Improved SSIs from *Aura/OMI*

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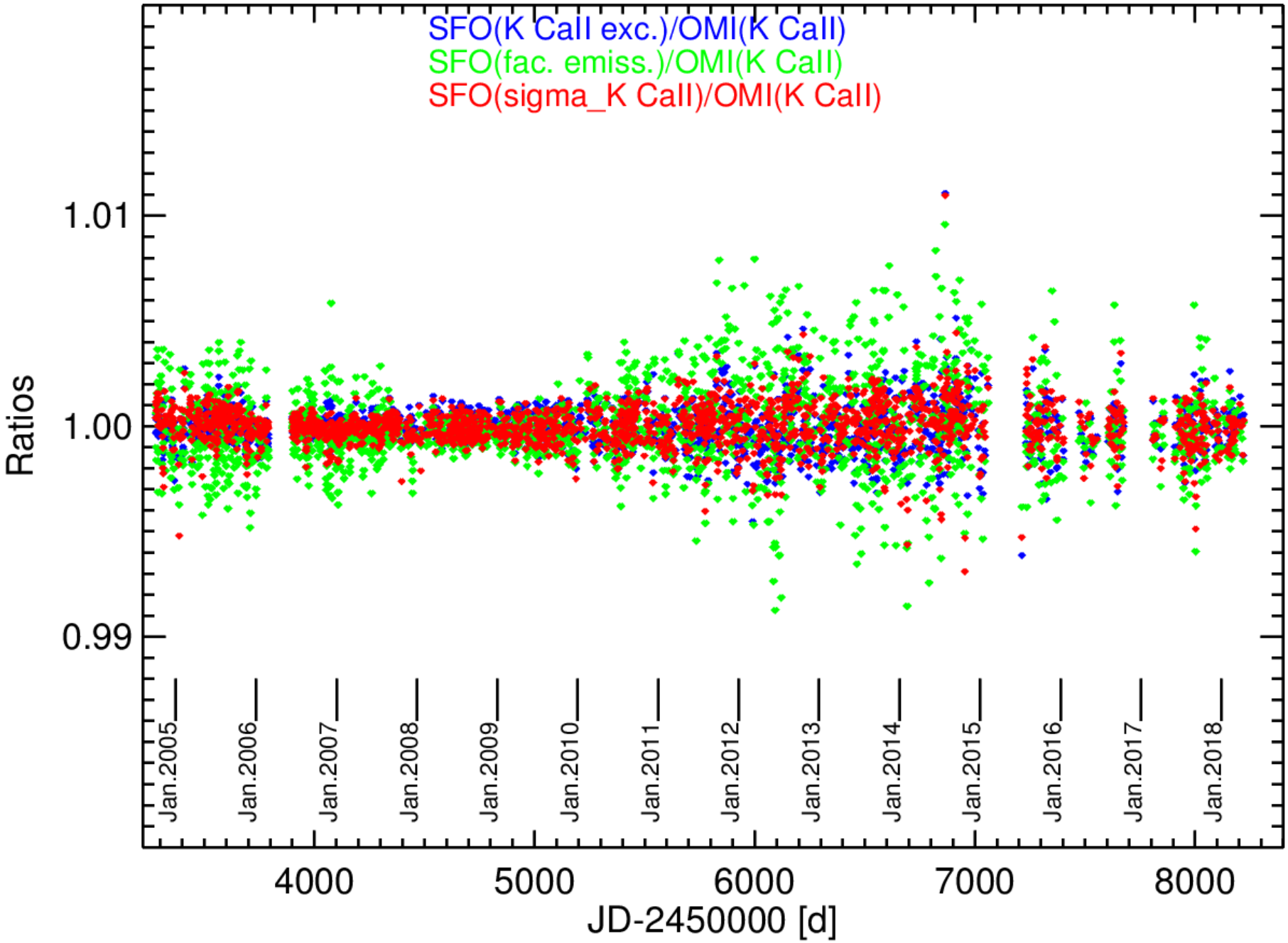
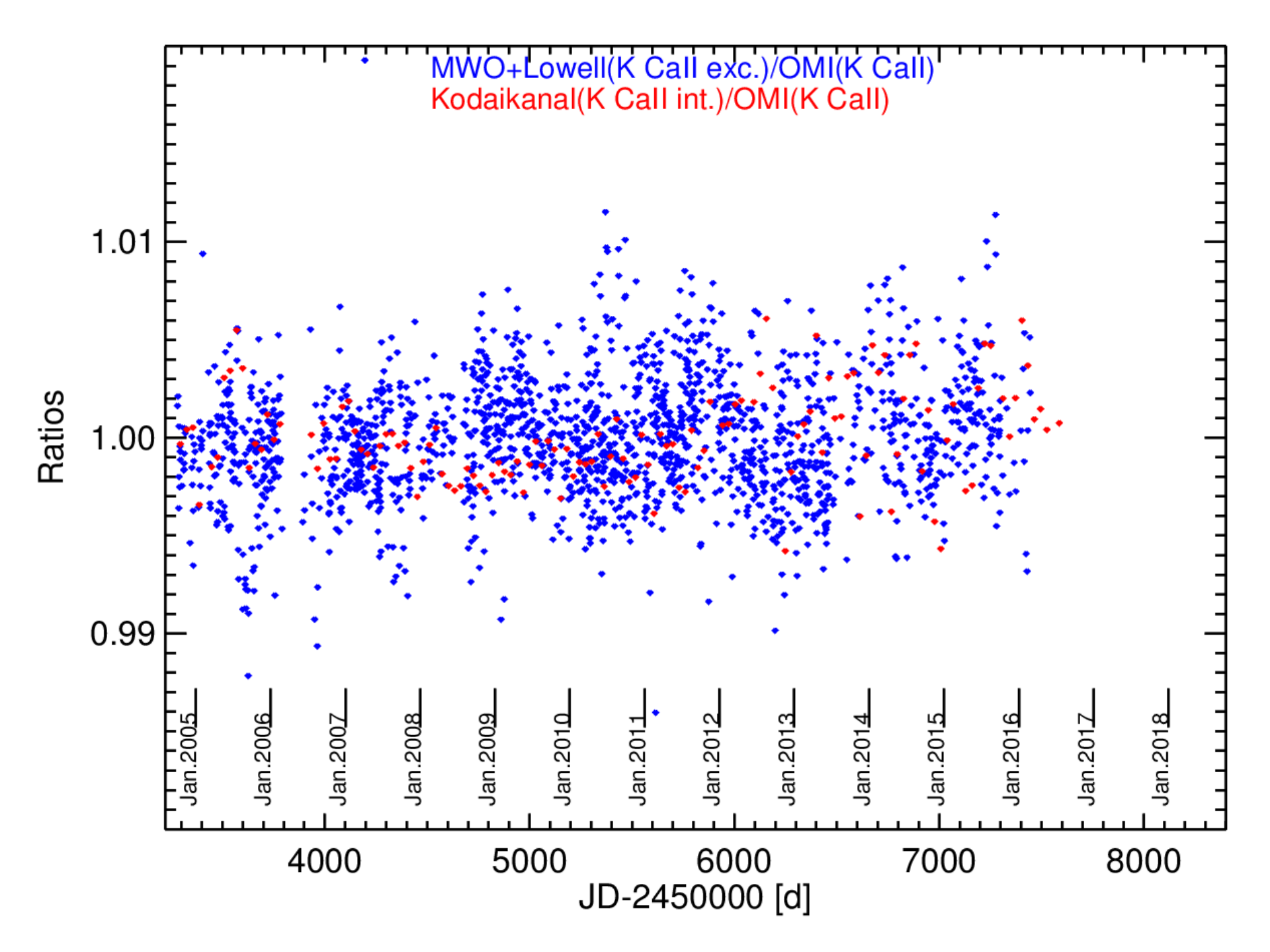
