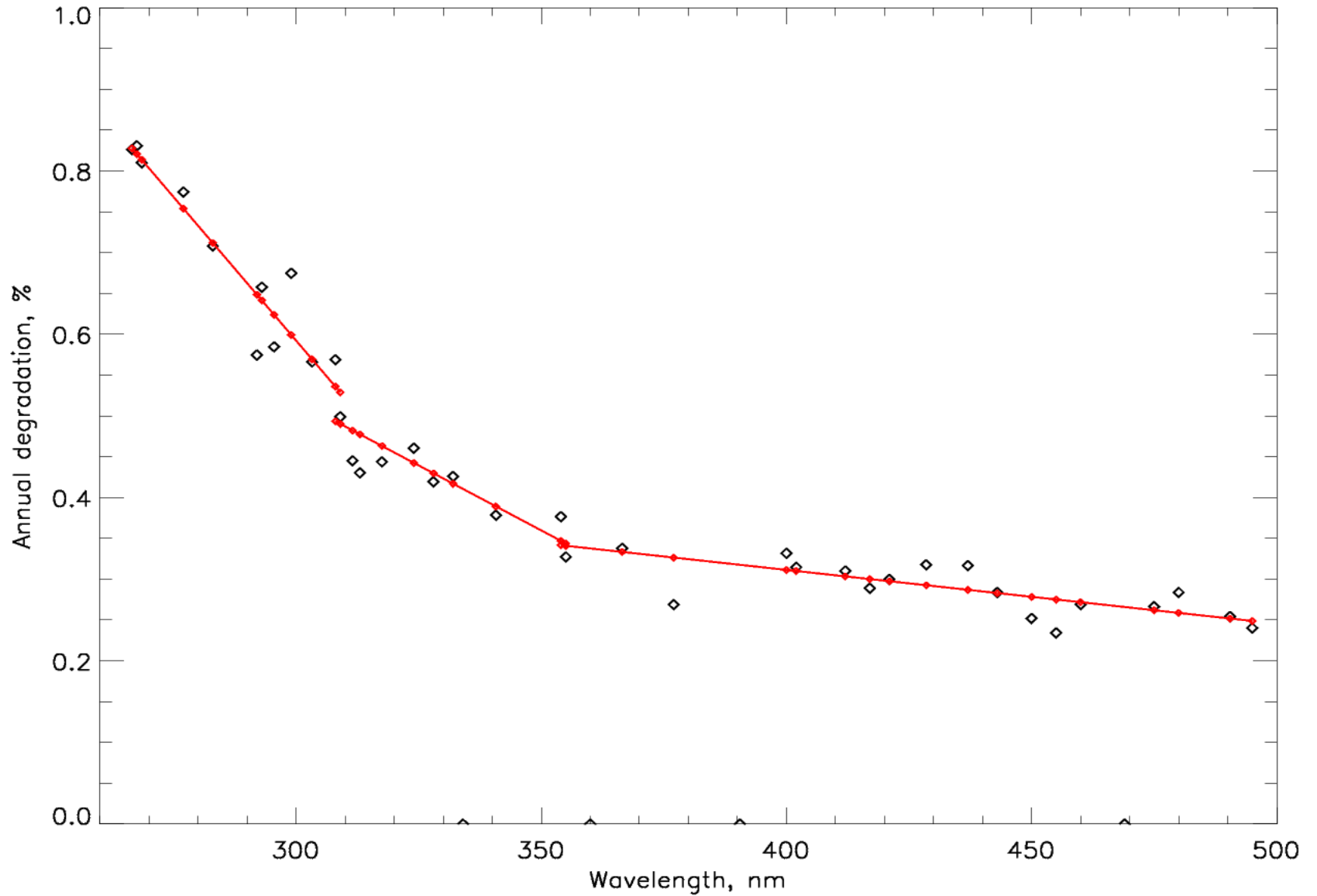
OMI degradation model (Marchenko & DeLand, 2014, ApJ,789, 117):
  - based on the sloar-minimum data (2007-2009);
  - assumes the FOV- and wavelength-dependent linear changes in the
    instrument throughput from y2007 and on.

