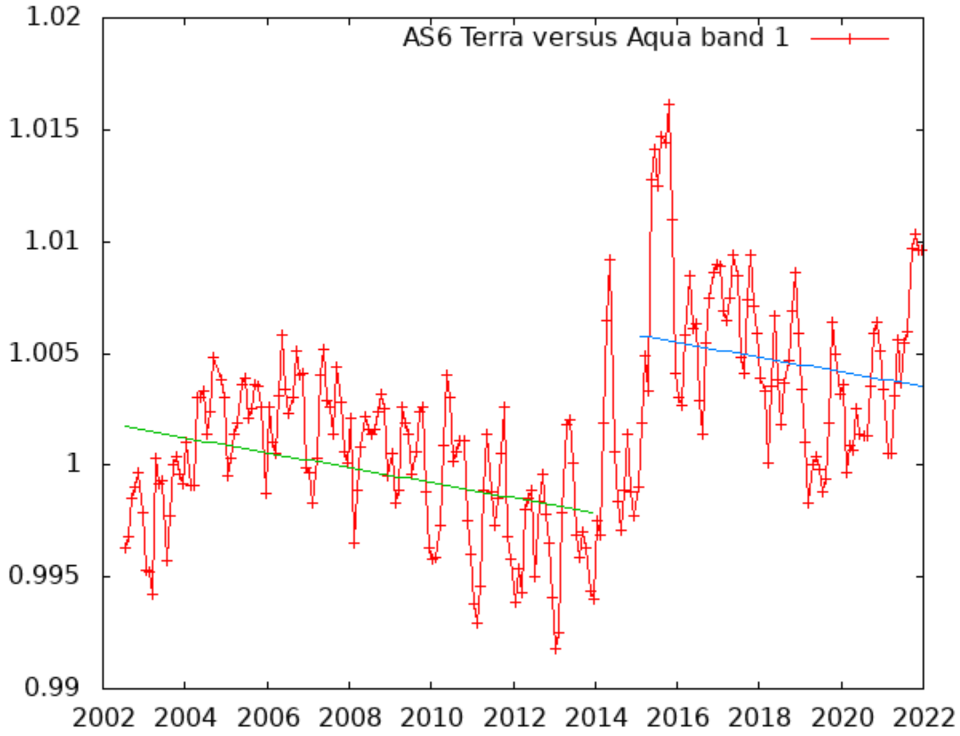
Harmonization of the calibration of MODIS and VIIRS (SNPP/NOAA-20)

Eric Vermote et al. Code 619/UMD

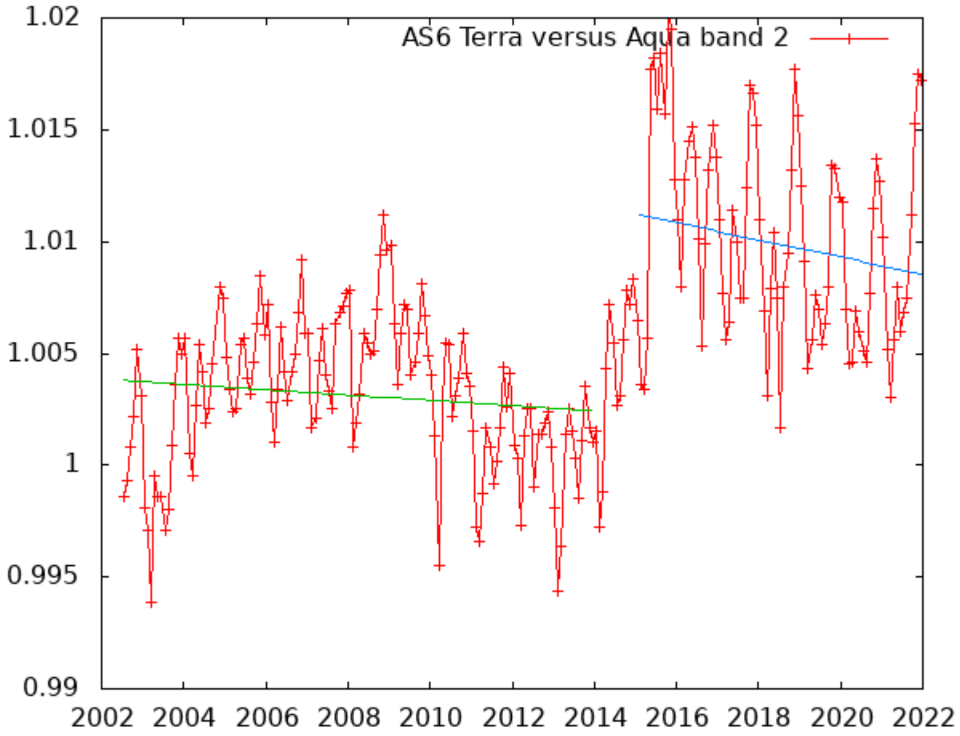
Aisheng Wu (MCST/VCST SSAI)

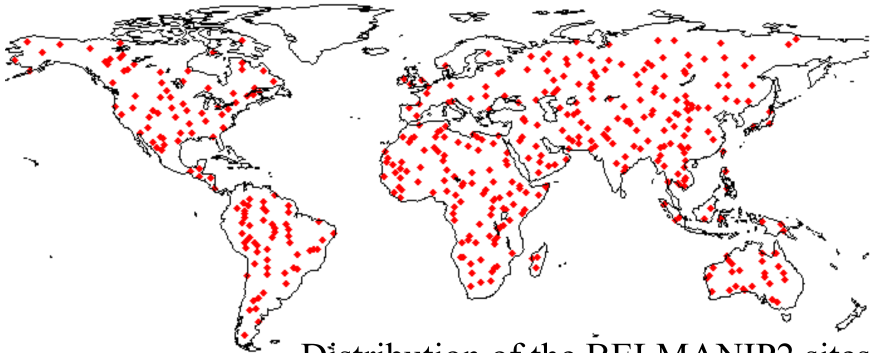
Cross-Calibration over BELMANIP Sites (Terra/Aqua AS6)

Terra vs Aqua (AS6) band 1



Terra vs Aqua (AS6) band 2

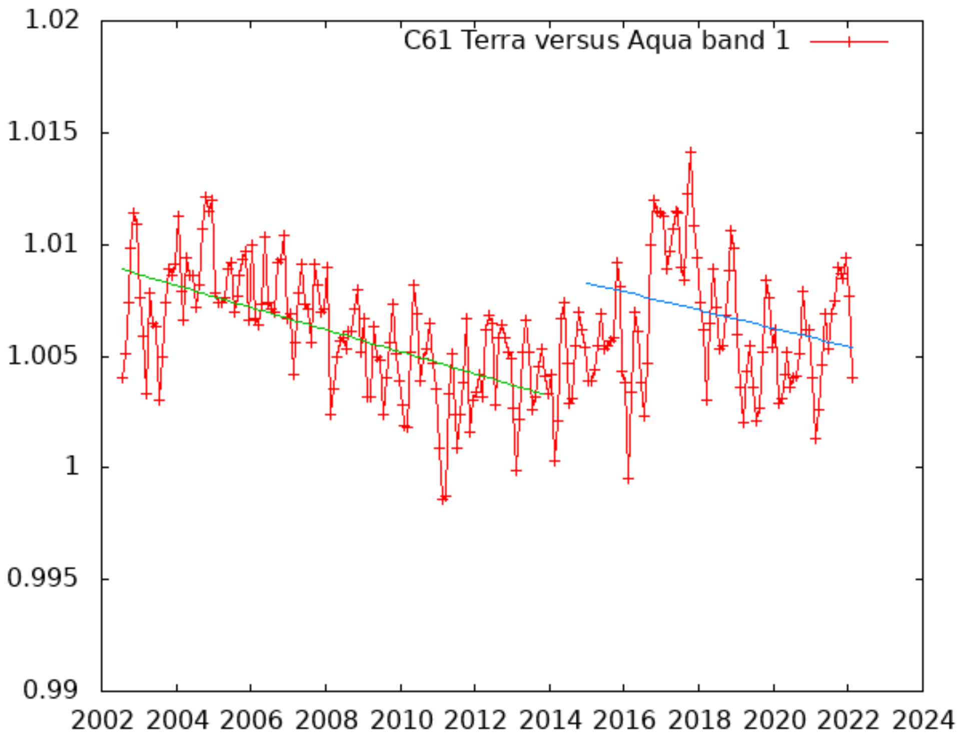




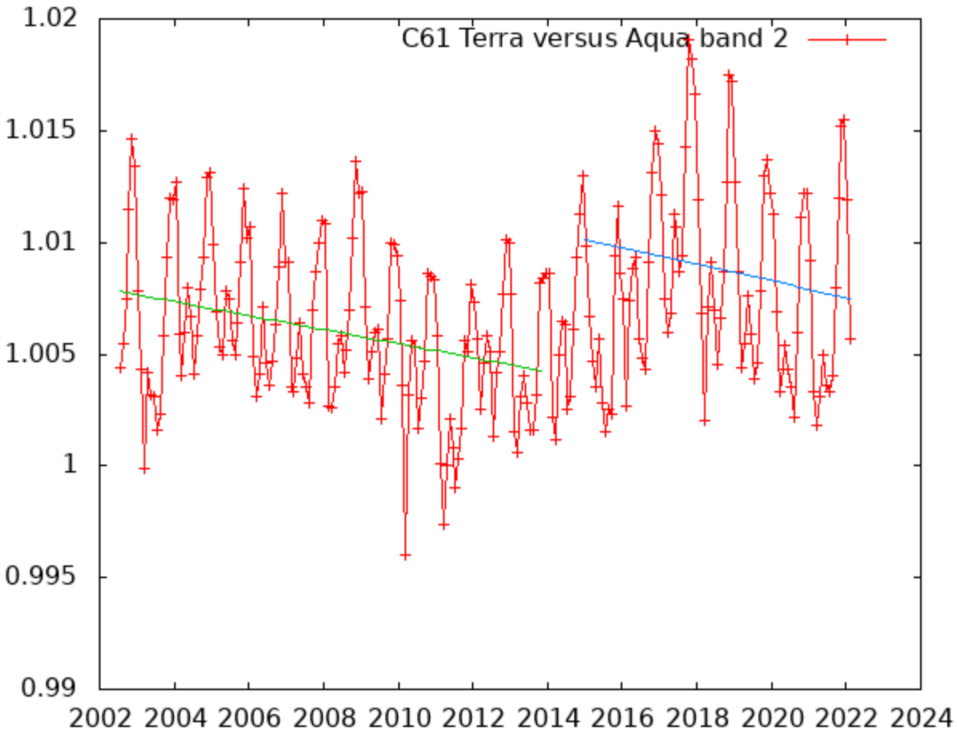
Distribution of the BELMANIP2 sites.