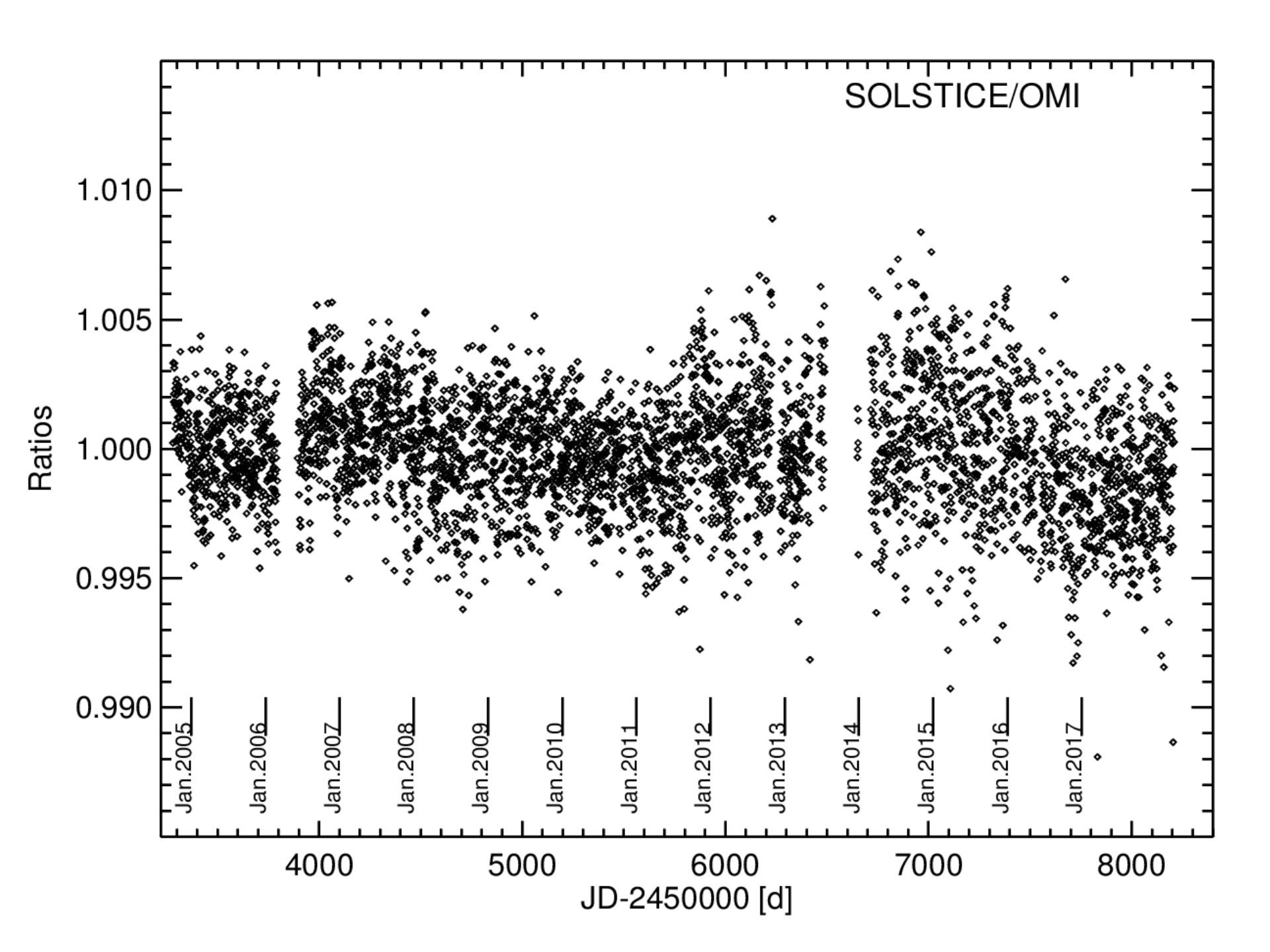
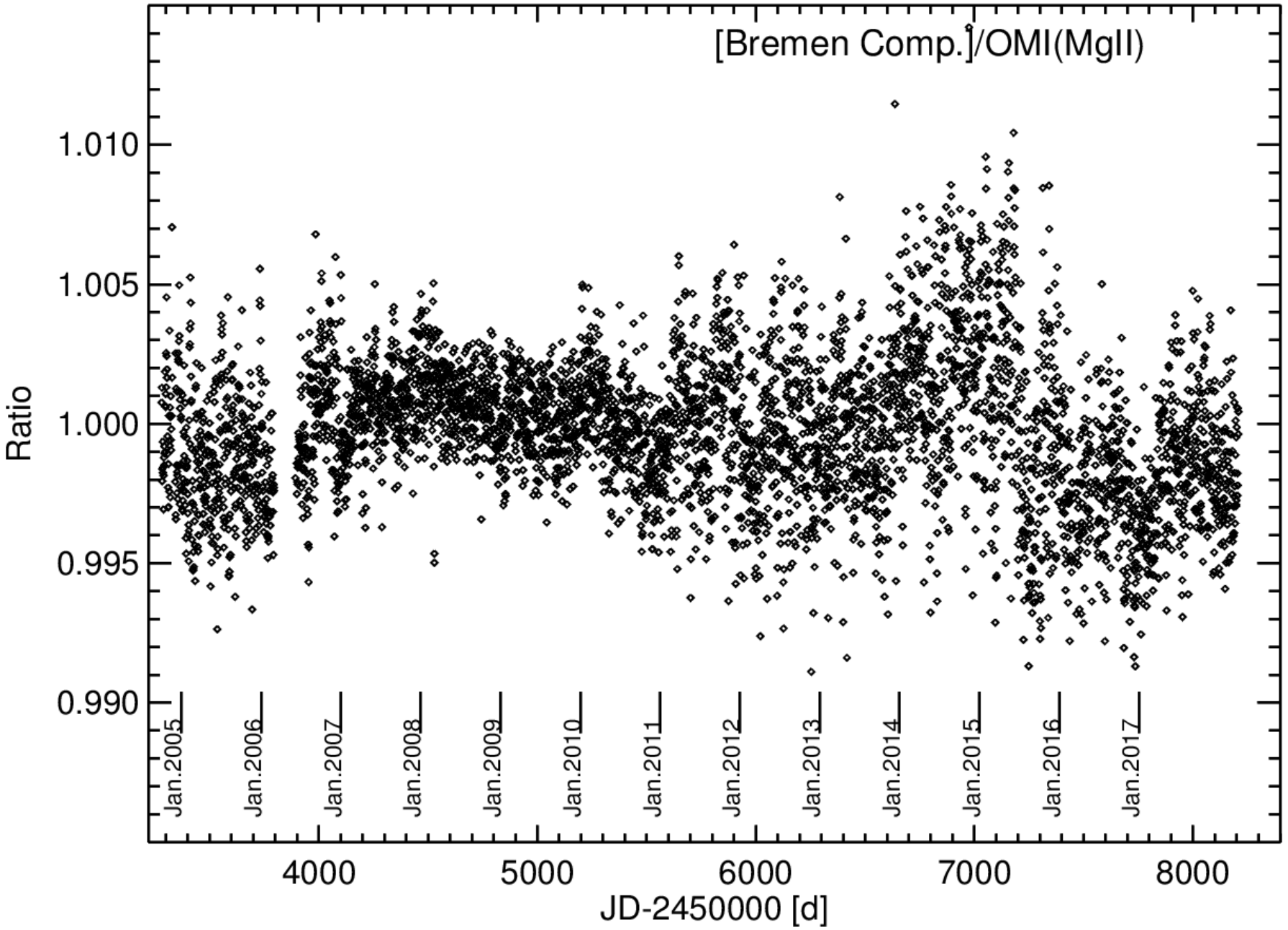
- **Updated OMI MgII index: back to independence.**
- **Revamped OMI degradation model and improved OMI SSIs.**