Building the degradation model for *OMI*

Norm. Solar Flux

266.5 nm
267.5 nm
268.5 nm

Solar minimum

2%

Model

Norm. Flux

1.02

1.00

0.98

0.96

0.94

Jan.2005
Jan.2006
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013

3500   4000   4500   5000   5500   6000   6500

HJD−2450000 [d]
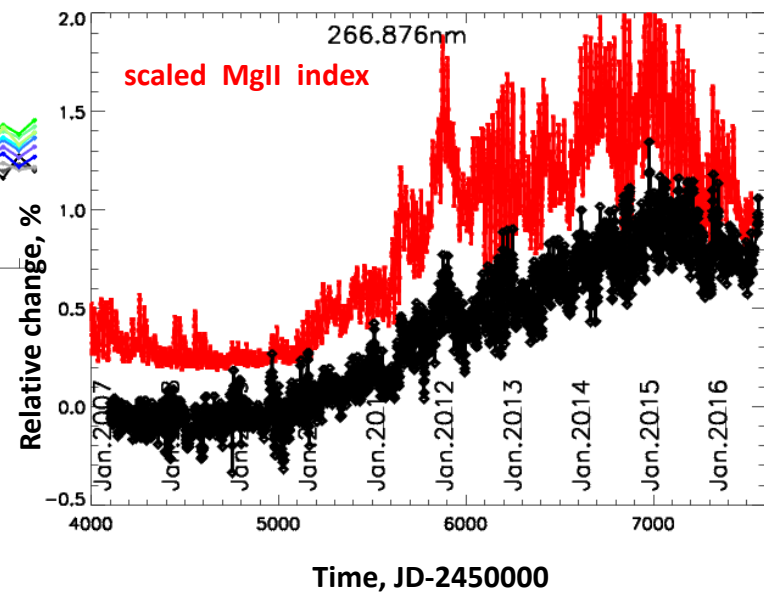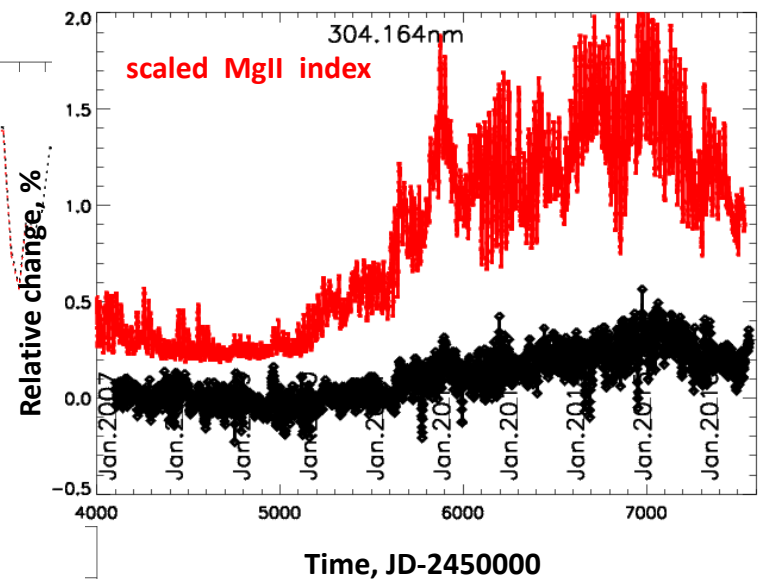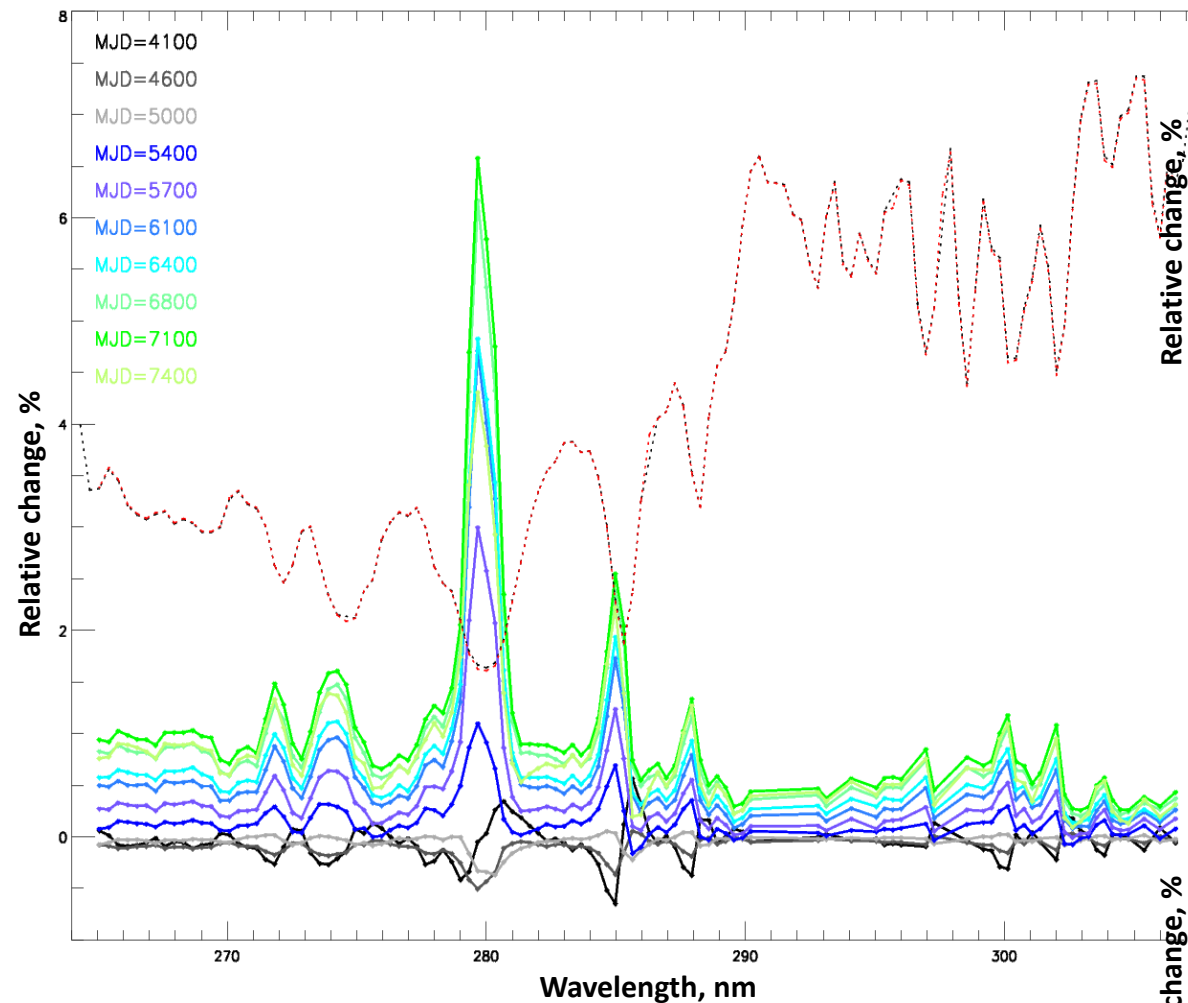
OMI's annual degradation: irradiances