Cross-Calibration over BELMANIP Sites (Terra/Aqua)

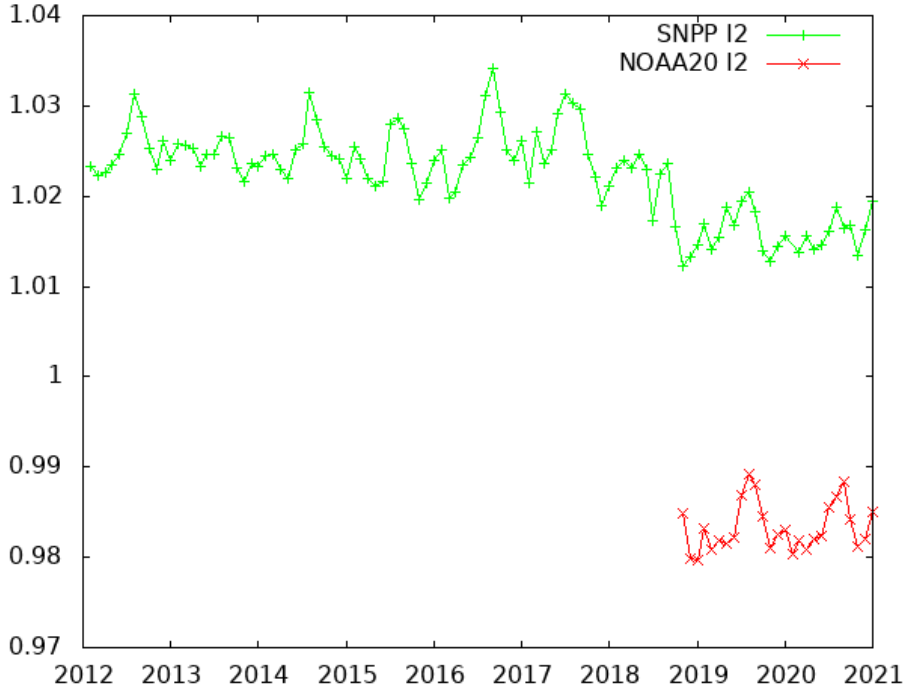
Terra vs Aqua (C6.1) band 1

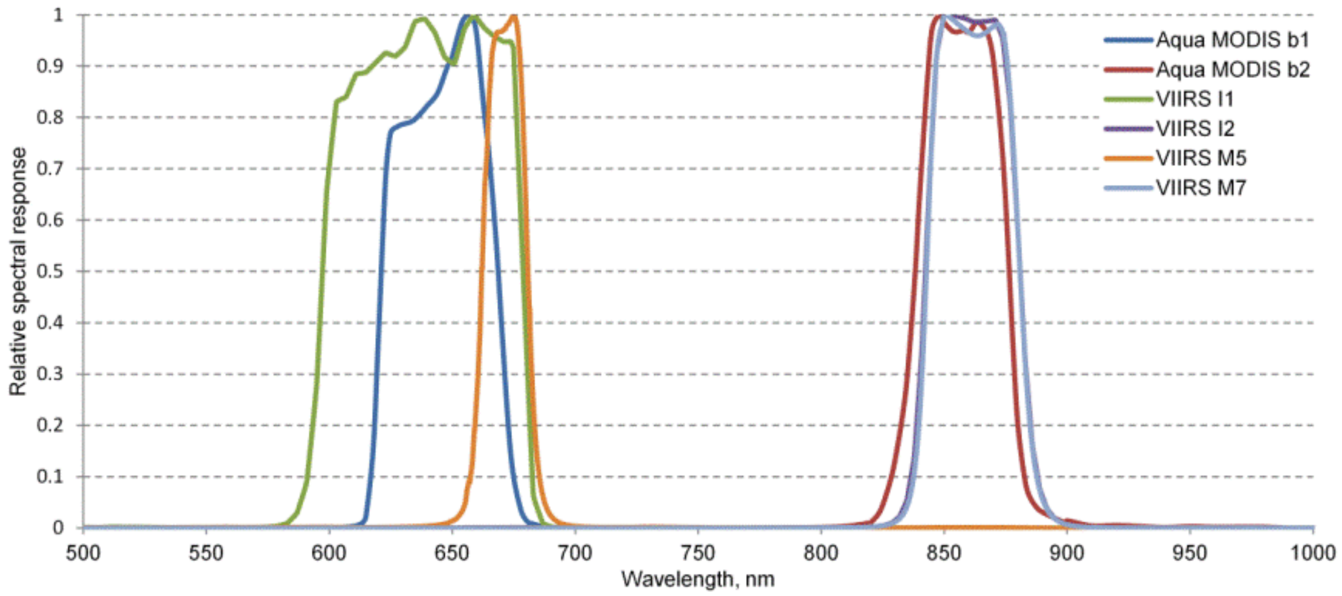


Terra vs Aqua (C6.1) band 2



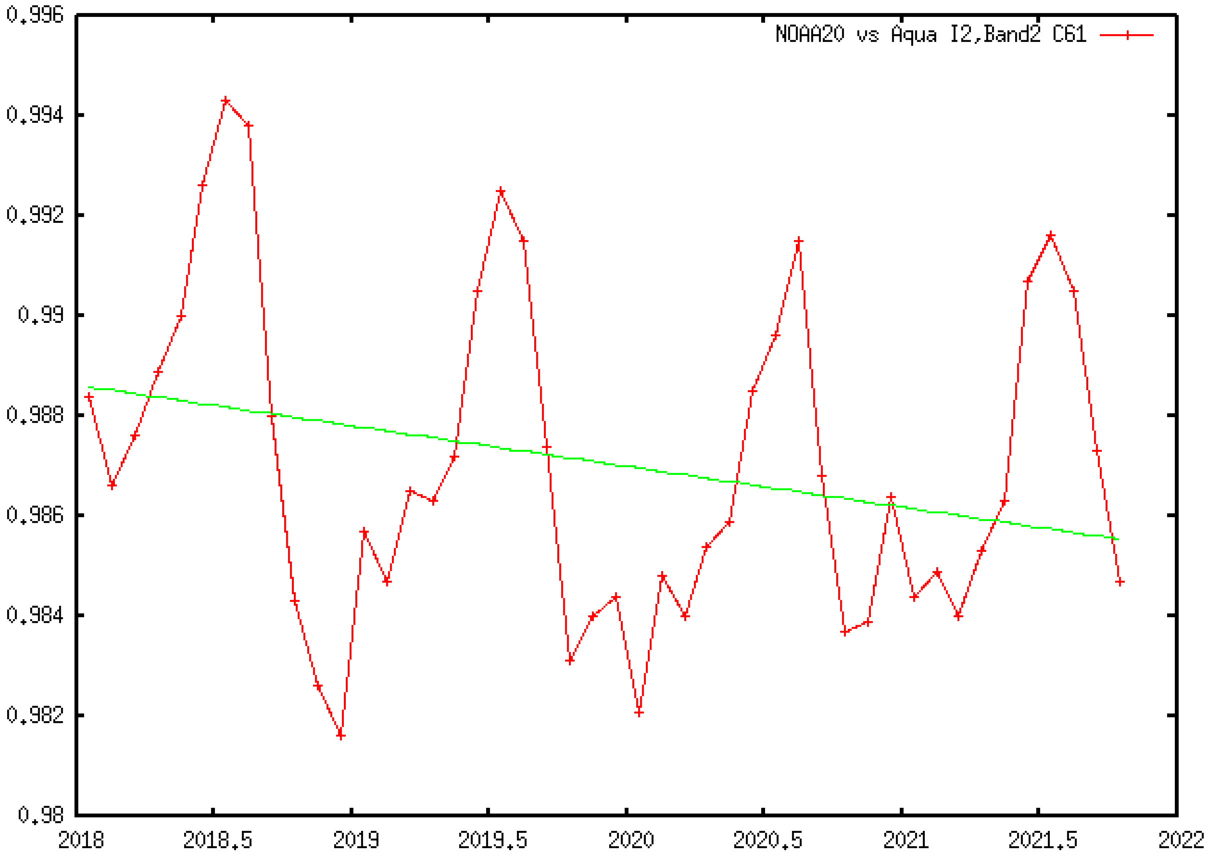
VIIRS Cross-Calibration I2/ MODIS Band 2



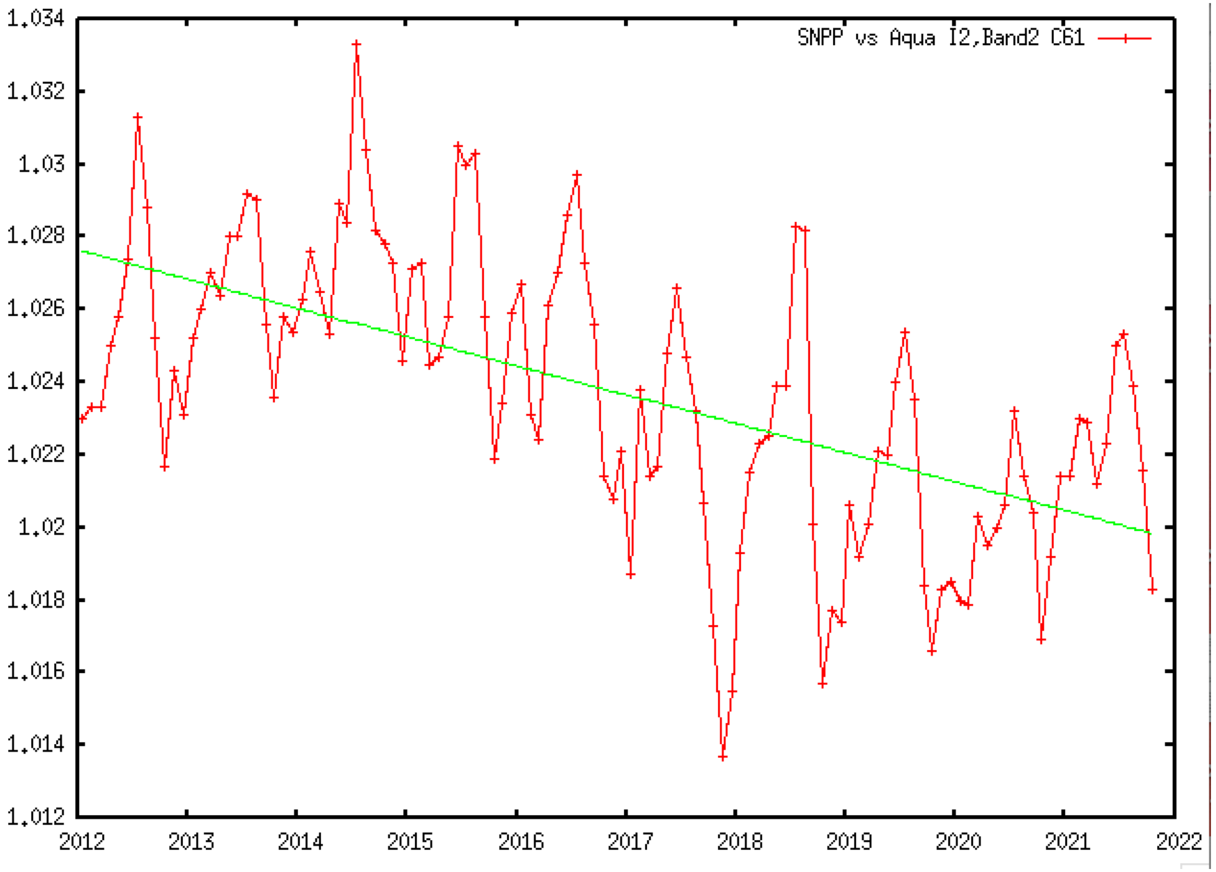


Cross-Calibration over BELMANIP Sites (VIIRS/Aqua I2)