SFO(K CaII exc.)/OMI(K CaII)
SFO(fac. emiss.)/OMI(K CaII)
SFO(sigma_K CaII)/OMI(K CaII)
Ratios
1.01
1.00
0.99
Jan.2005
Jan.2006
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
Jan.2018
4000
5000
6000
7000
8000
JD-2450000 [d]


MWO+Lowell(K CaII exc.)/OMI(K CaII)
Kodaikanal(K CaII int.)/OMI(K CaII)
Ratios
1.01
1.00
0.99
Jan.2005
Jan.2006
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
Jan.2018
4000
5000
6000
7000
8000
JD-2450000 [d]


SOLSTICE/OMI
Ratios
1.010
1.005
1.000
0.995
0.990
Jan.2005
Jan.2006
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
4000
5000
6000
7000
8000
JD-2450000 [d]


[Bremen Comp.]/OMI(MgII)
Ratio
1.010
1.005
1.000
0.995
0.990
Jan.2005
Jan.2006
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
4000
5000
6000
7000
8000
JD-2450000 [d]

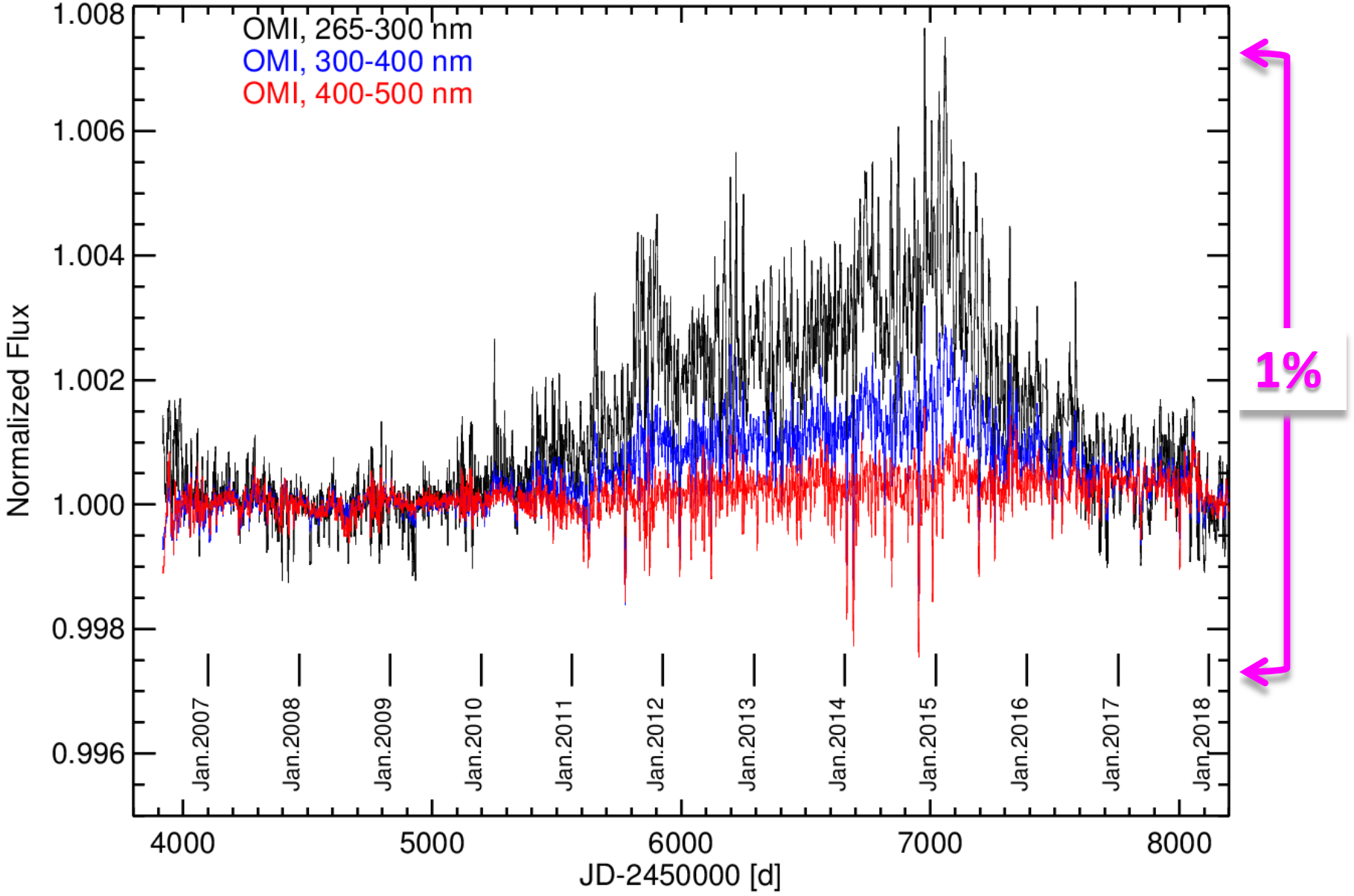
Upgrade of the OMI degradation model*; attempting to achieve <0.1% long-term (Solar cycle) SSI accuracy:

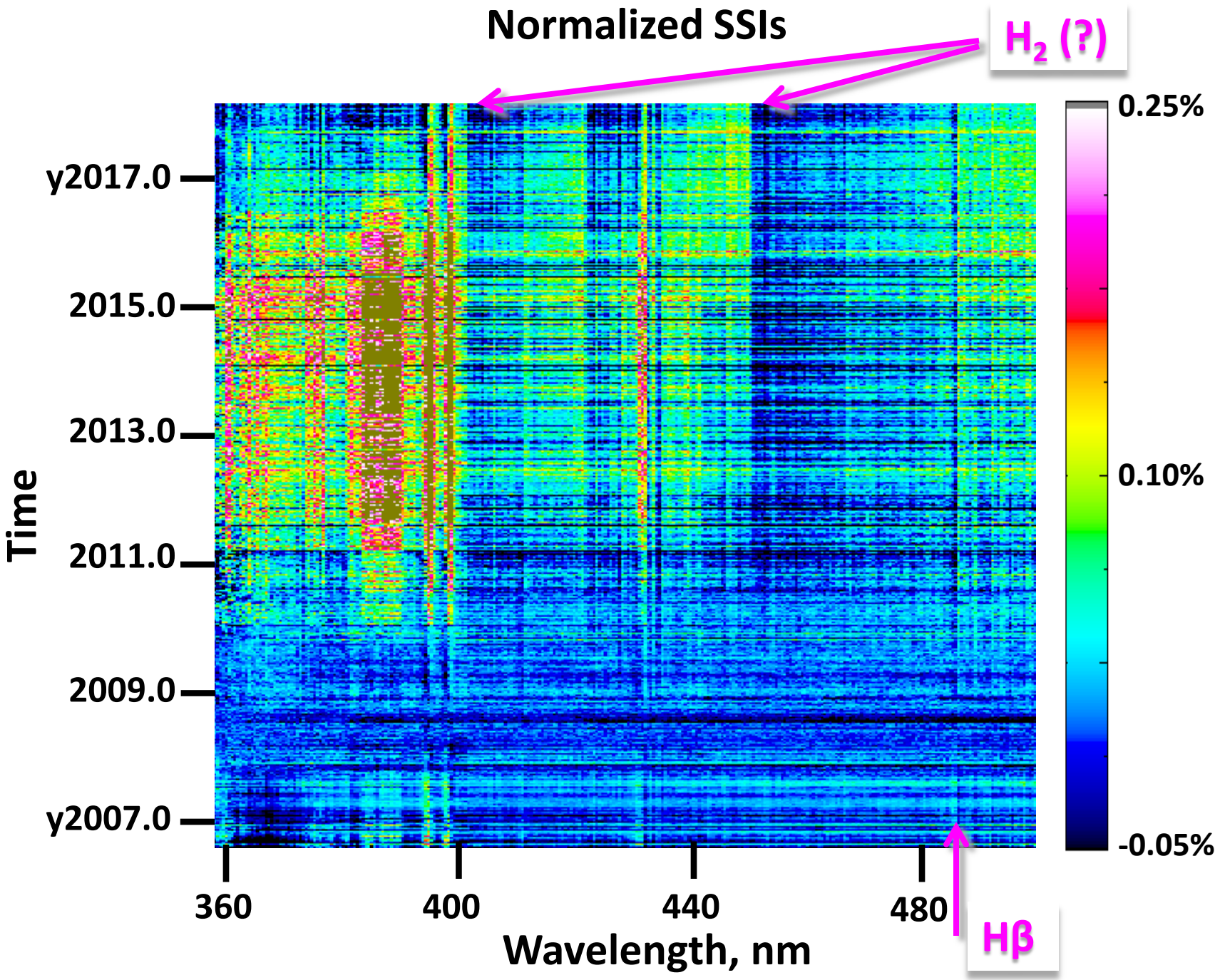
- Involving all available on-board calibration sources (two backup solar diffusors; weekly and monthly cadences)
- Better accounting for the goniometry-related changes
- Approximating the optical degradation by

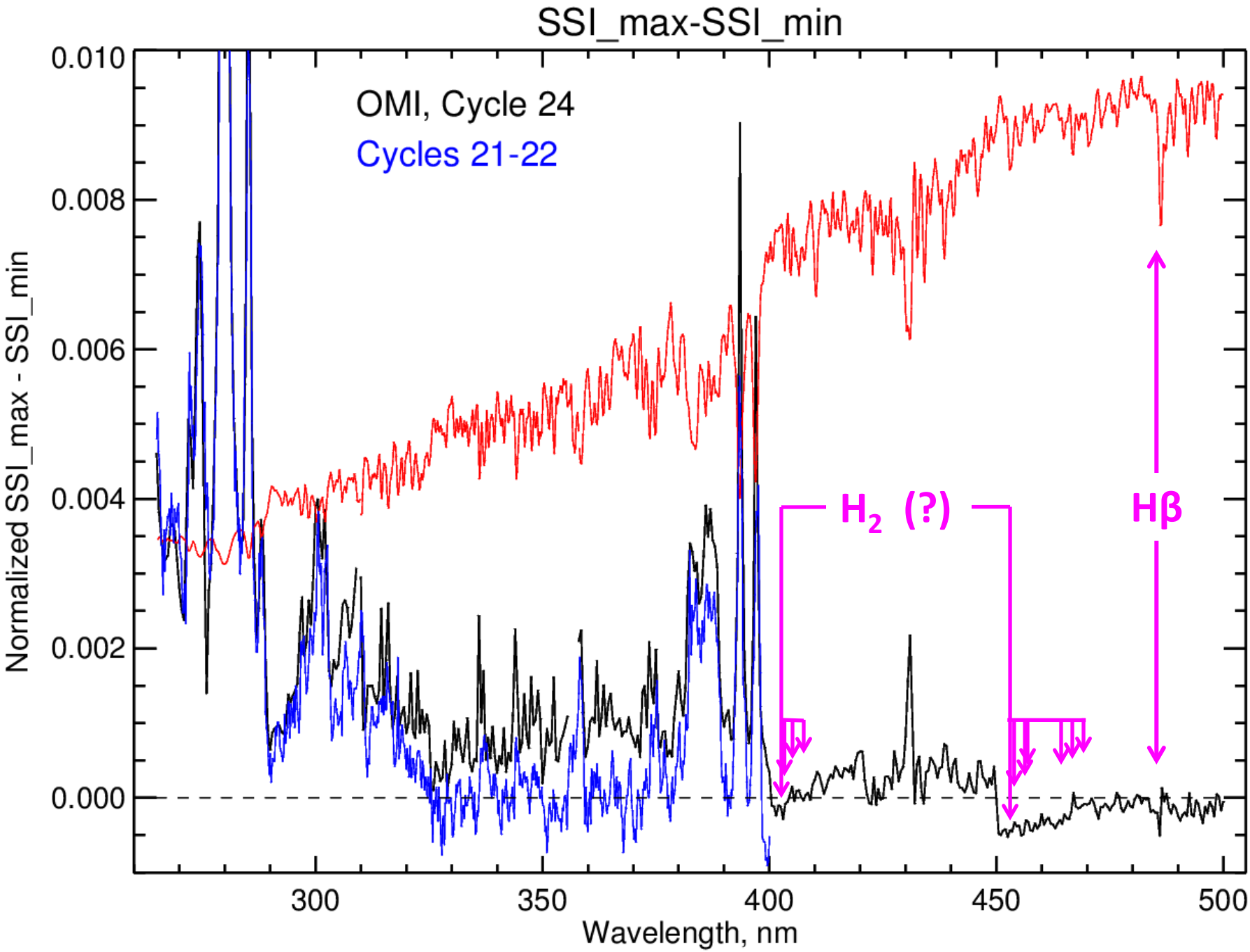
$$I(\lambda,t,VZA)=a_1(\lambda,VZA) \times \exp[-a_2(\lambda,VZA) \times t^{\,a3(\lambda,VZA)}]$$