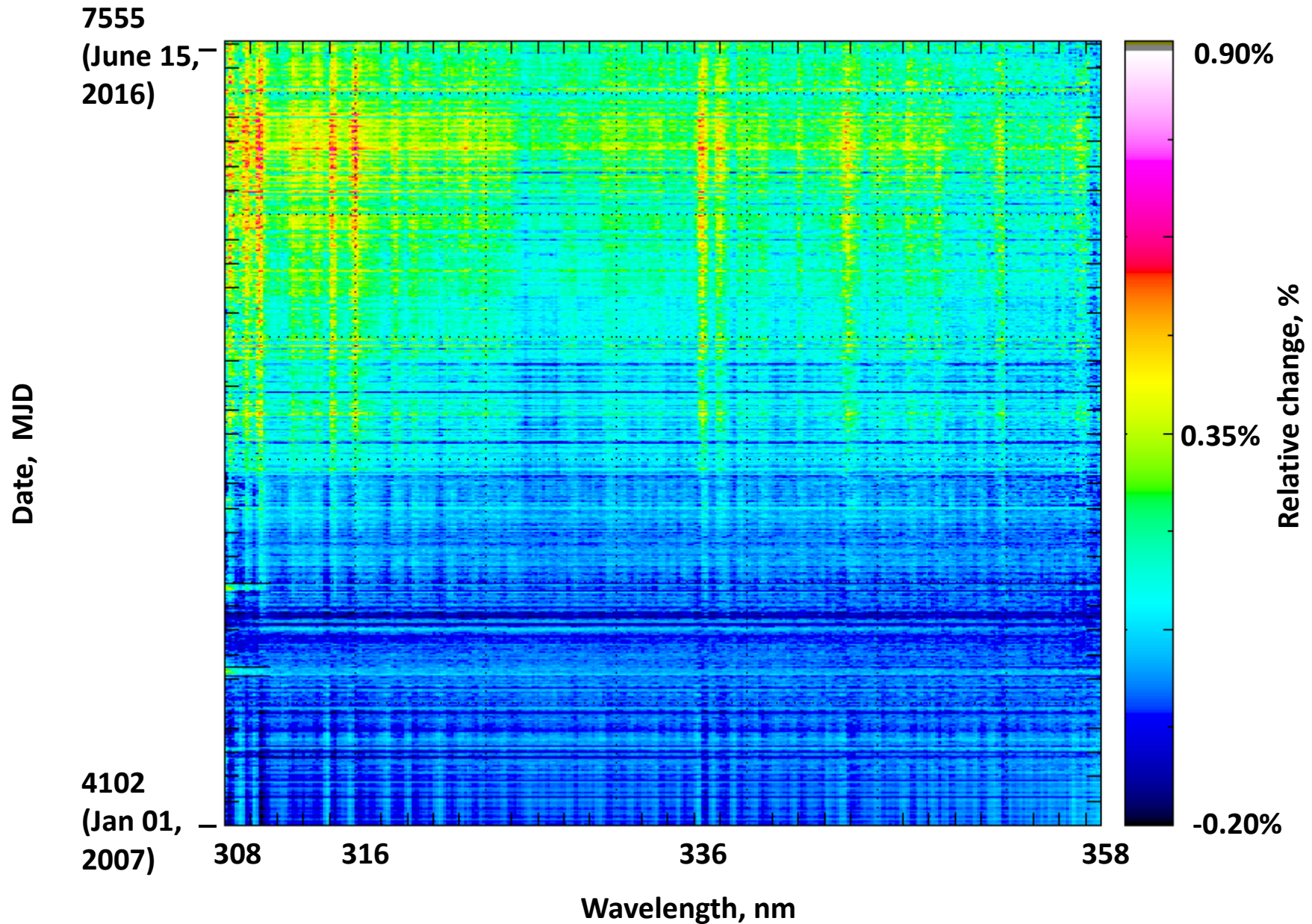**More details in: Marchenko & DeLand, 2014, ApJ,789, 117**
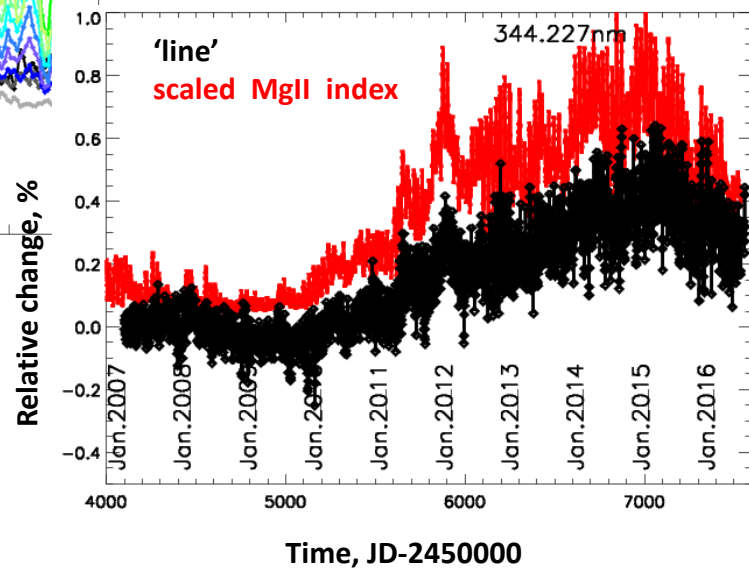