NOAA20 vs Aqua (C6.1) I2 vs band 2

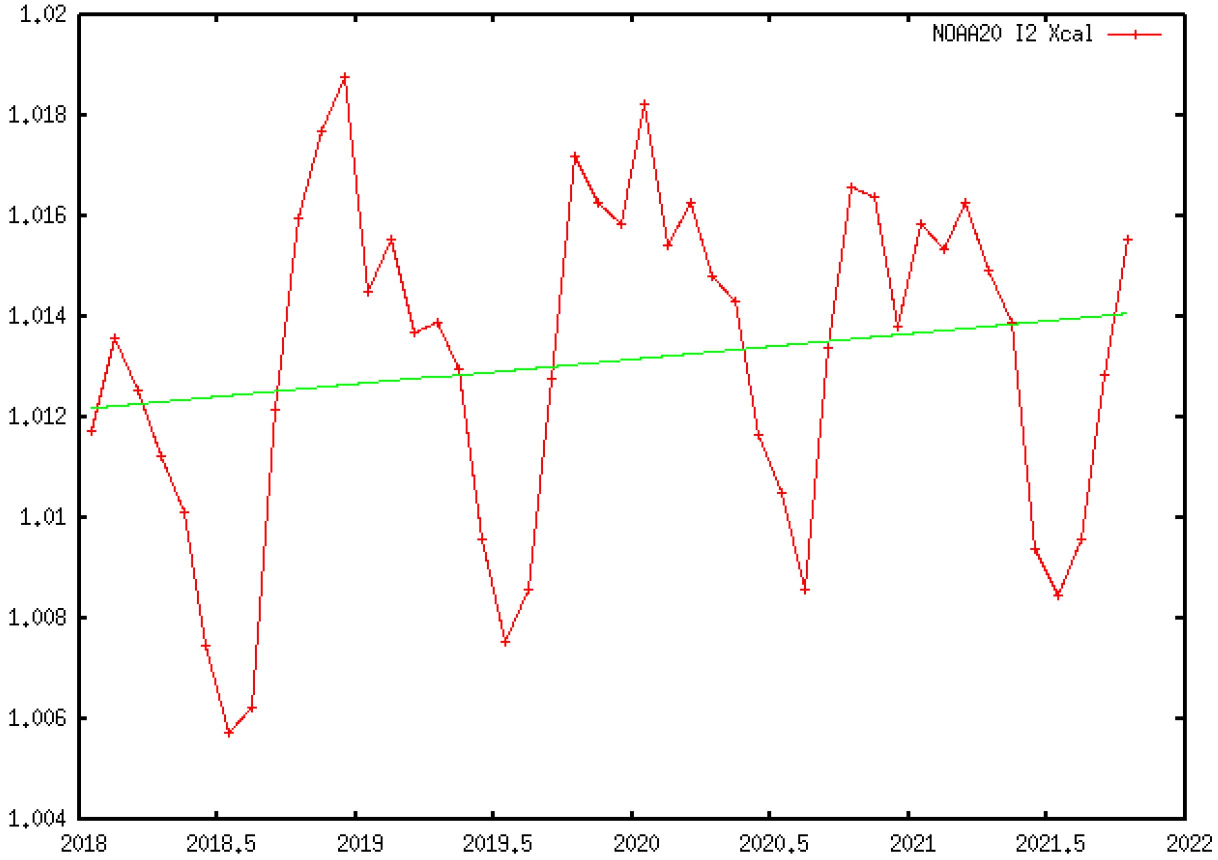


SNPP vs Aqua (C6.1) I2 vs band 2



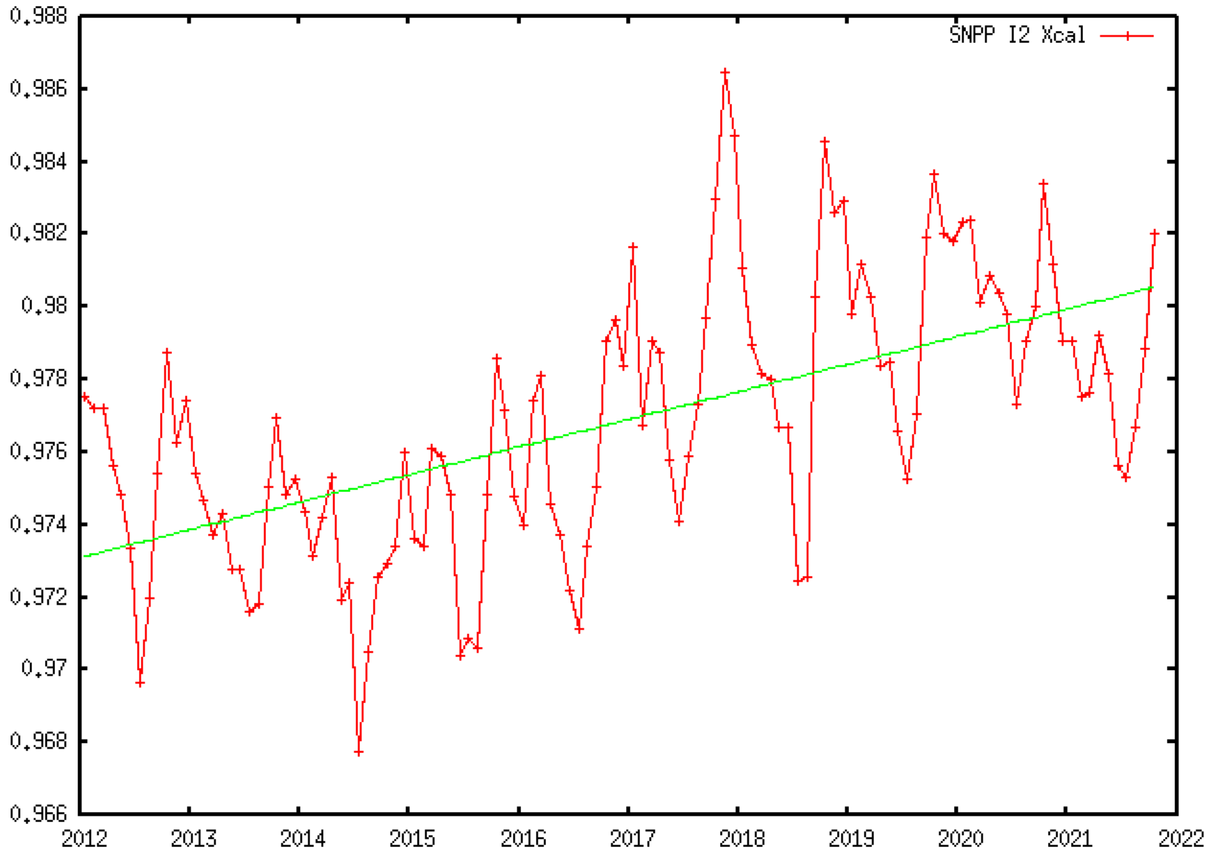
Cross-Calibration coefficients VIIRS – I2

NOAA20-I2



Xcal=1.0121+0.000514x(Year-2018)