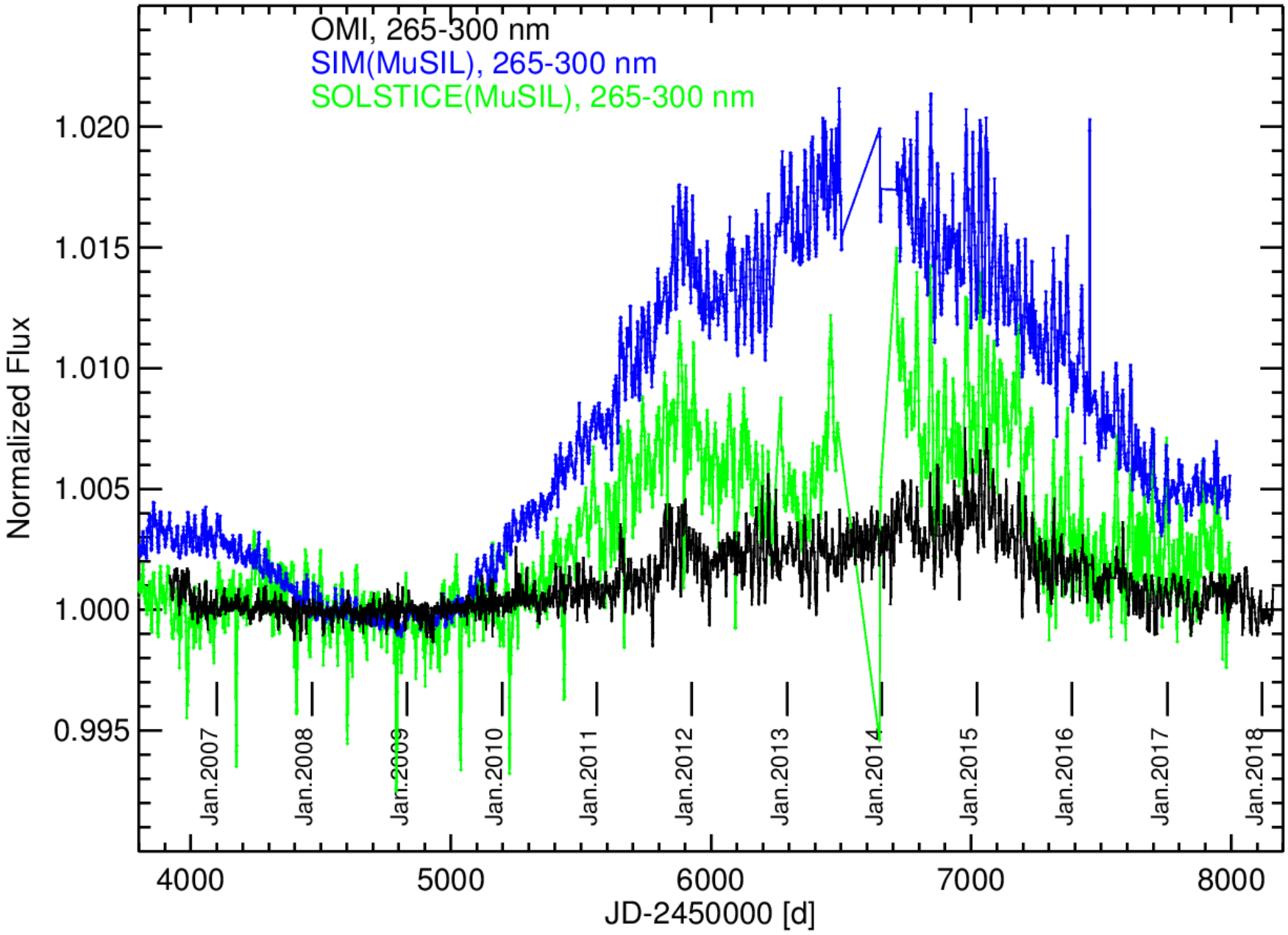
- Assuming consistent absolute irradiance levels at the minima of Cycles 23 and 24. Otherwise, the model results in uncertainties comparable to the linear fit* (~0.2%).

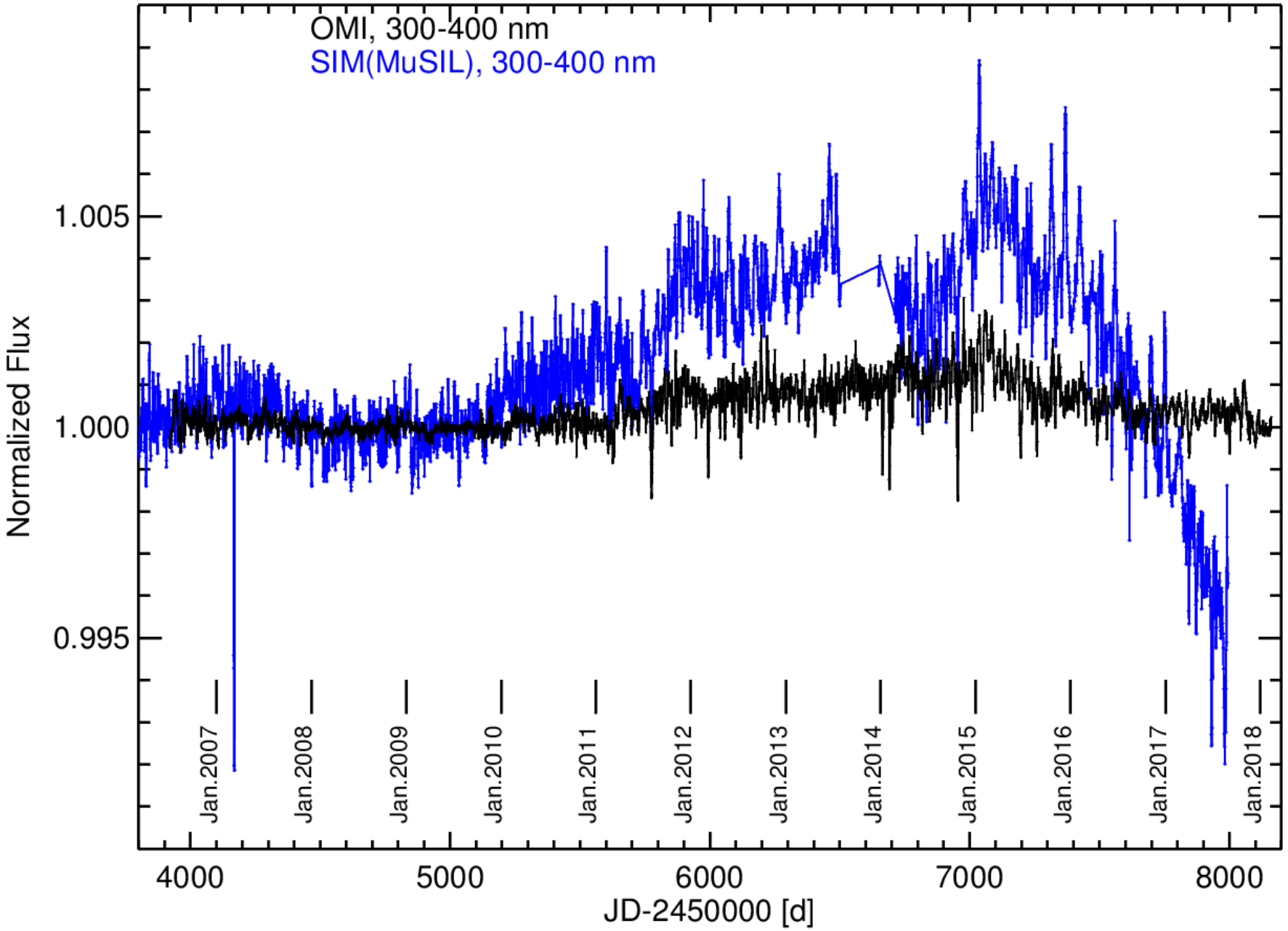
* Description of the earlier approach: Marchenko & DeLand, 2014, ApJ,789, 117