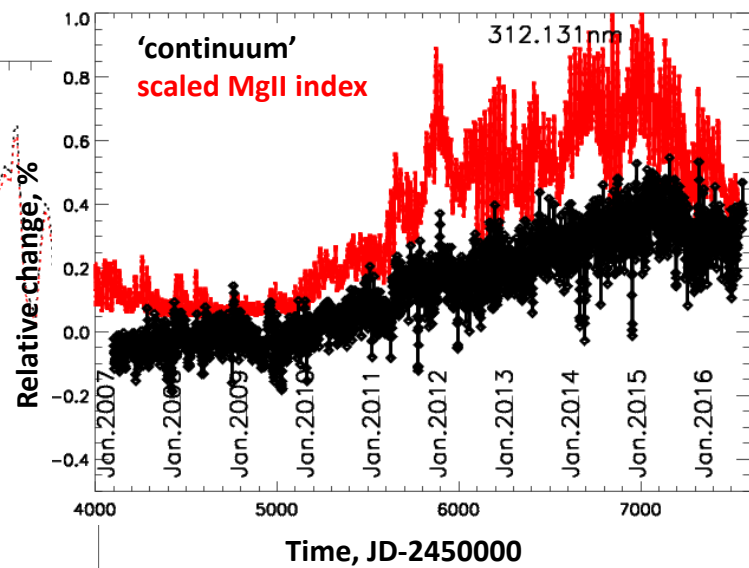
Normalized daily SSI changes from OMI data
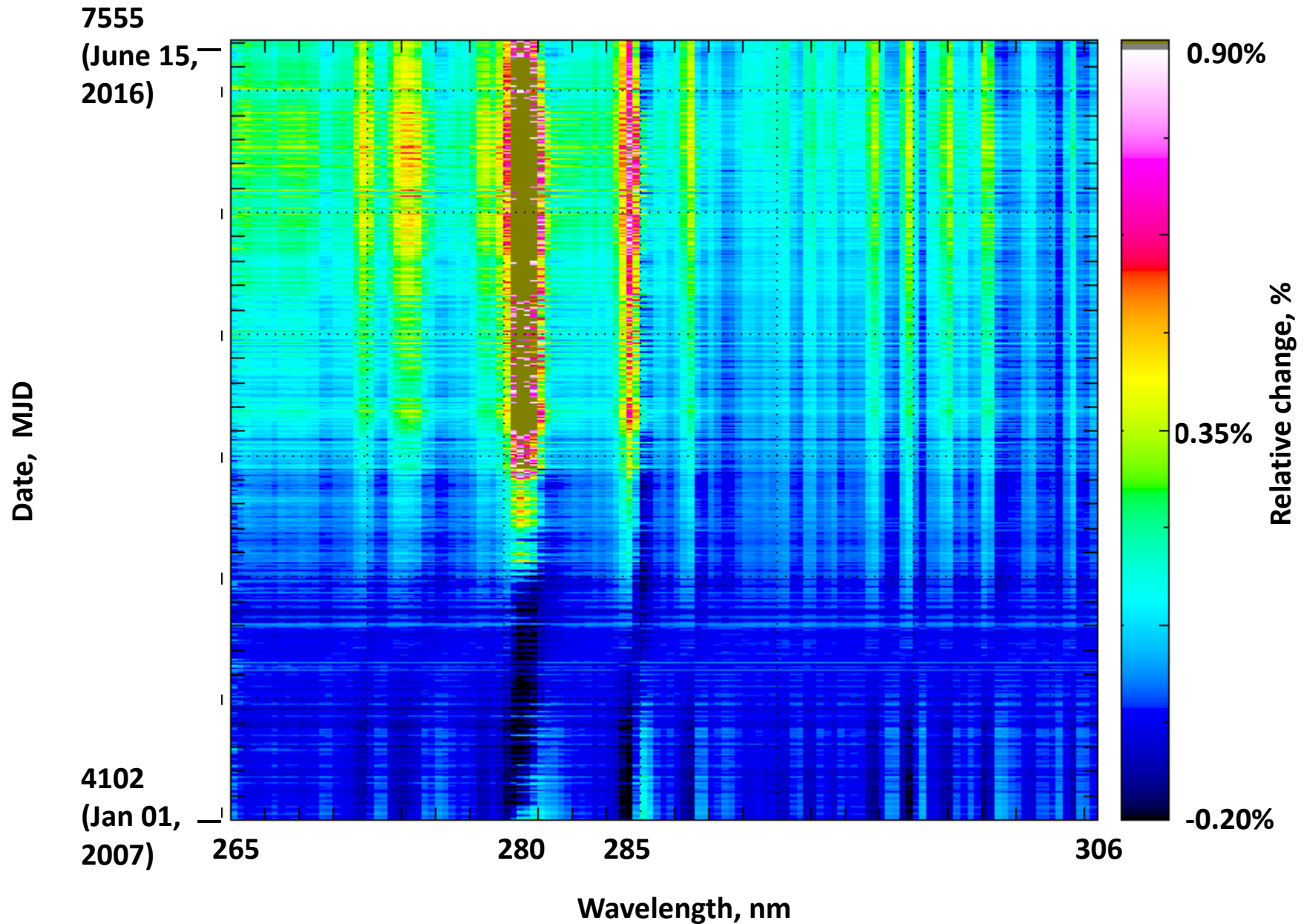
Normalized daily SSI changes