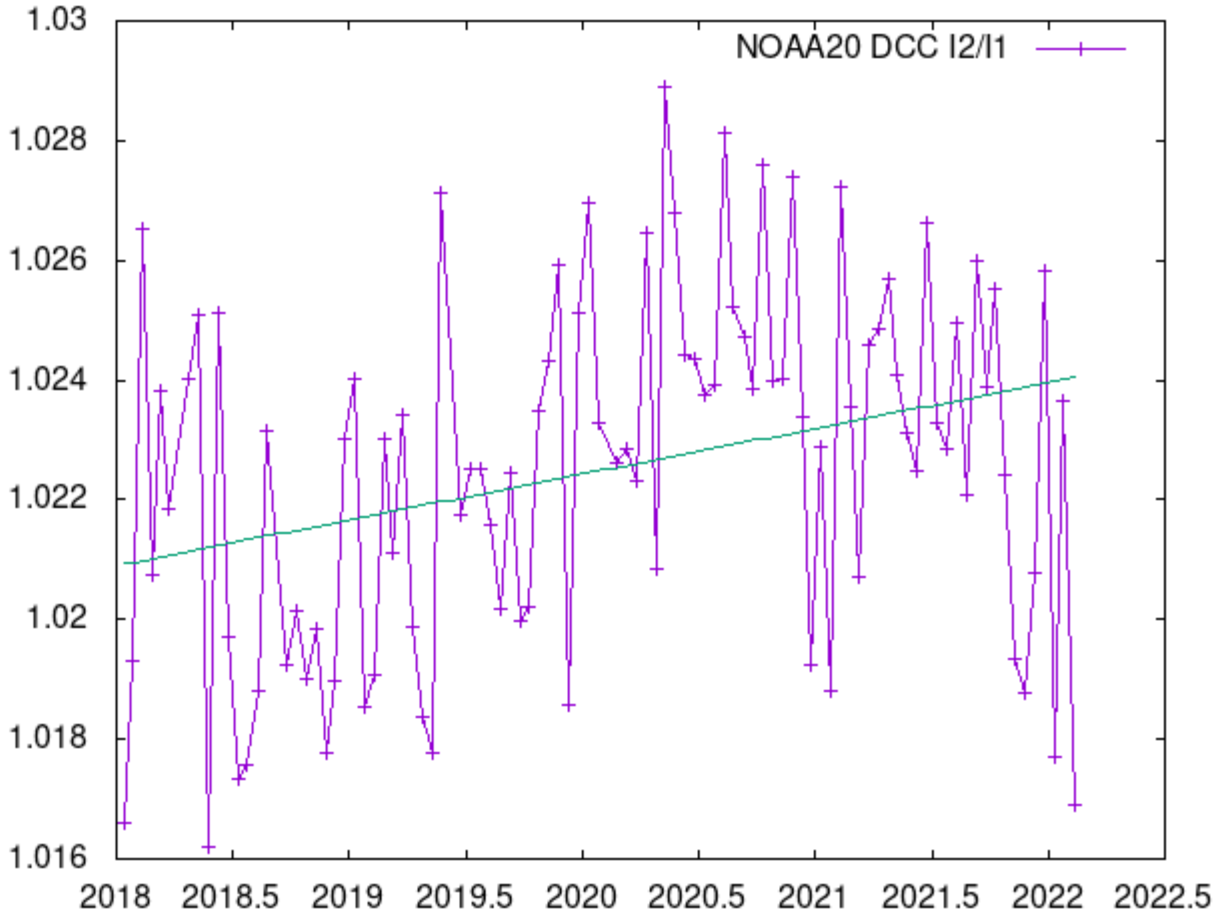
SNPP-I2



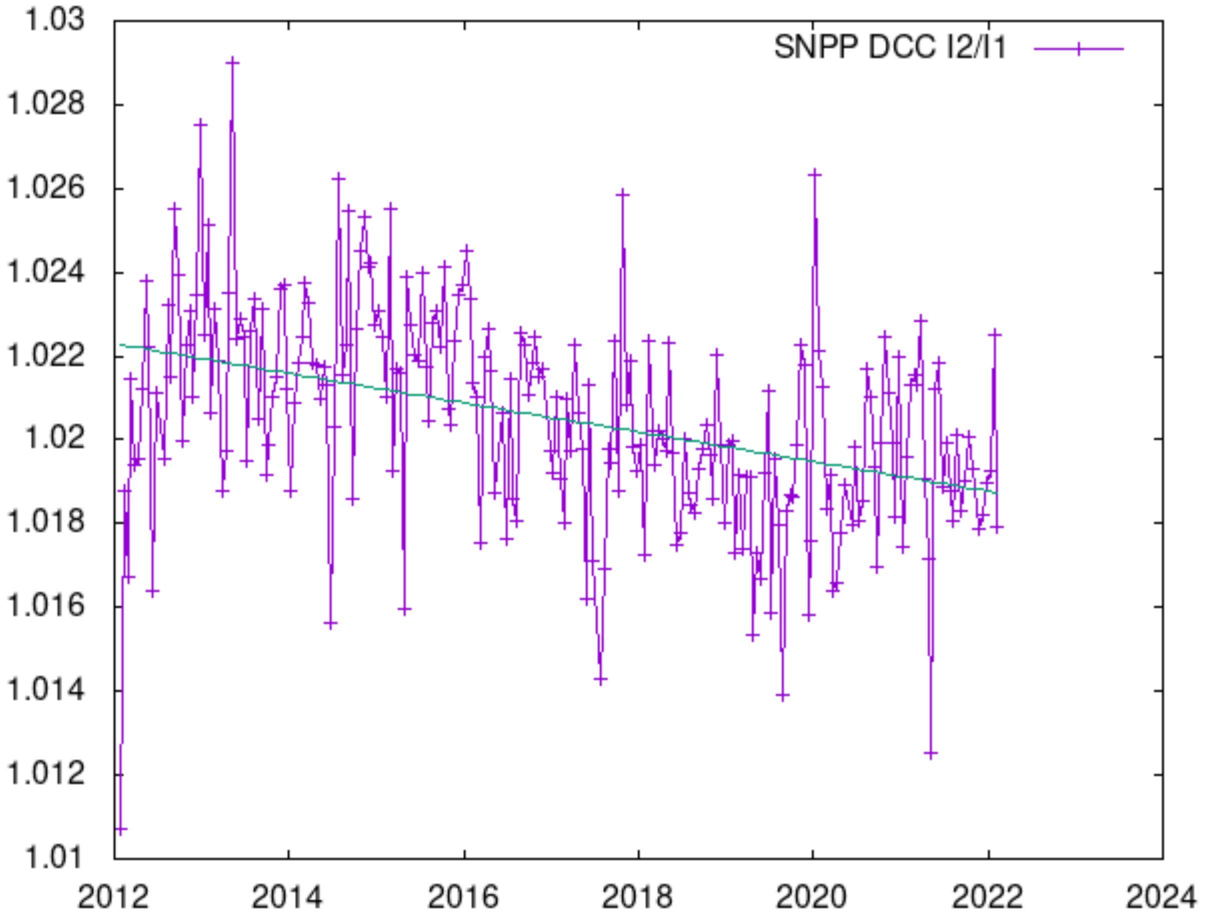
Xcal=0.9731+0.000760x(Year-2012)

Ratio over Deep Convective Clouds (VIIRS I2/I1)

NOAA20 DCC I2/I1

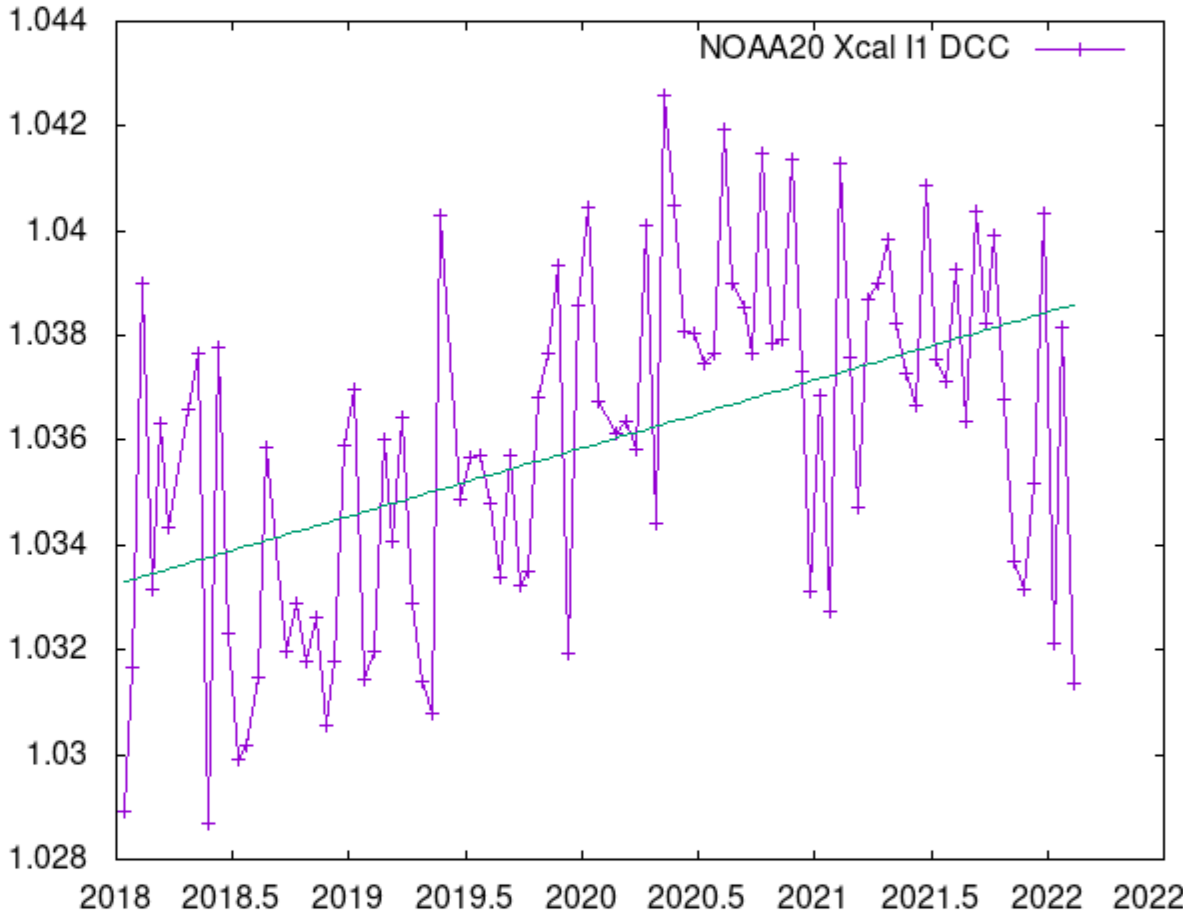


SNPP DCC I2/I1



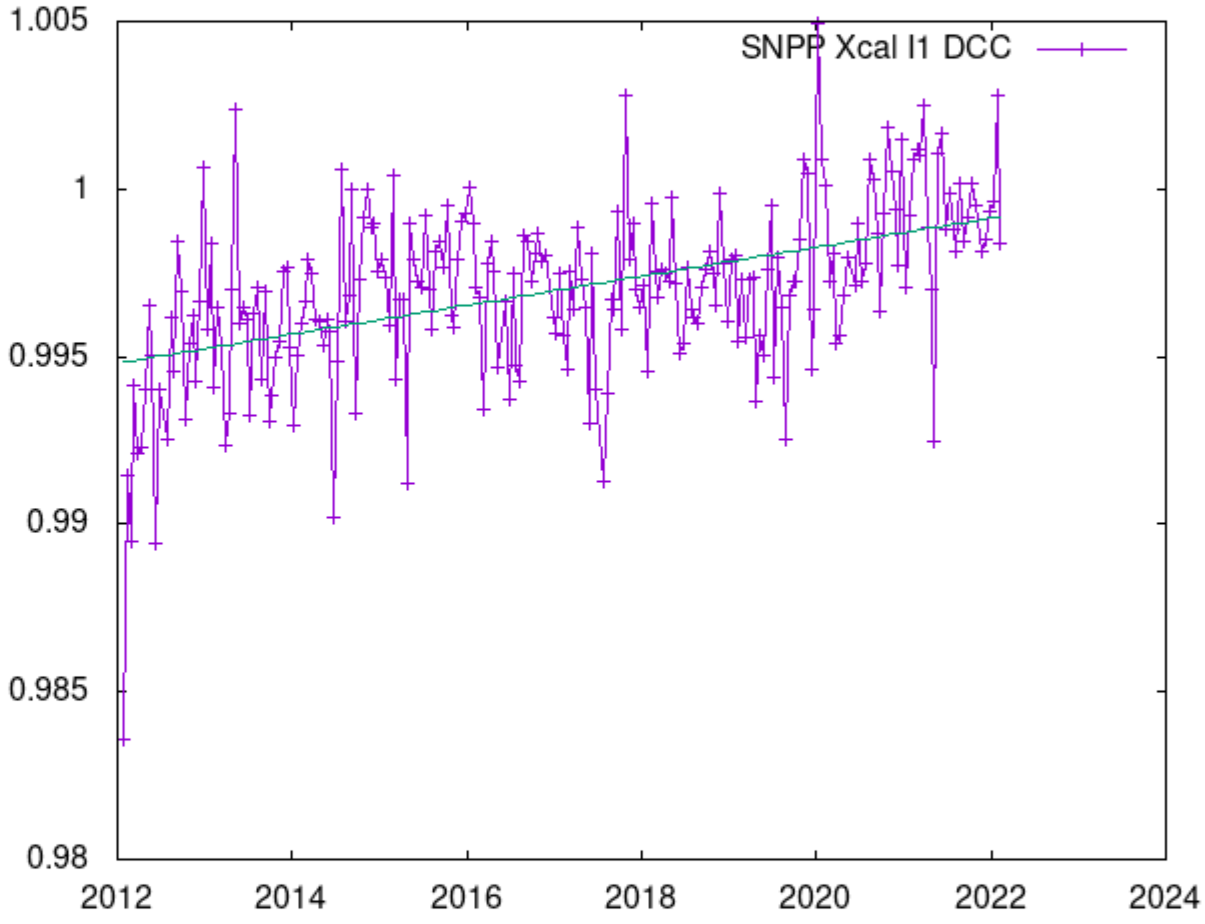
Cross Calibration coefficient Deep Convective Clouds (VIIRS I1)