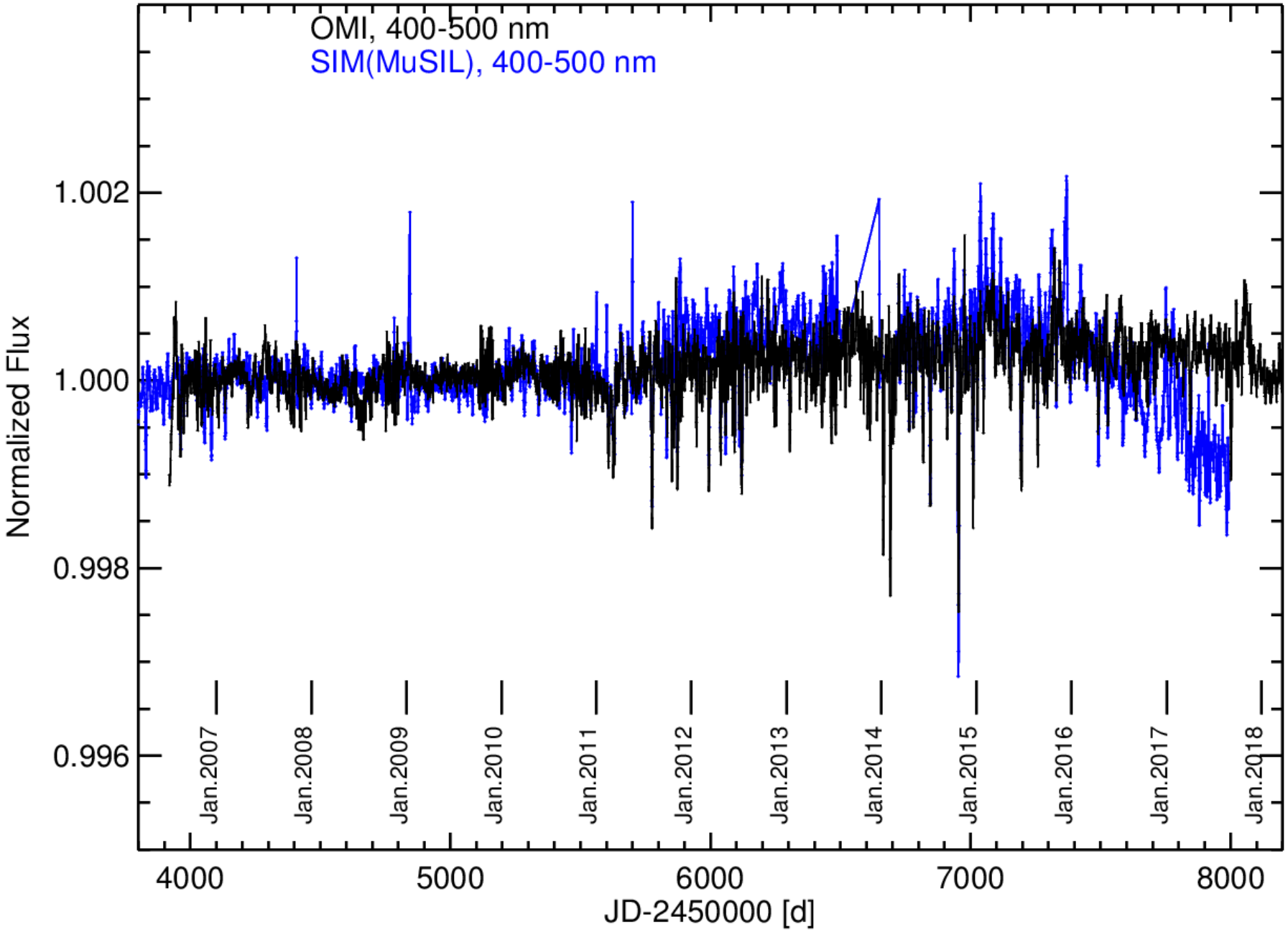

OMI, 265-300 nm
OMI, 300-400 nm
OMI, 400-500 nm
Normalized Flux
1.008
1.006
1.004
1.002
1.000
0.998
0.996
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
Jan.2018
4000
5000
6000
7000
8000
JD-2450000 [d]
1%

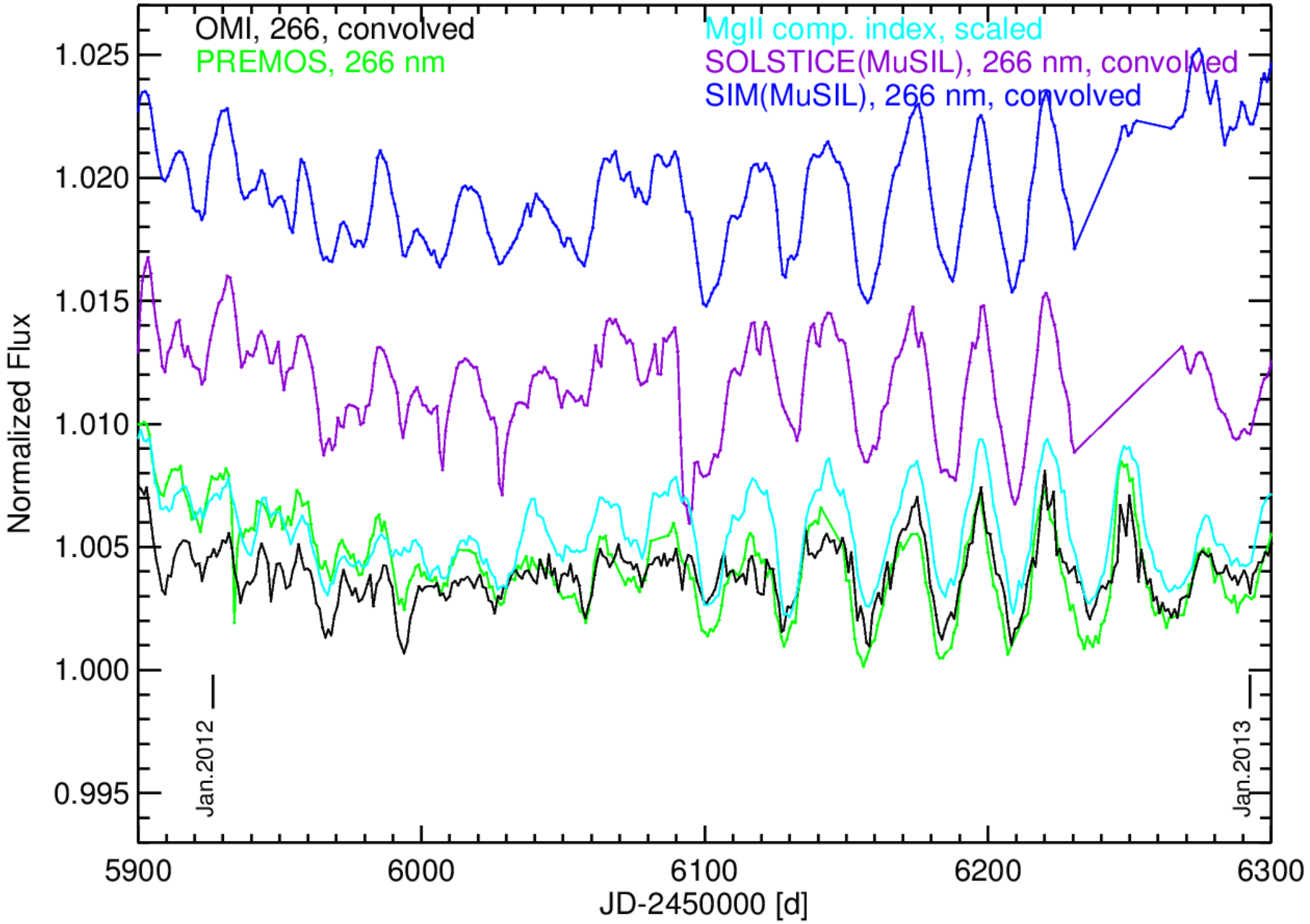

Normalized SSIs
H2 (?)
0.25%
0.10%
-0.05%
y2017.0
2015.0
2013.0
2011.0
2009.0
y2007.0
Time
360
400
440
480
Wavelength, nm
Hβ