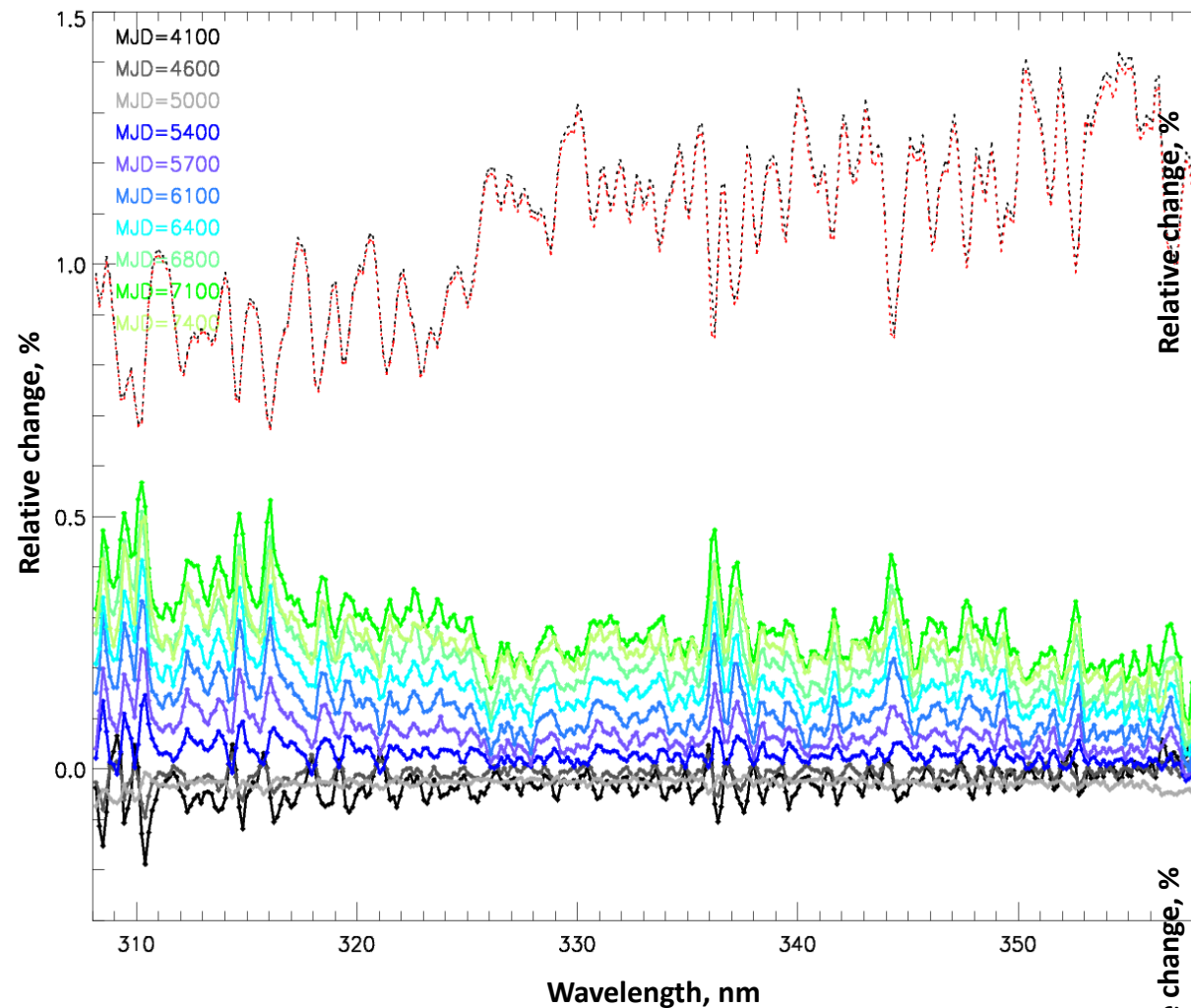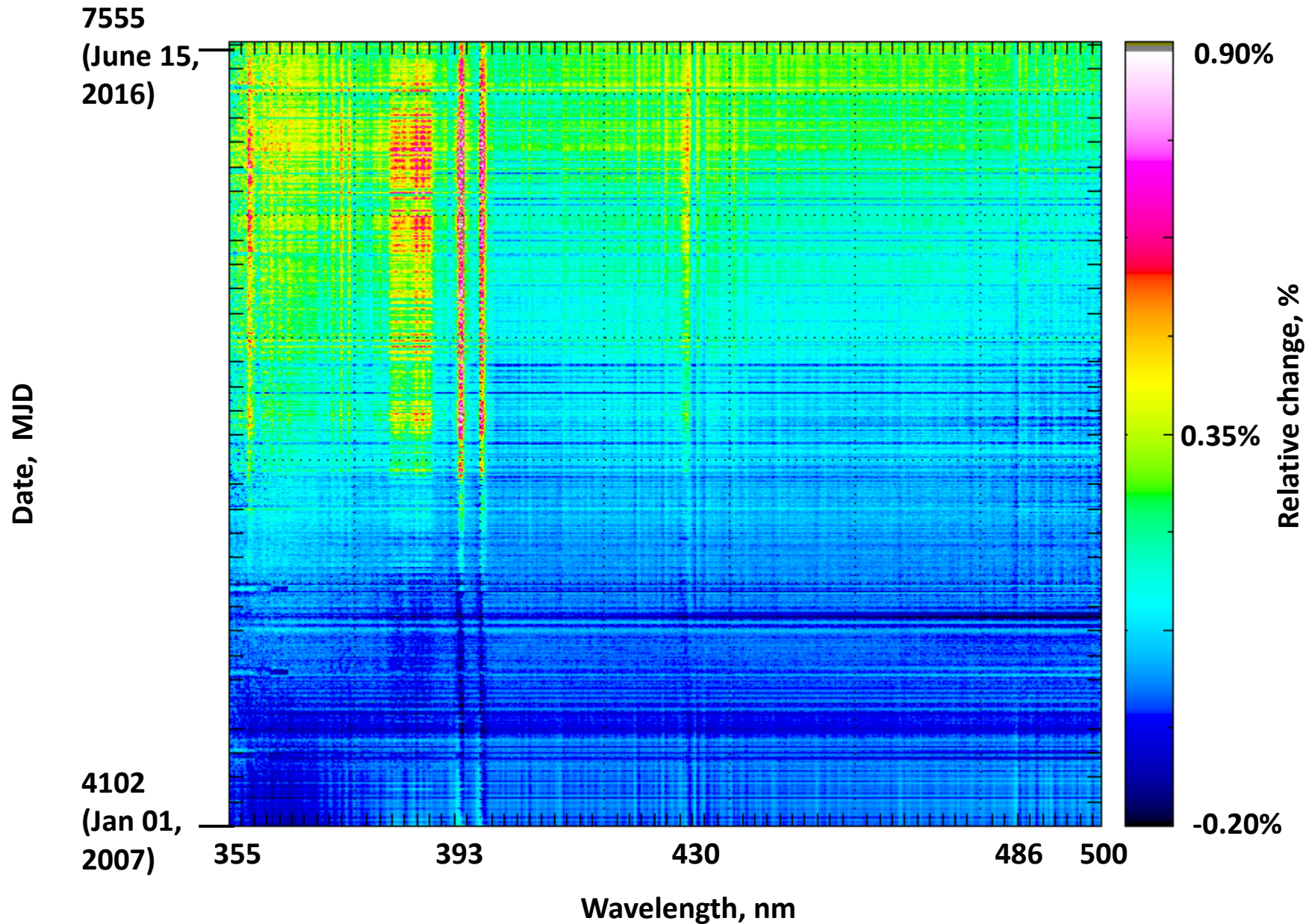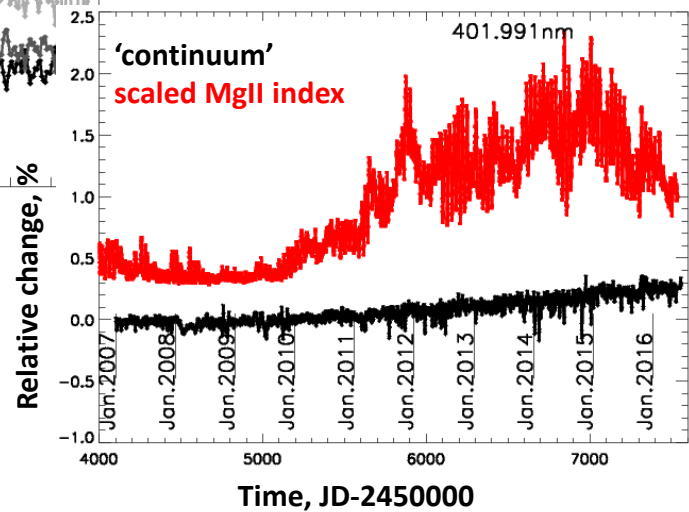# Normalized daily SSI changes from OMI data