NOAA20 I1



Xcal=1.0333+0.001299x(Year-2018)

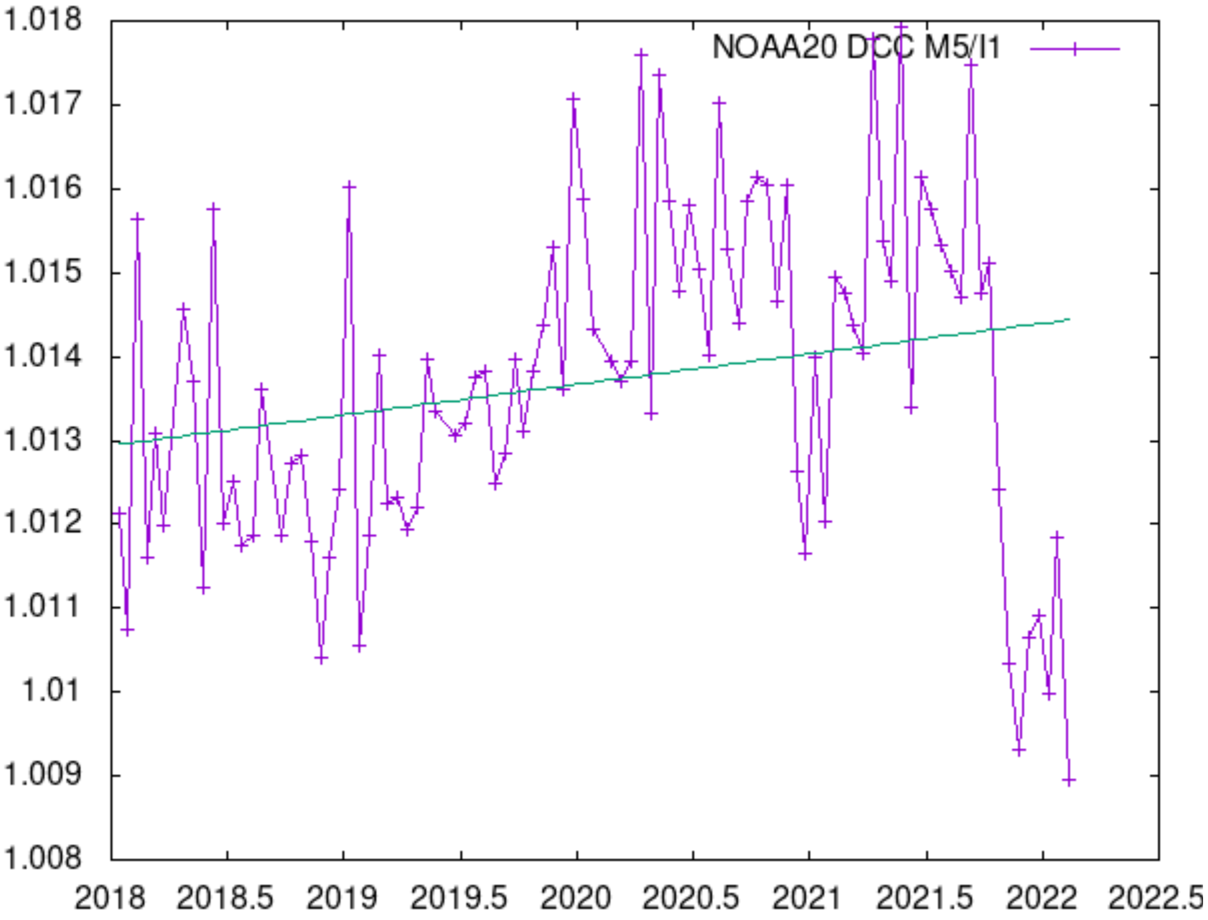
SNPP I1



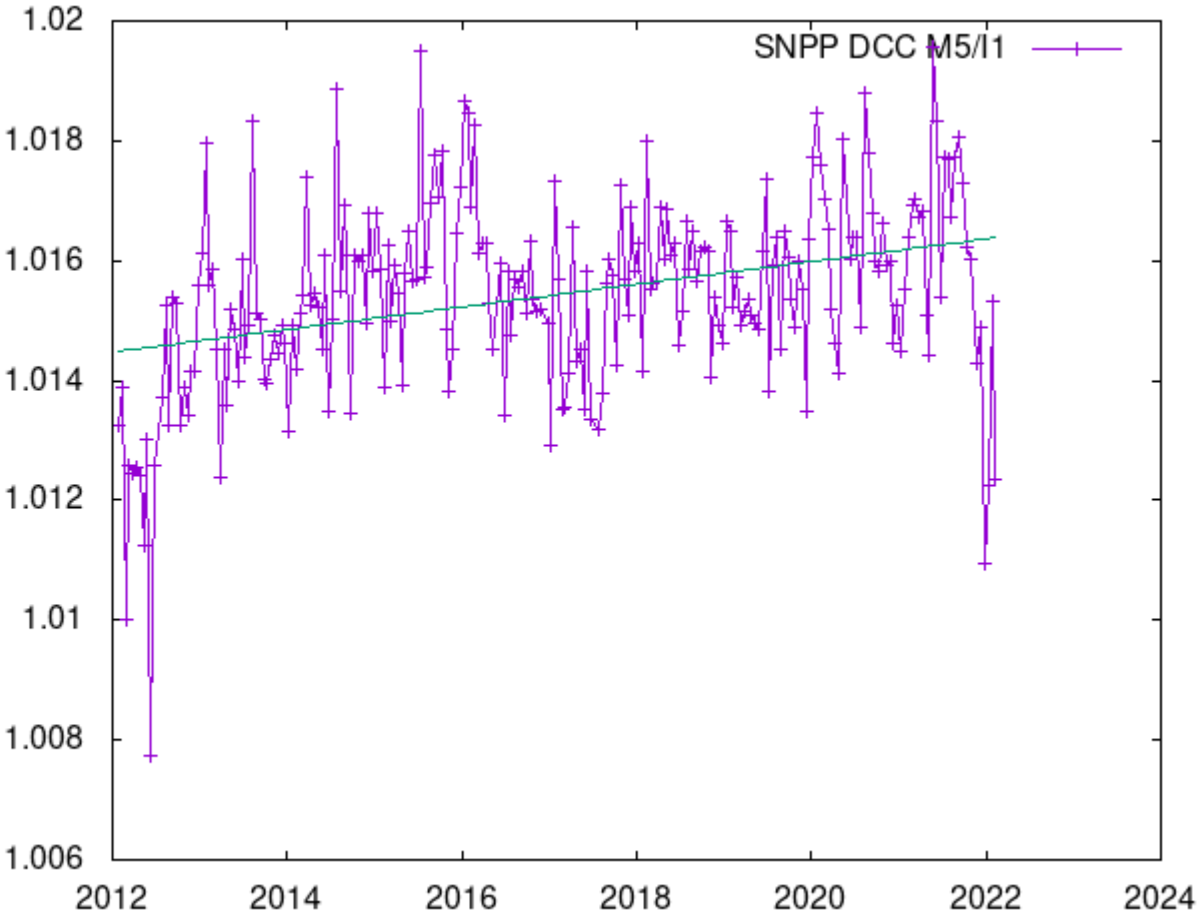
Xcal=0.9948+0.000433x(Year-2012)

Ratio over Deep Convective Clouds (VIIRS M5/I1)