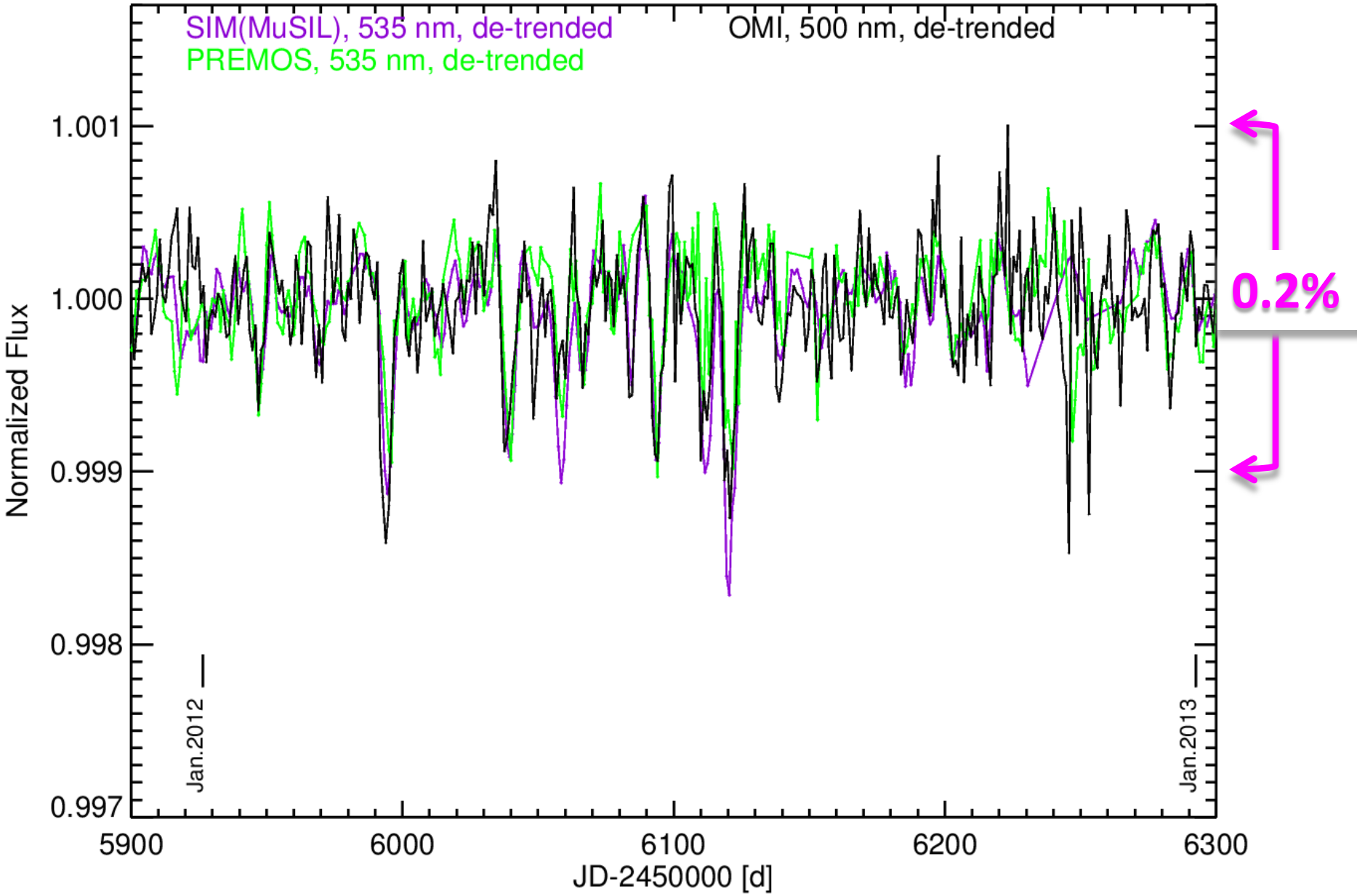

SSI_max-SSI_min
OMI, Cycle 24
Cycles 21-22
H2 (?)
Hβ
Normalized SSI_max - SSI_min
Wavelength, nm
0.010
0.008
0.006
0.004
0.002
0.000
300
350
400
450
500

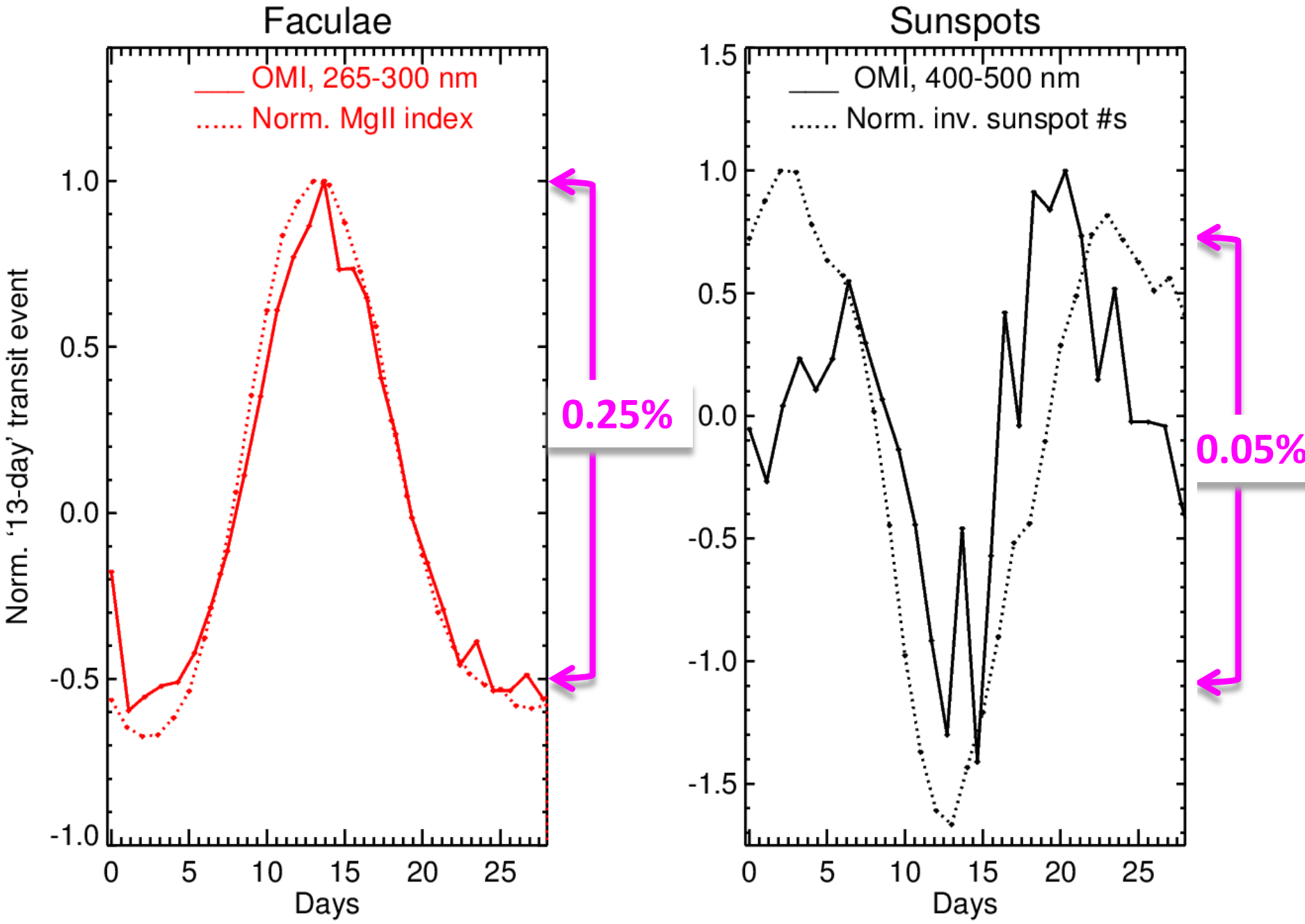

OMI, 265-300 nm
SIM(MuSIL), 265-300 nm
SOLSTICE(MuSIL), 265-300 nm
Normalized Flux
1.020
1.015
1.010
1.005
1.000
0.995
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
Jan.2018
4000
5000
6000
7000
8000
JD-2450000 [d]