Normalized daily SSI changes
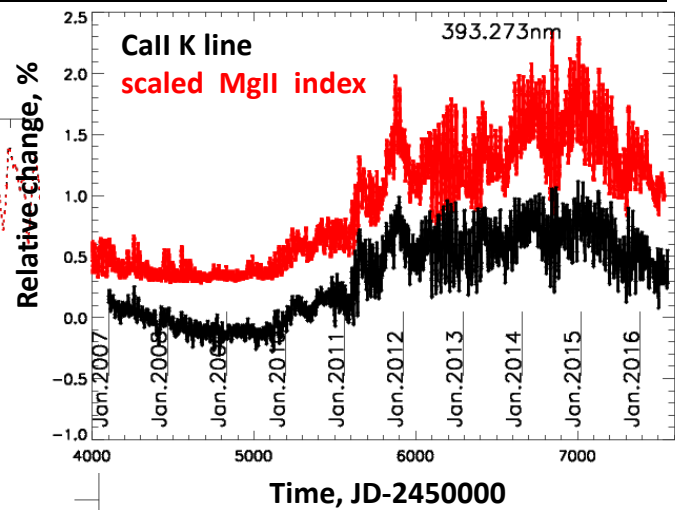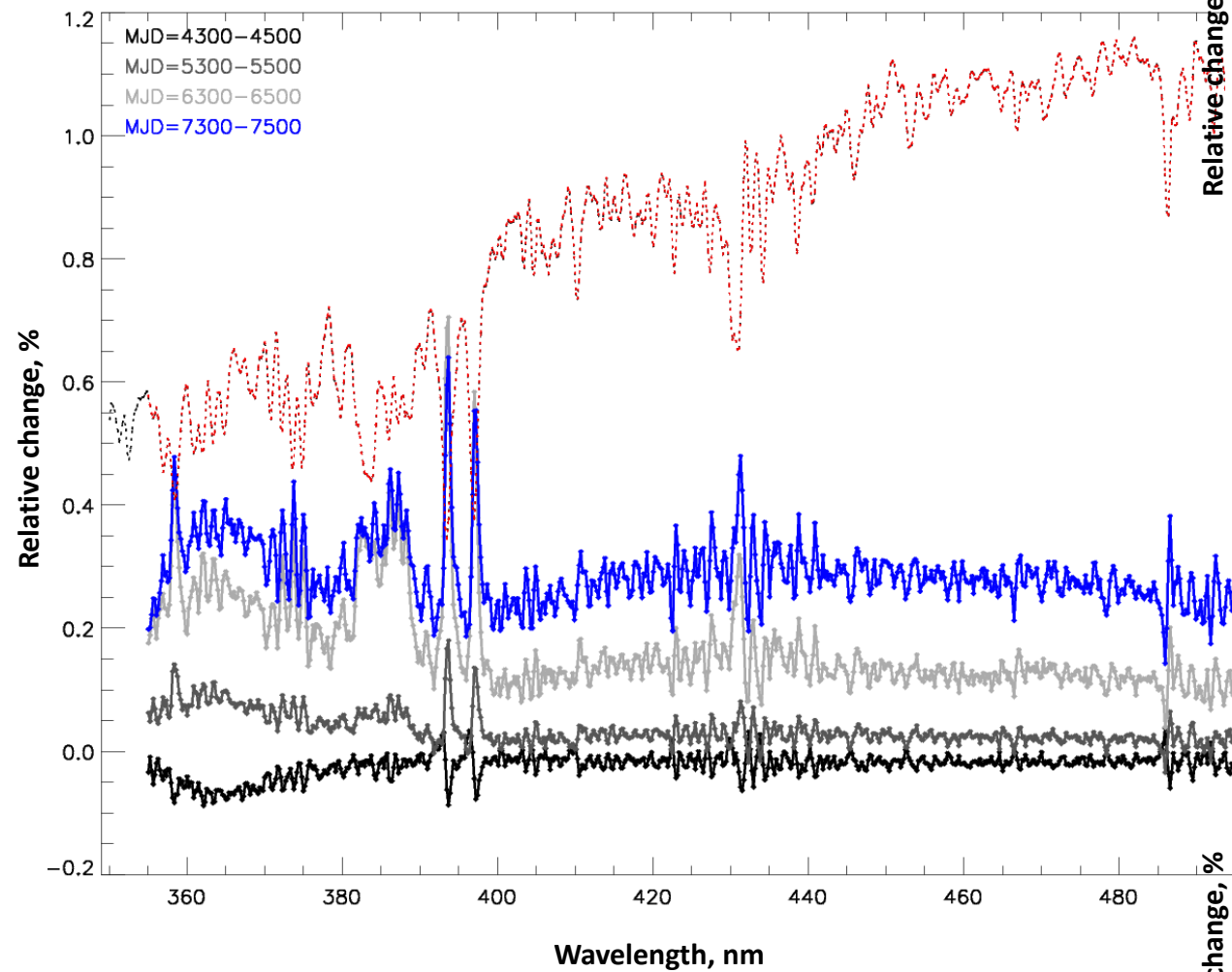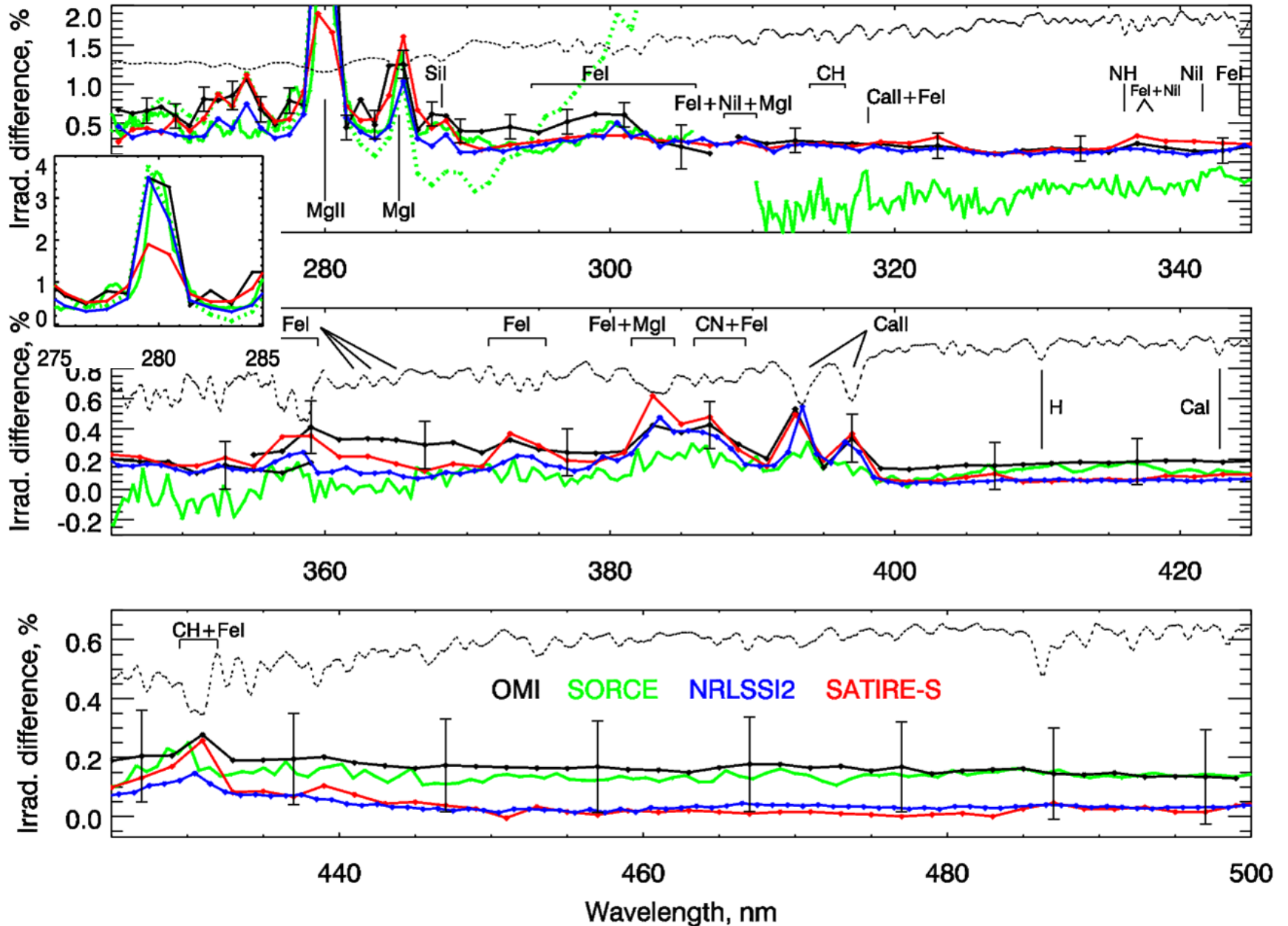