NOAA20 DCC M5/I1

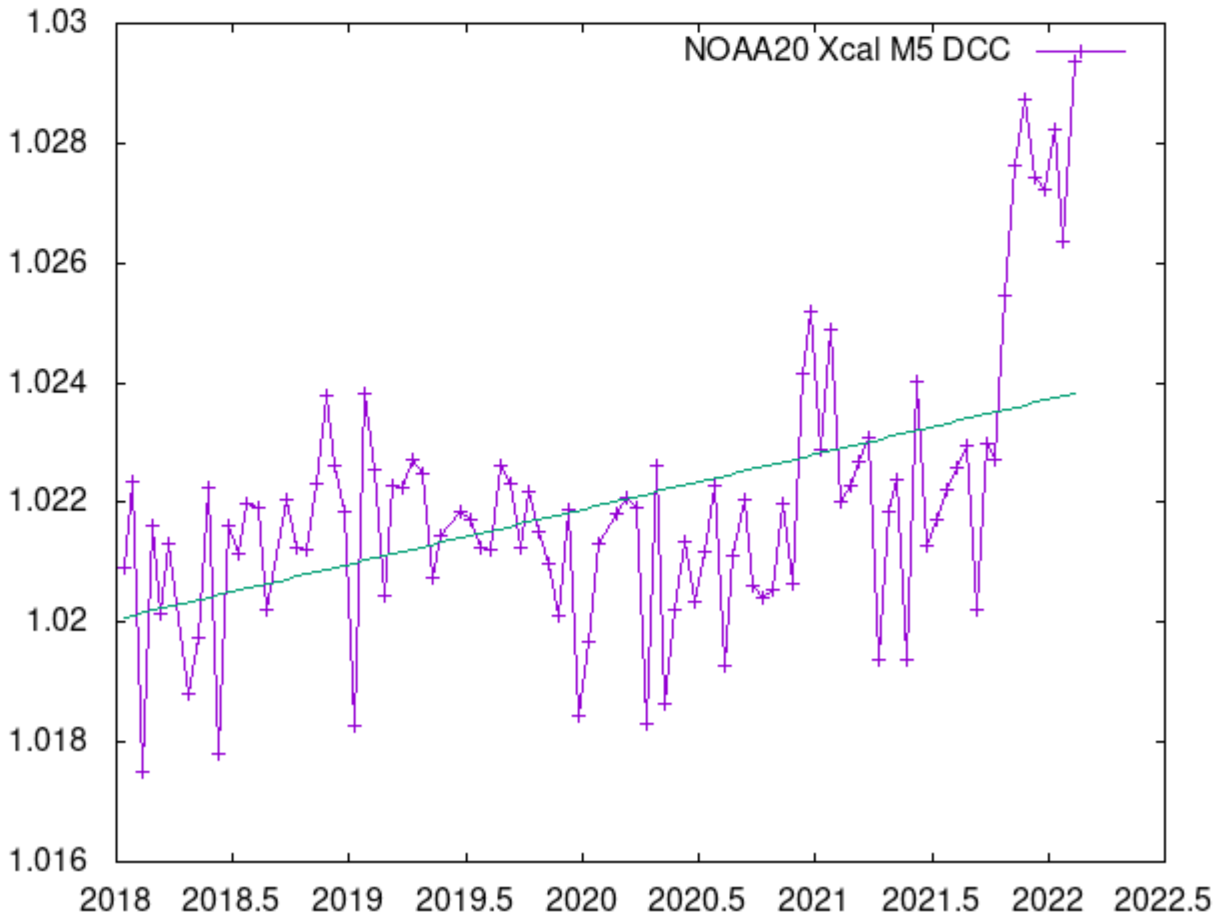


SNPP DCC M5/I1



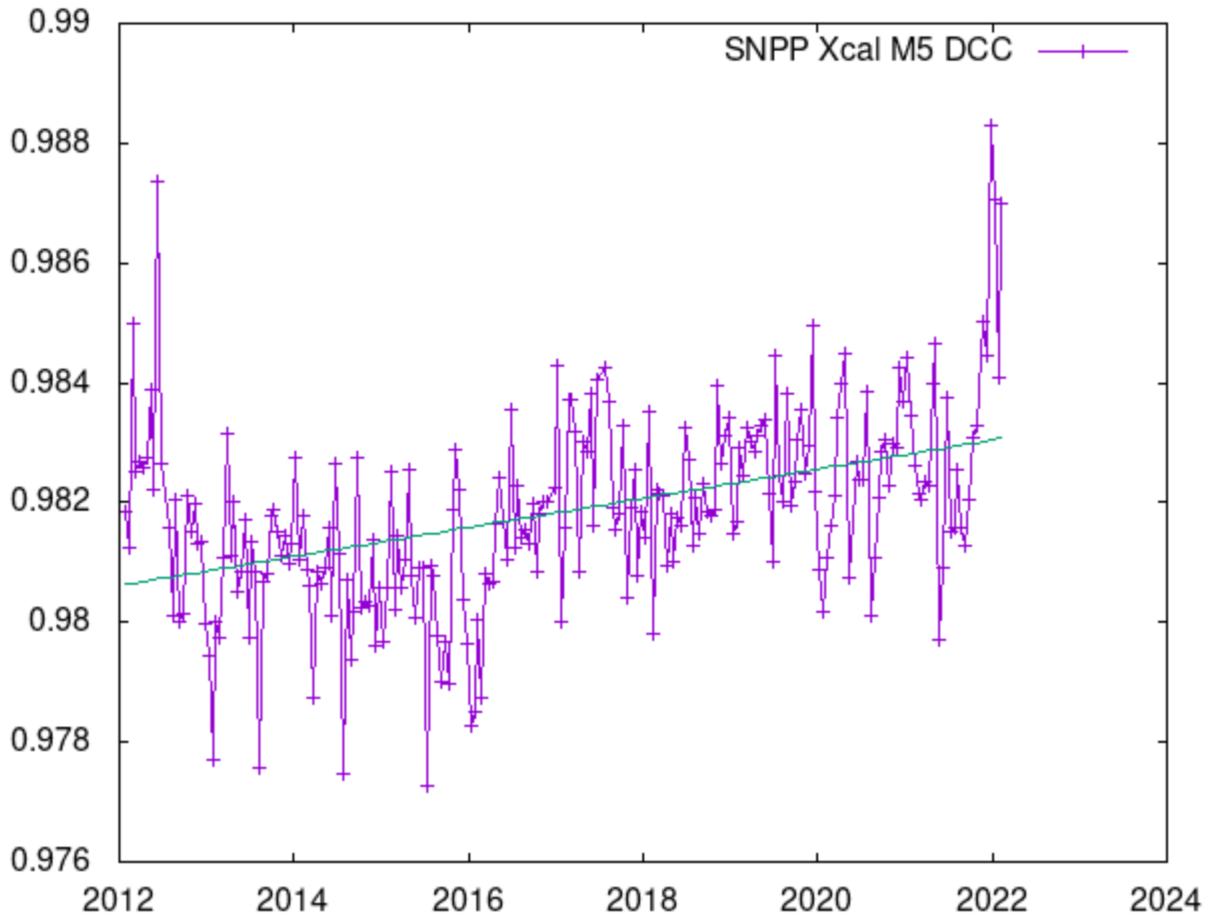
Cross Calibration coefficient Deep Convective Clouds (VIIRS M5)

NOAA20 M5



Xcal= 1.0201+0.000917x(Year-2018)

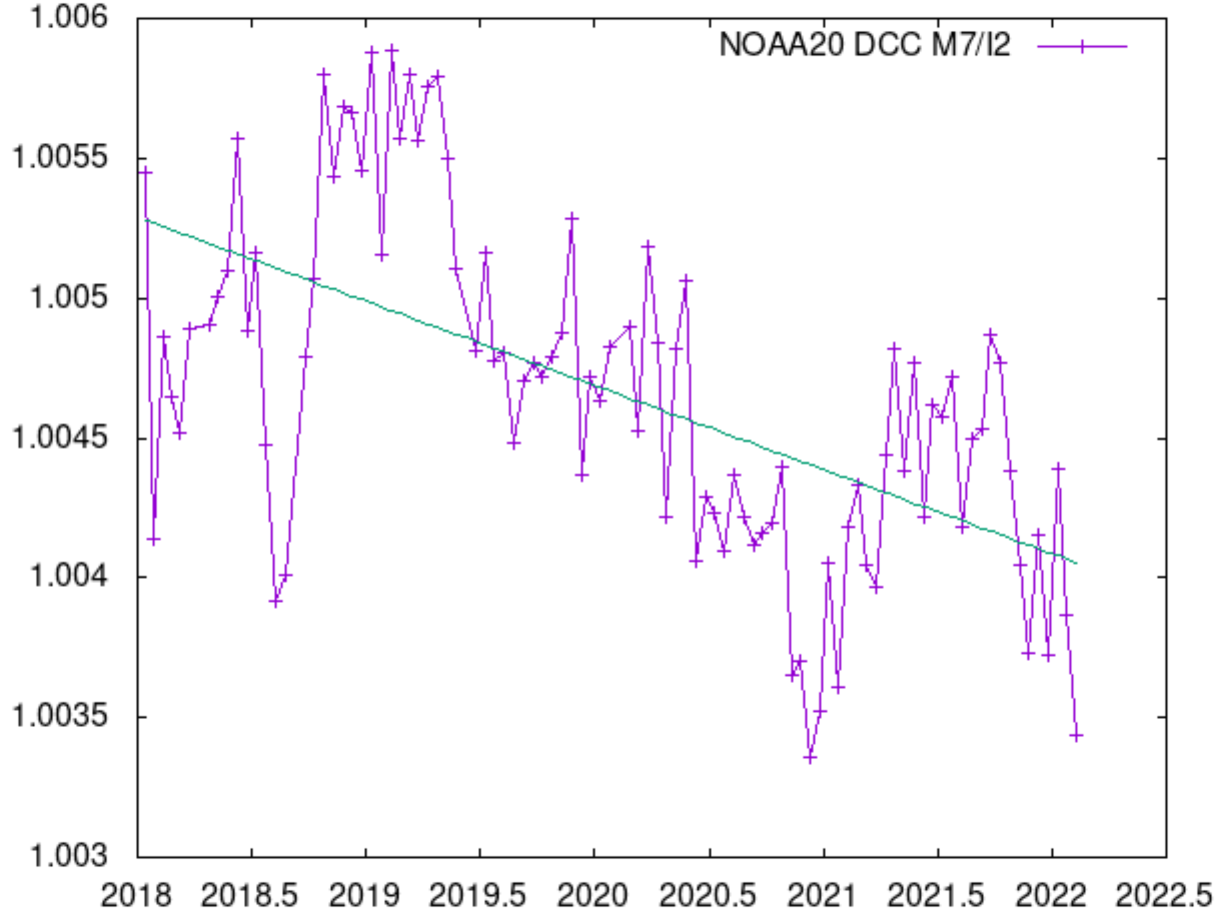
SNPP M5



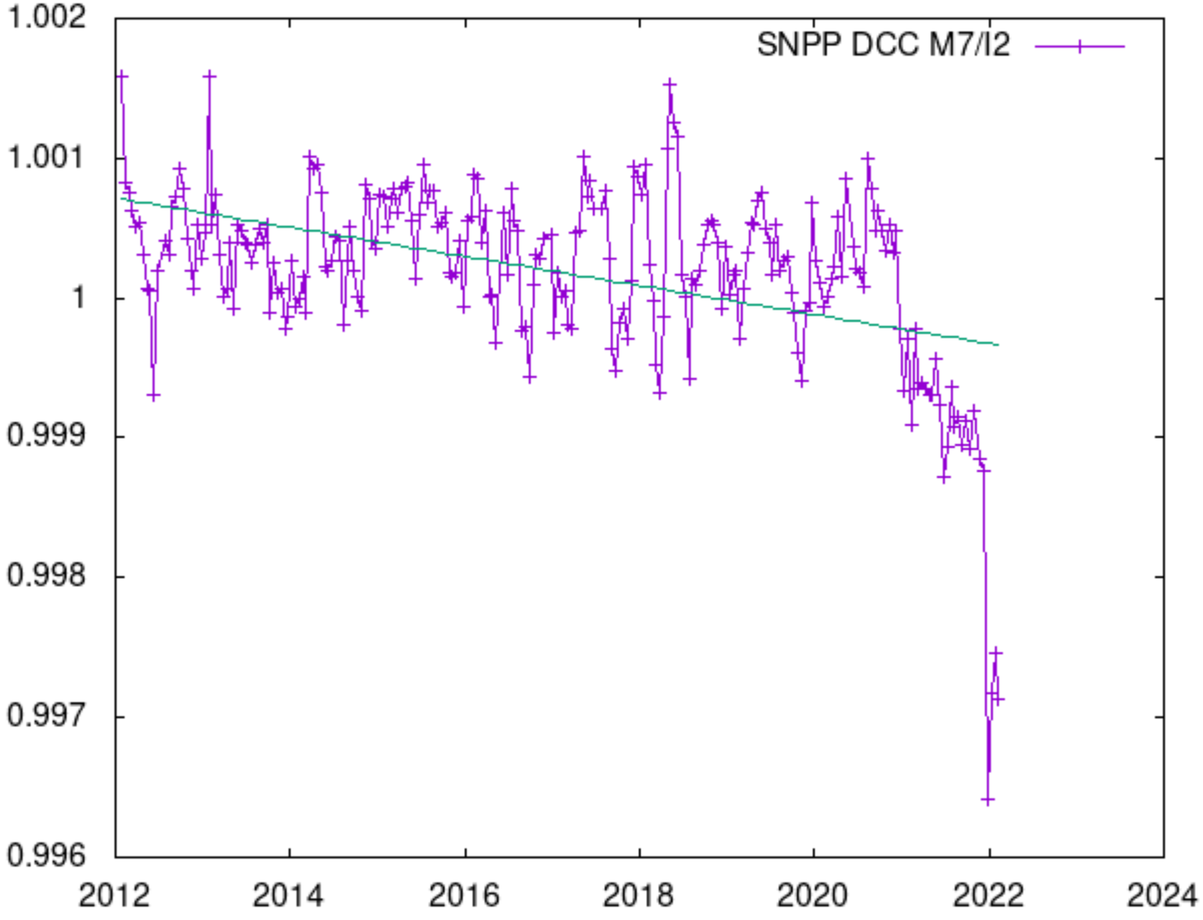
Xcal=0.9806+0.000243x(Year-2012)

Ratio over Deep Convective Clouds (VIIRS M7/I2)