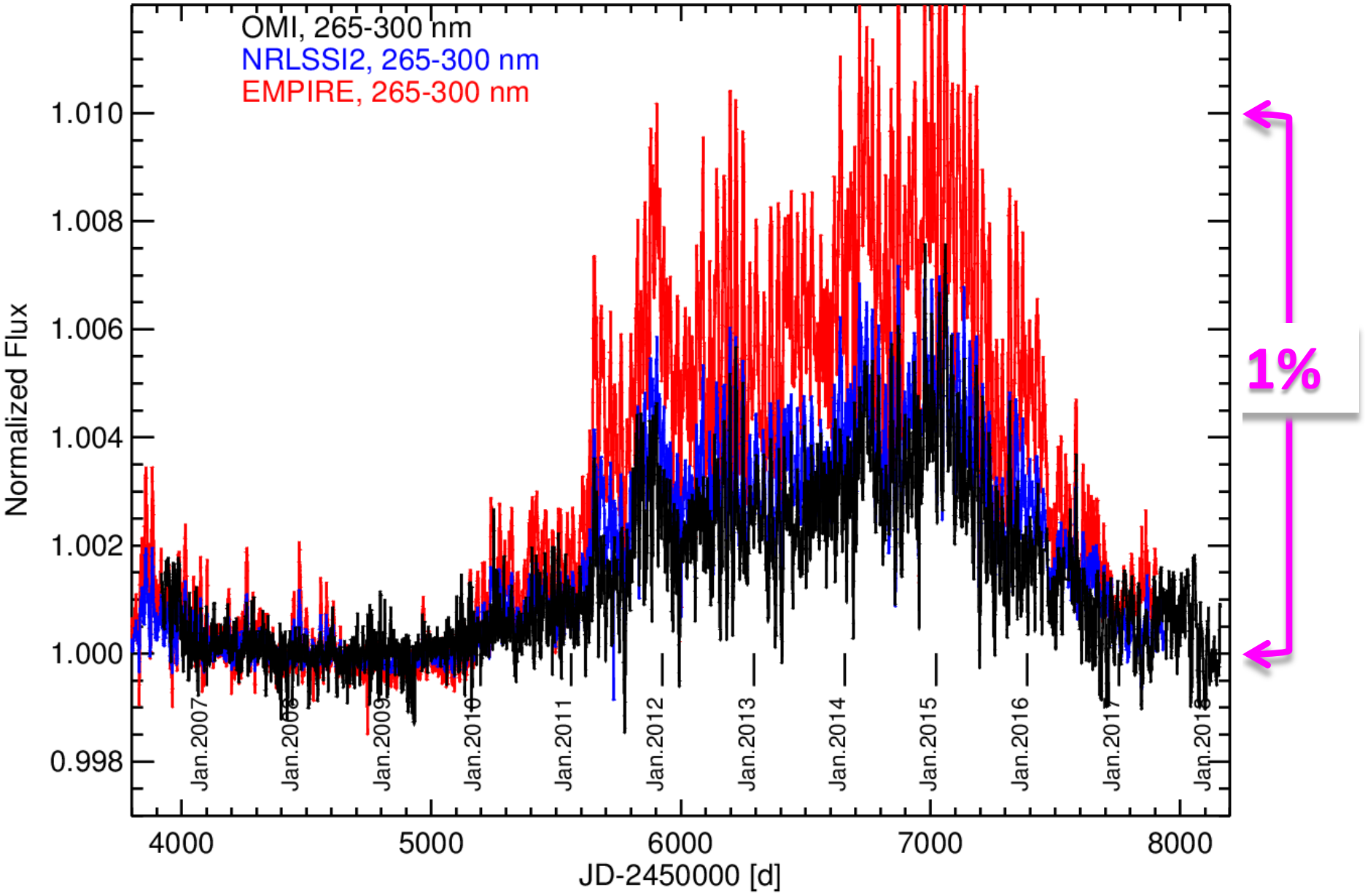

OMI, 300-400 nm
SIM(MuSIL), 300-400 nm
Normalized Flux
1.005
1.000
0.995
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
Jan.2018
4000
5000
6000
7000
8000
JD-2450000 [d]

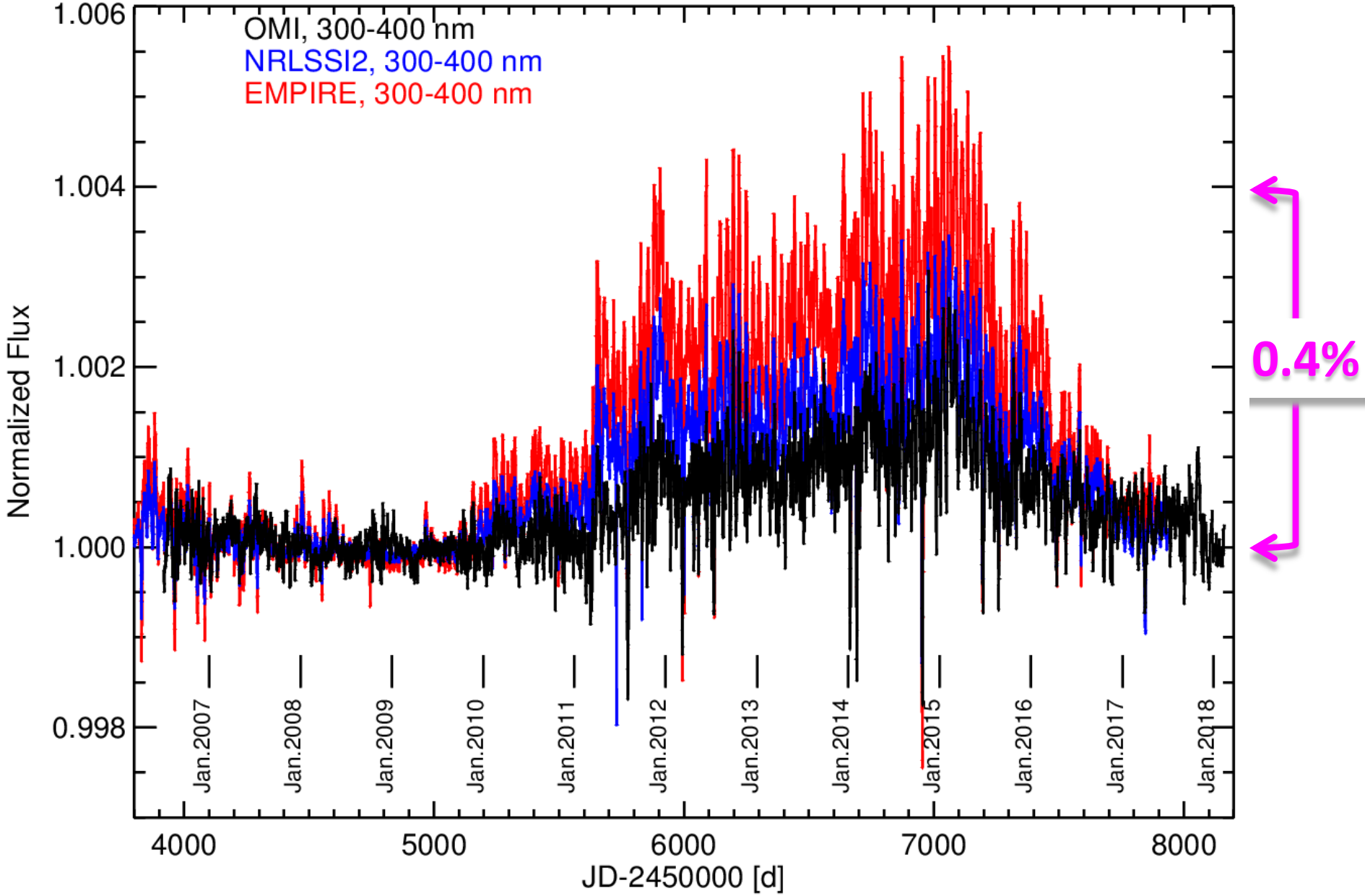

OMI, 400-500 nm
SIM(MuSIL), 400-500 nm
Normalized Flux
1.002
1.000
0.998
0.996
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
Jan.2018
4000
5000
6000
7000
8000
JD-2450000 [d]