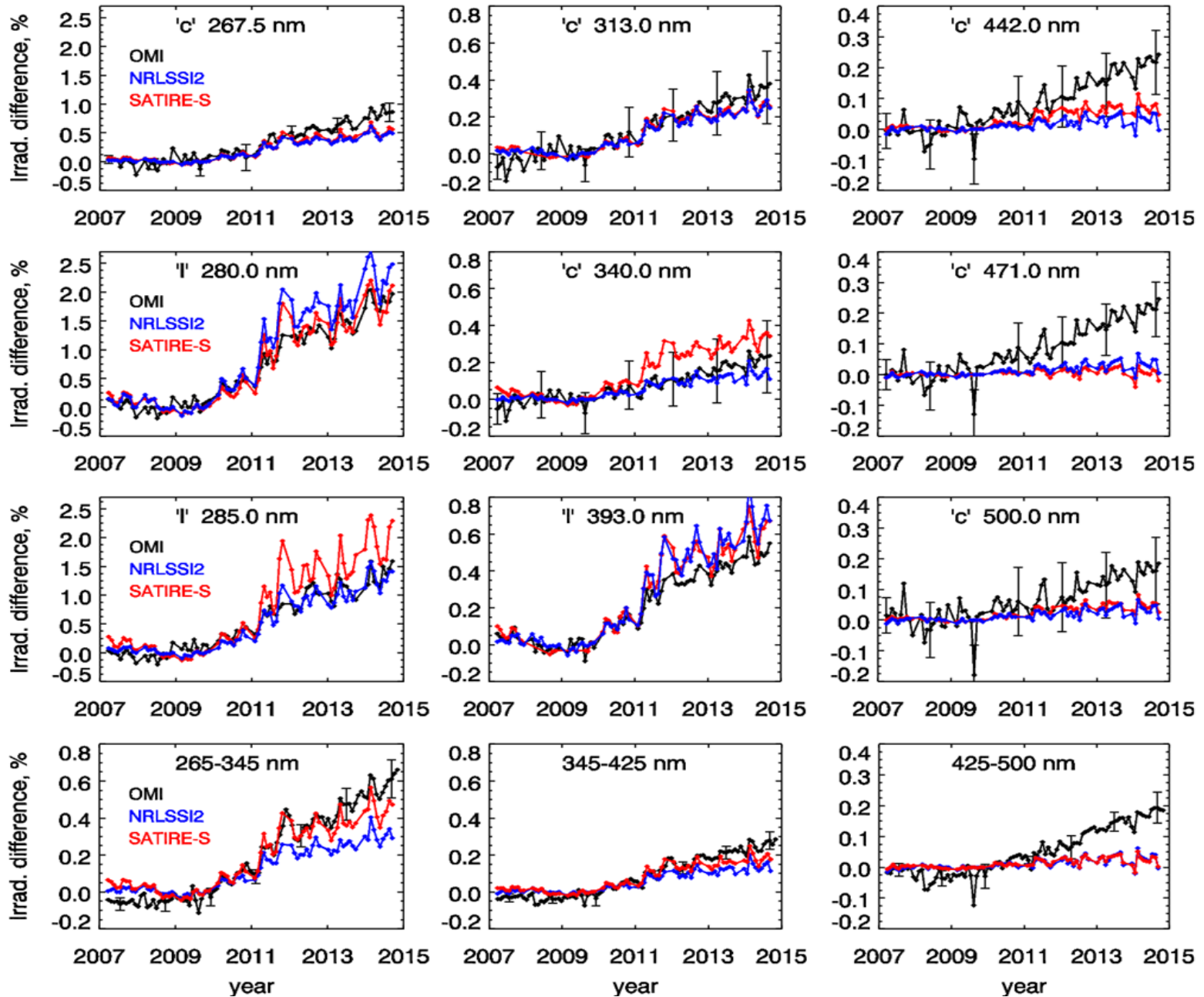
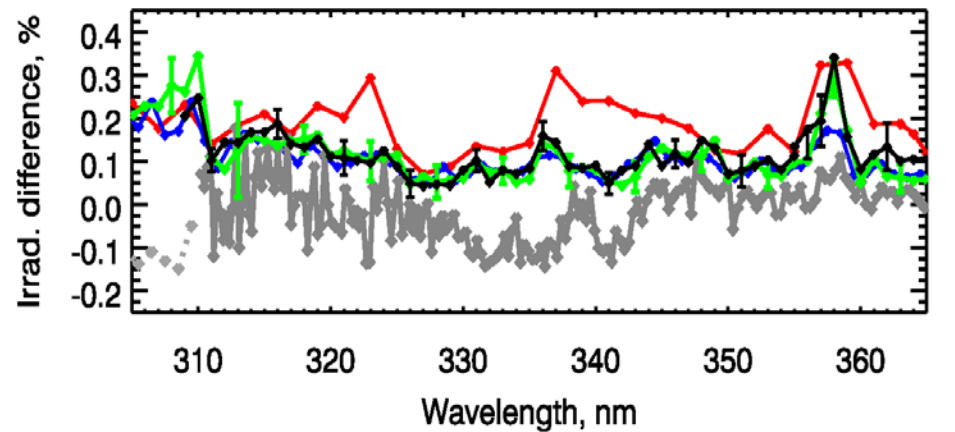Normalized daily SSI changes from OMI data