NOAA20 DCC M7/I2

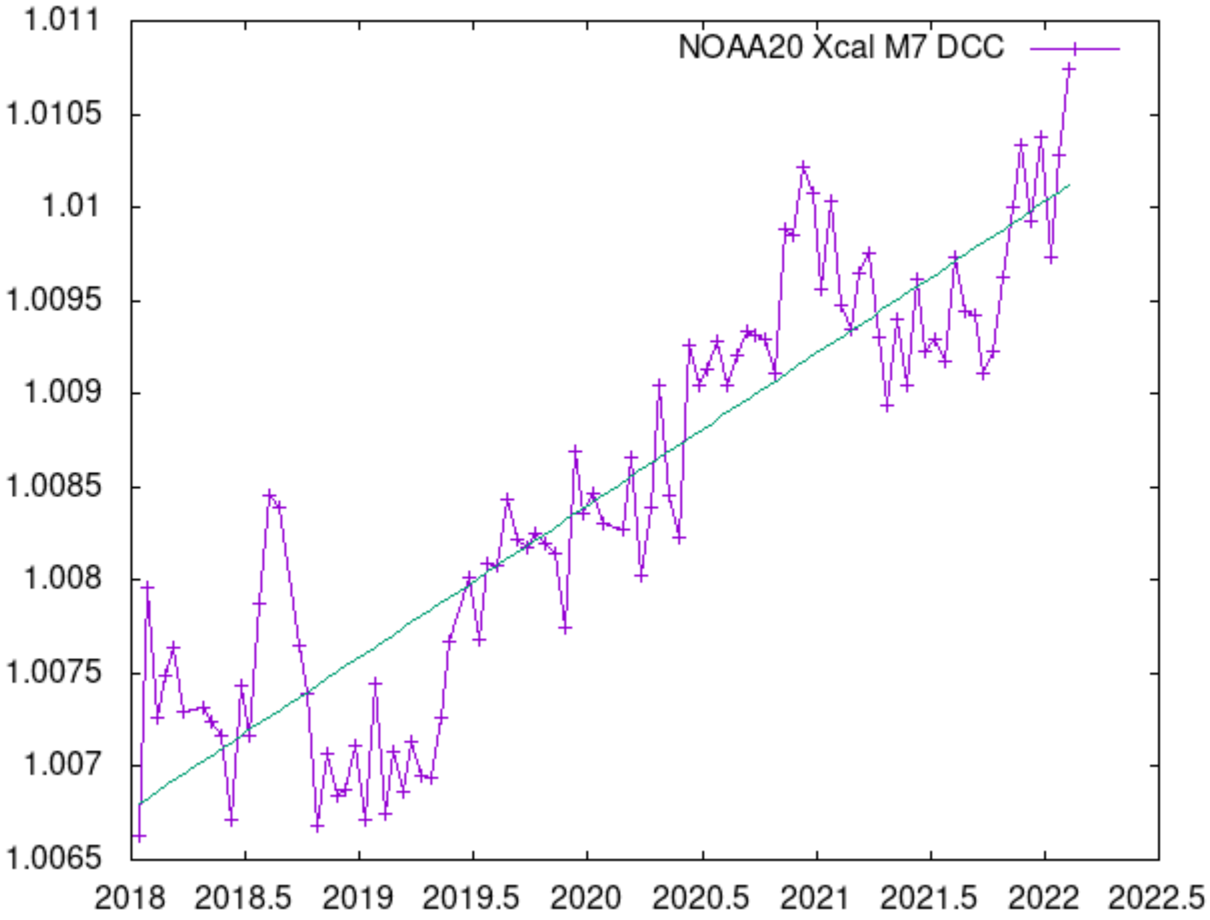


SNPP DCC M7/I2



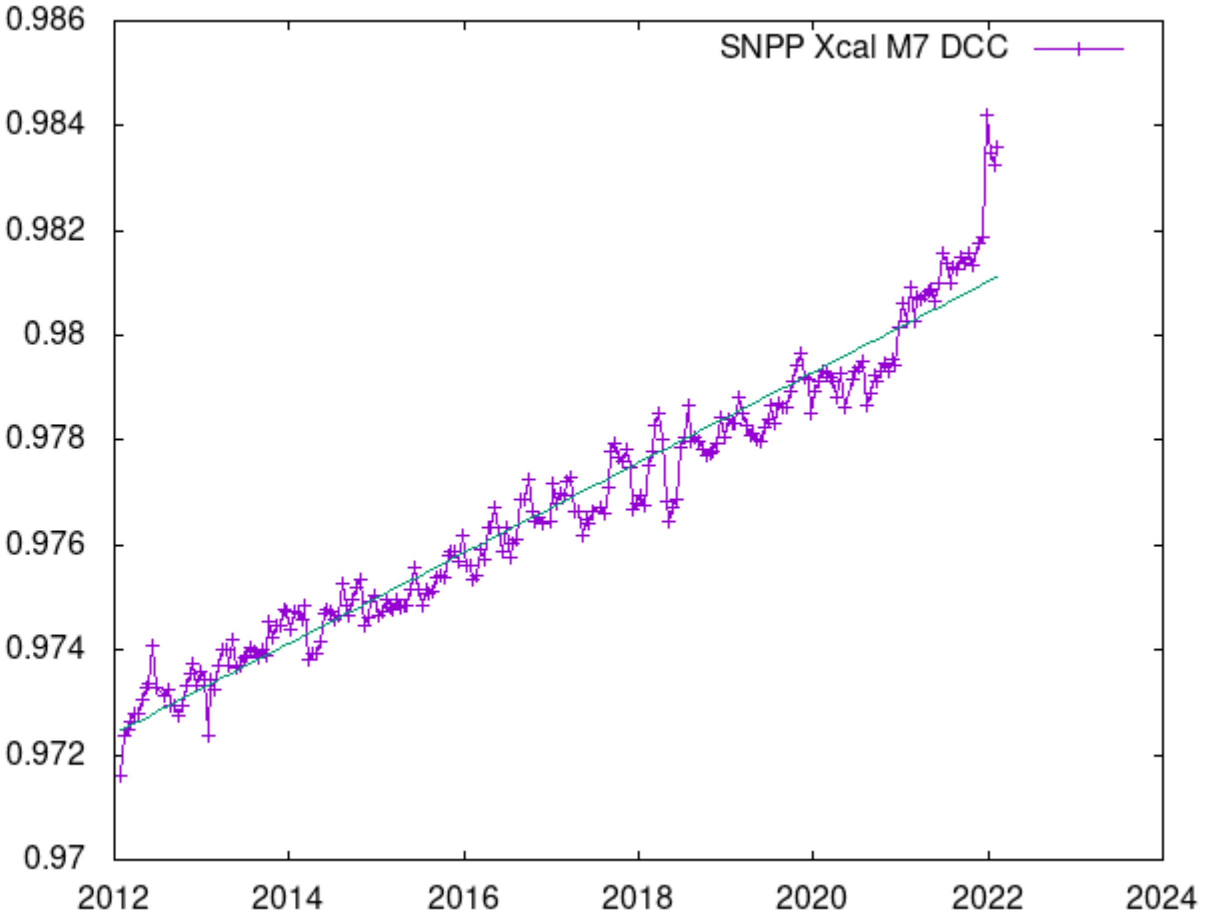
Cross Calibration coefficient Deep Convective Clouds (VIIRS M7)

NOAA20 M7



Xcal=1.0068+0.000814x(Year-2018)