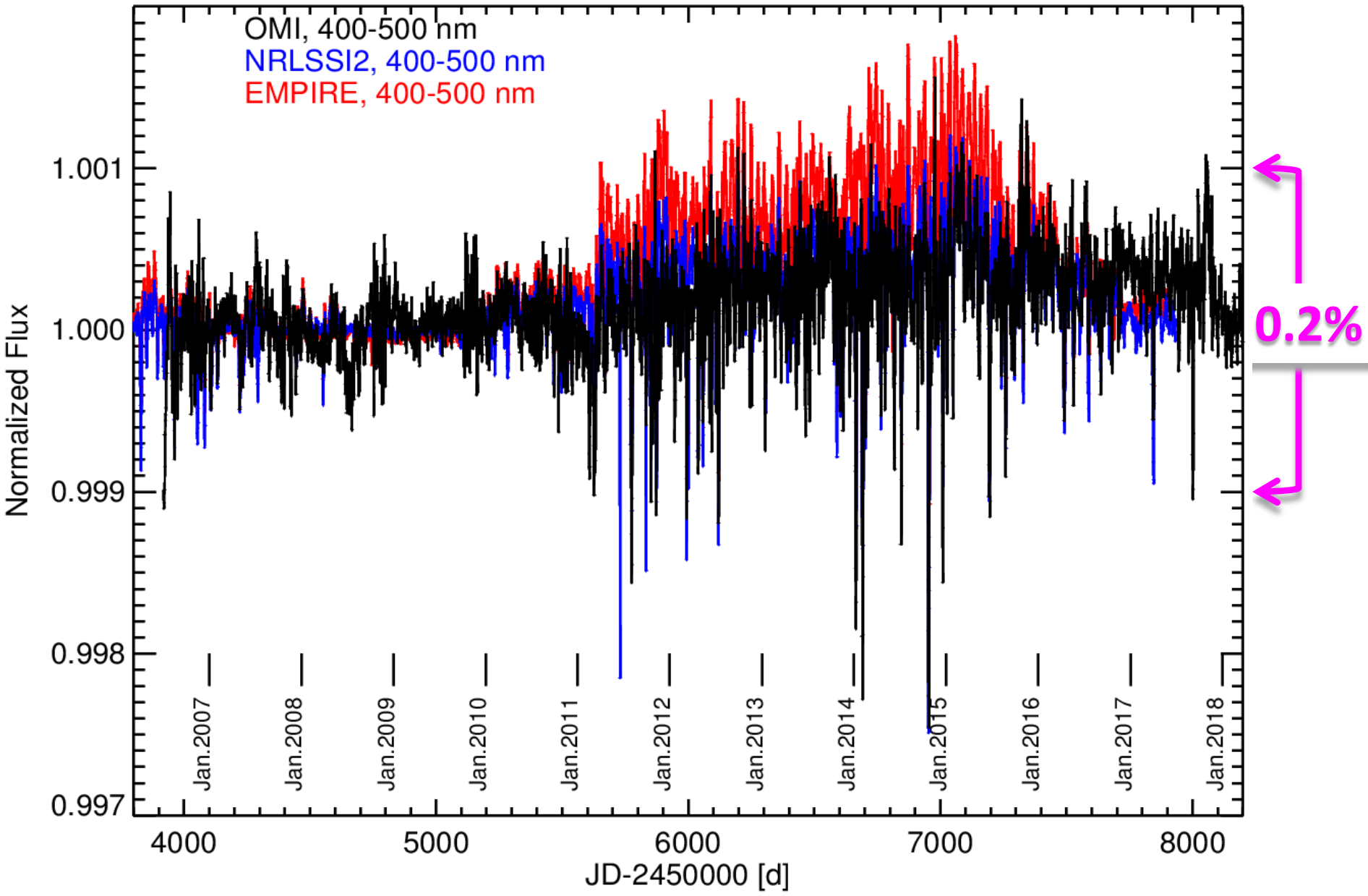

OMI, 266, convolved
PREMOS, 266 nm
MgII comp. index, scaled
SOLSTICE(MuSIL), 266 nm, convolved
SIM(MuSIL), 266 nm, convolved
Normalized Flux
1.025
1.020
1.015
1.010
1.005
1.000
0.995
Jan.2012
Jan.2013
5900
6000
6100
6200
6300
JD-2450000 [d]

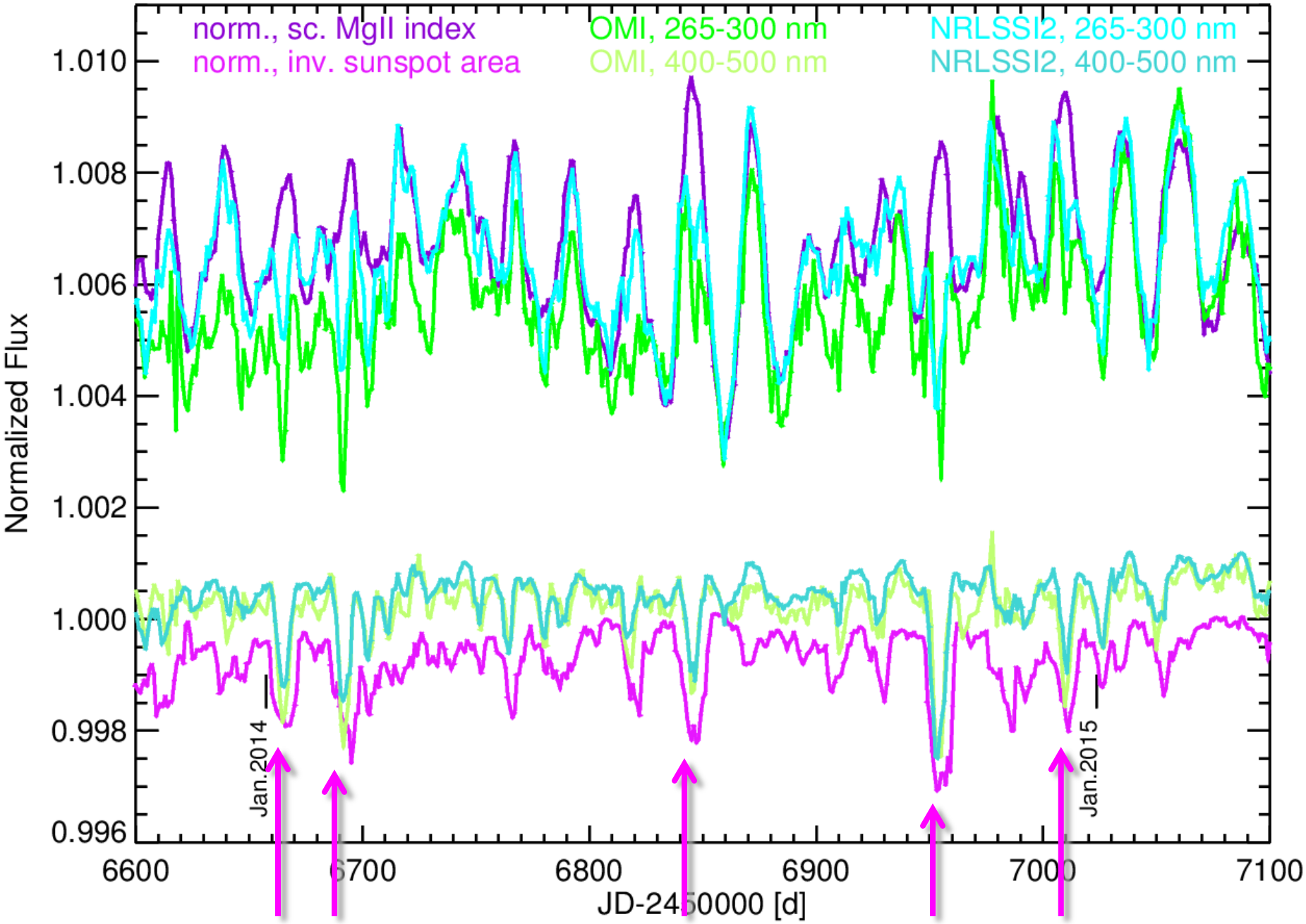

SIM(MuSIL), 535 nm, de-trended
PREMOS, 535 nm, de-trended
OMI, 500 nm, de-trended
1.001
1.000
0.999
0.998
0.997
Normalized Flux
0.2%
Jan.2012
Jan.2013
5900
6000
6100
6200
6300
JD-2450000 [d]


Faculae
OMI, 265-300 nm
Norm. MgII index
Norm. '13-day' transit event
1.0
0.5
0.0
-0.5
-1.0
0
5
10
15
20
25
Days
0.25%
Sunspots
OMI, 400-500 nm
Norm. inv. sunspot #s
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
0
5
10
15
20
25
Days
0.05%


OMI, 265-300 nm
NRLSSI2, 265-300 nm
EMPIRE, 265-300 nm
Normalized Flux
1.010
1.008
1.006
1.004
1.002
1.000
0.998
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
Jan.2018
4000
5000
6000
7000
8000
JD-2450000 [d]
1%


OMI, 300-400 nm
NRLSSI2, 300-400 nm
EMPIRE, 300-400 nm
Normalized Flux
1.006
1.004
1.002
1.000
0.998
4000
5000
6000
7000
8000
JD-2450000 [d]
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
Jan.2018
0.4%


OMI, 400-500 nm
NRLSSI2, 400-500 nm
EMPIRE, 400-500 nm
Normalized Flux
1.001
1.000
0.999
0.998
0.997
0.2%
Jan.2007
Jan.2008
Jan.2009
Jan.2010
Jan.2011
Jan.2012
Jan.2013
Jan.2014
Jan.2015
Jan.2016
Jan.2017
Jan.2018
4000
5000
6000
7000
8000
JD-2450000 [d]


norm., sc. MgII index
norm., inv. sunspot area
OMI, 265-300 nm
OMI, 400-500 nm
NRLSSI2, 265-300 nm
NRLSSI2, 400-500 nm
Normalized Flux
1.010
1.008
1.006
1.004
1.002
1.000
0.998
0.996
Jan.2014
Jan.2015
6600
6700
6800
6900
7000
7100
JD-2450000 [d]

- The updated OMI MgII index is corrected by the OMI CaII H & K indices.

- The typical point-to-point uncertainties in the improved OMI SSIs are close to 0.05% (k=1), with occasional goniometry-related ~0.1% spikes:

https://sbuv2.gsfc.nasa.gov/solar/omi/