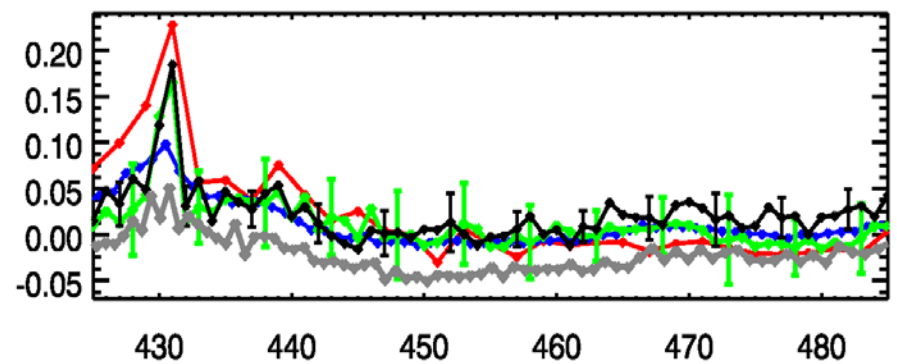# Normalized daily SSI changes

Solar-cycle SSI changes: [max(yy2012...14) − min(yy2007...09)]/min

Solar-cycle SSI changes

Rotational SSI changes: 8 cycles in yy2012 – 2013
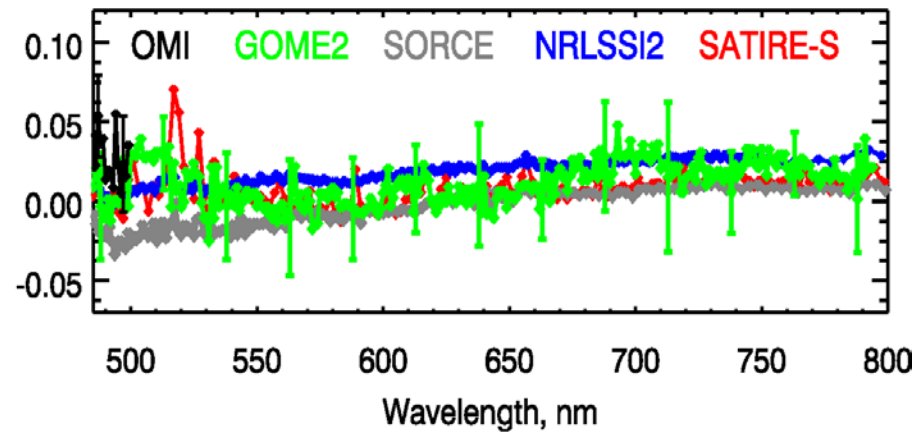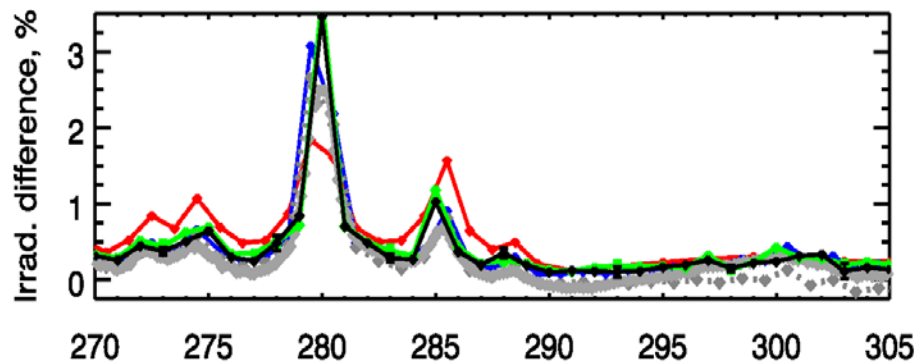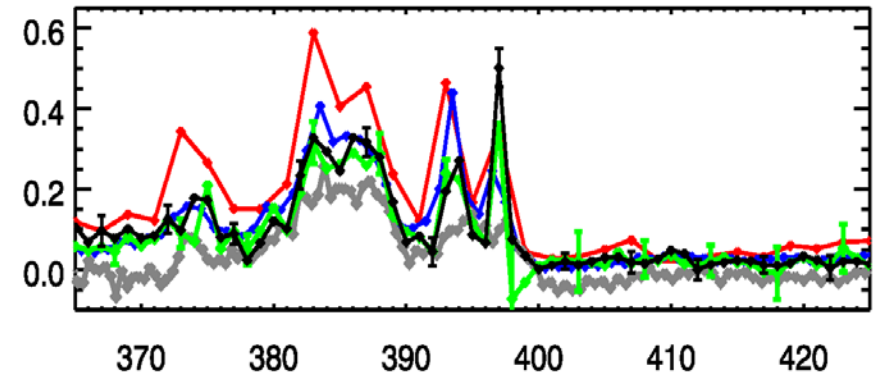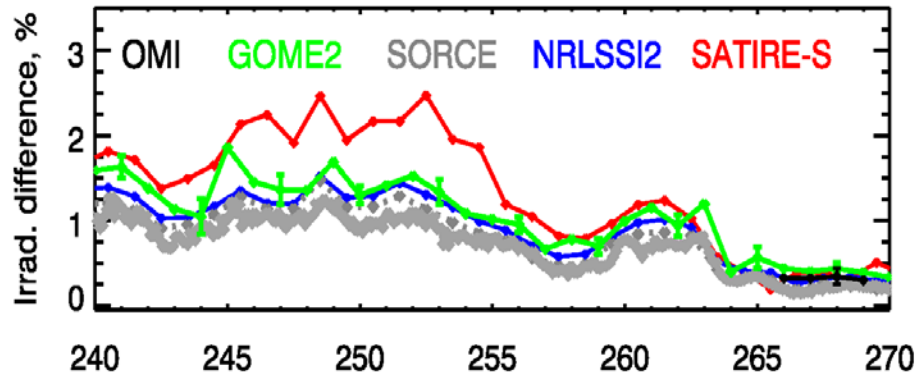
Improving the OMI degradation model:

- workaround the missing data (bad, dead pixels, RTS noise, grown from 2-3% in y2005 to ~12% in y2016);

- better account for the goniometry-related changes in throughput;

- improved wavelength resolution, to ~1 nm;

- possibly, individual (per given FOV) degradation coefficients.