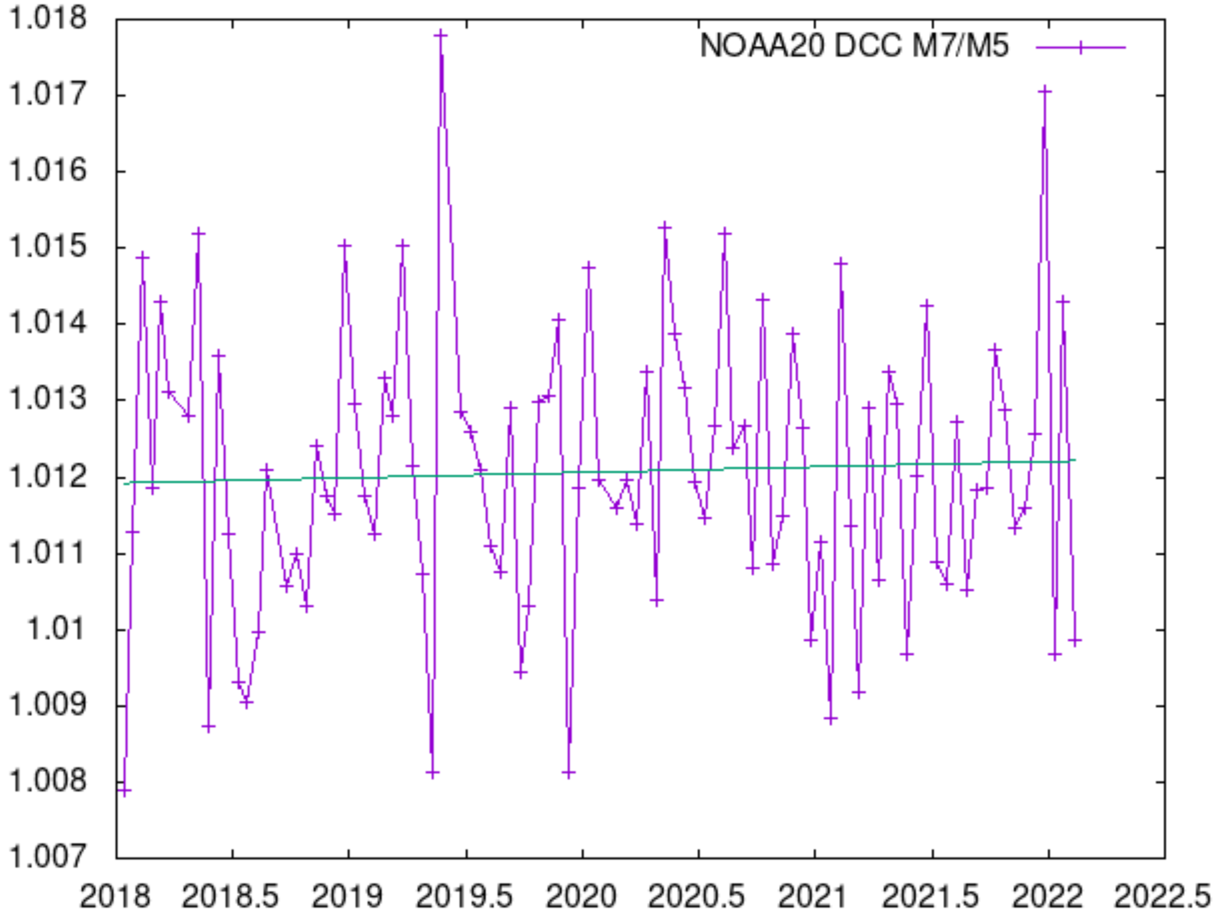
SNPP M7



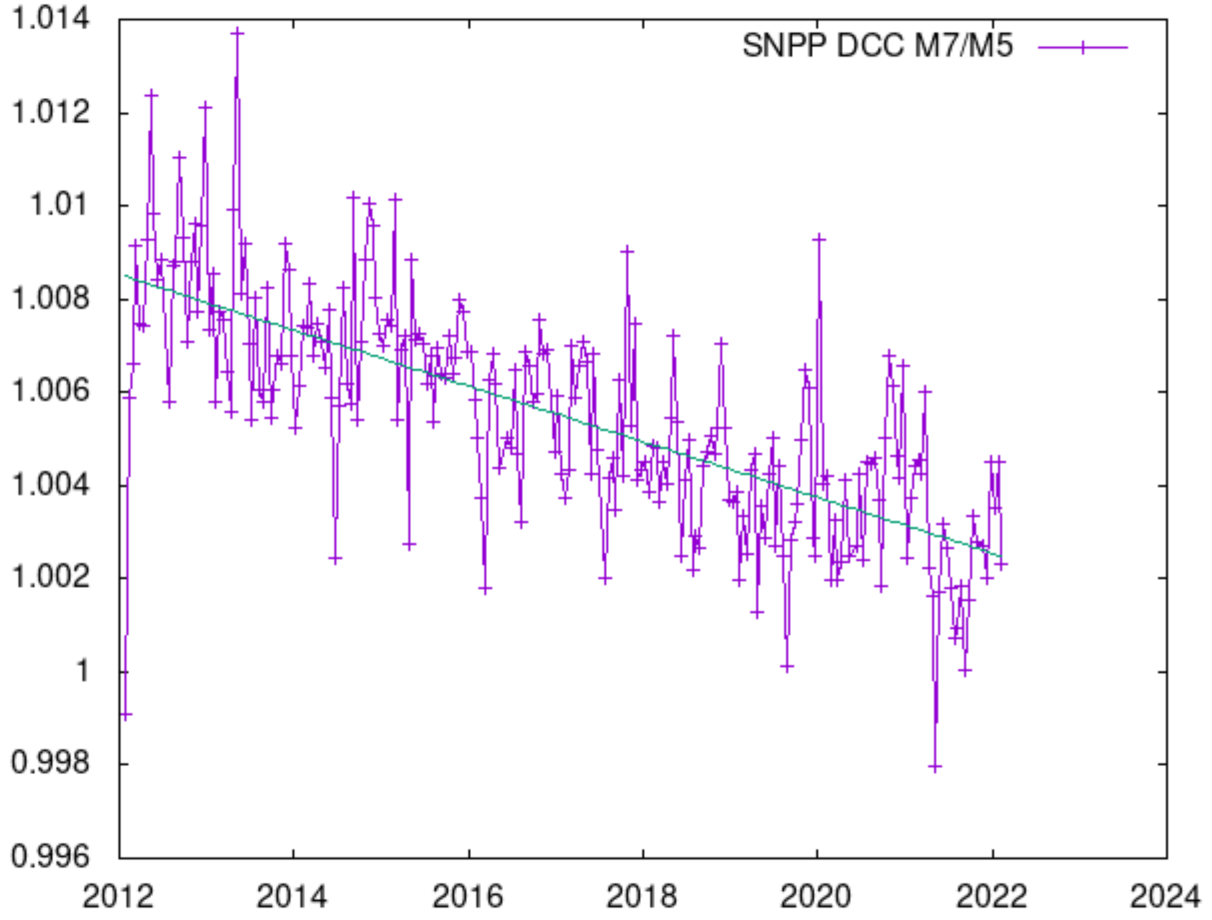
Xcal= 0.9724+0.000862x(Year-2012)

Ratio over Deep Convective Clouds (VIIRS M7/M5)

NOAA20 DCC M7/M5

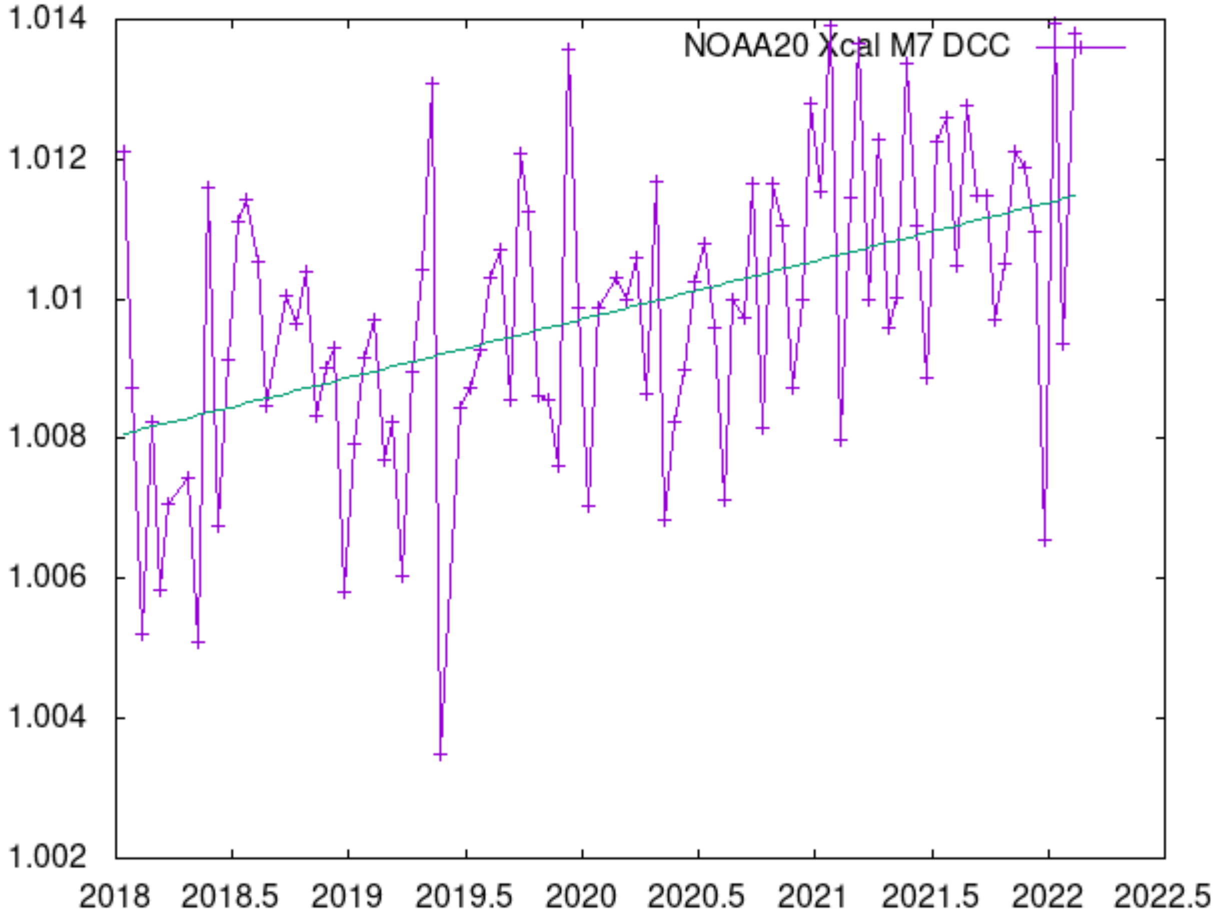


SNPP DCC M7/M5



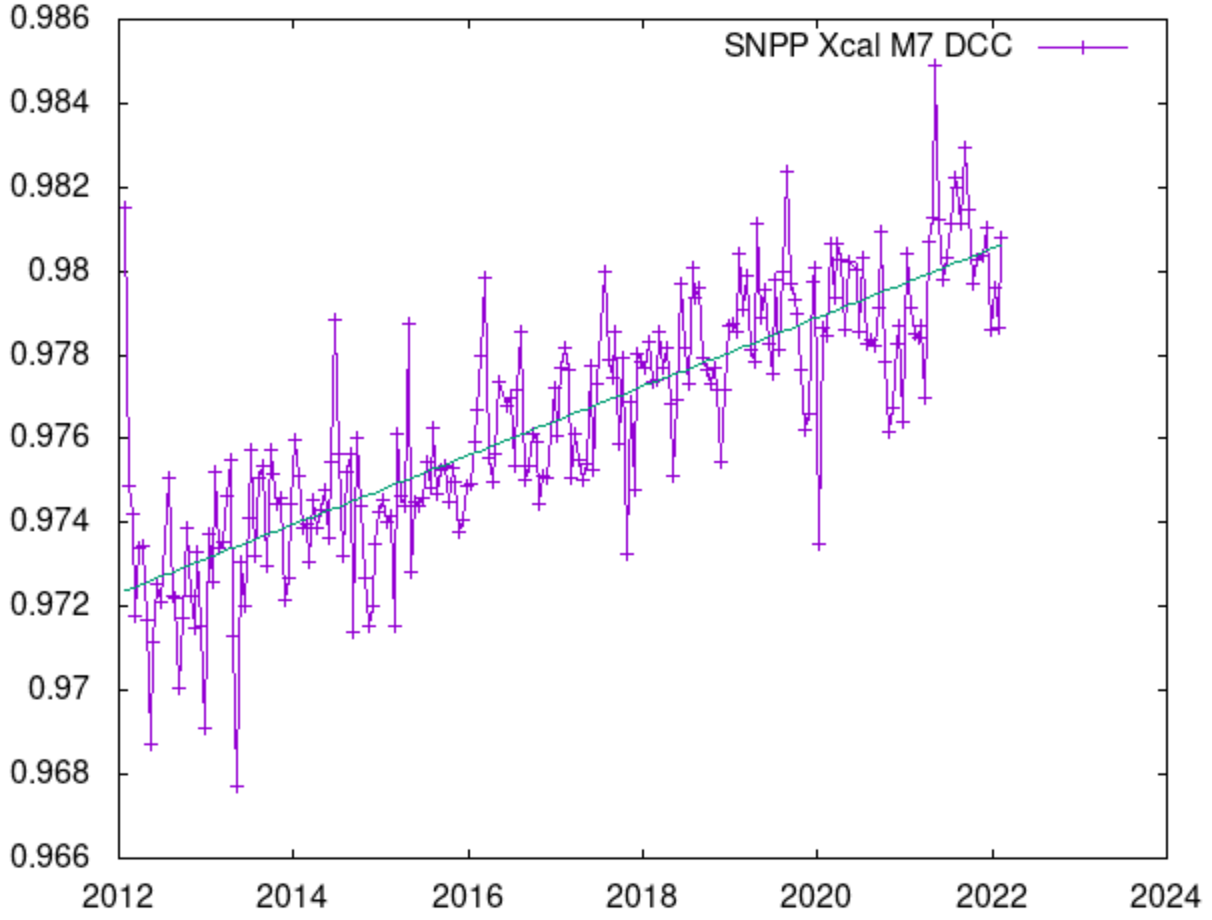
Cross Calibration coefficient Deep Convective Clouds (VIIRS M7)

NOAA20 M7



Xcal= 1.0080+0.000834x(Year-2018)

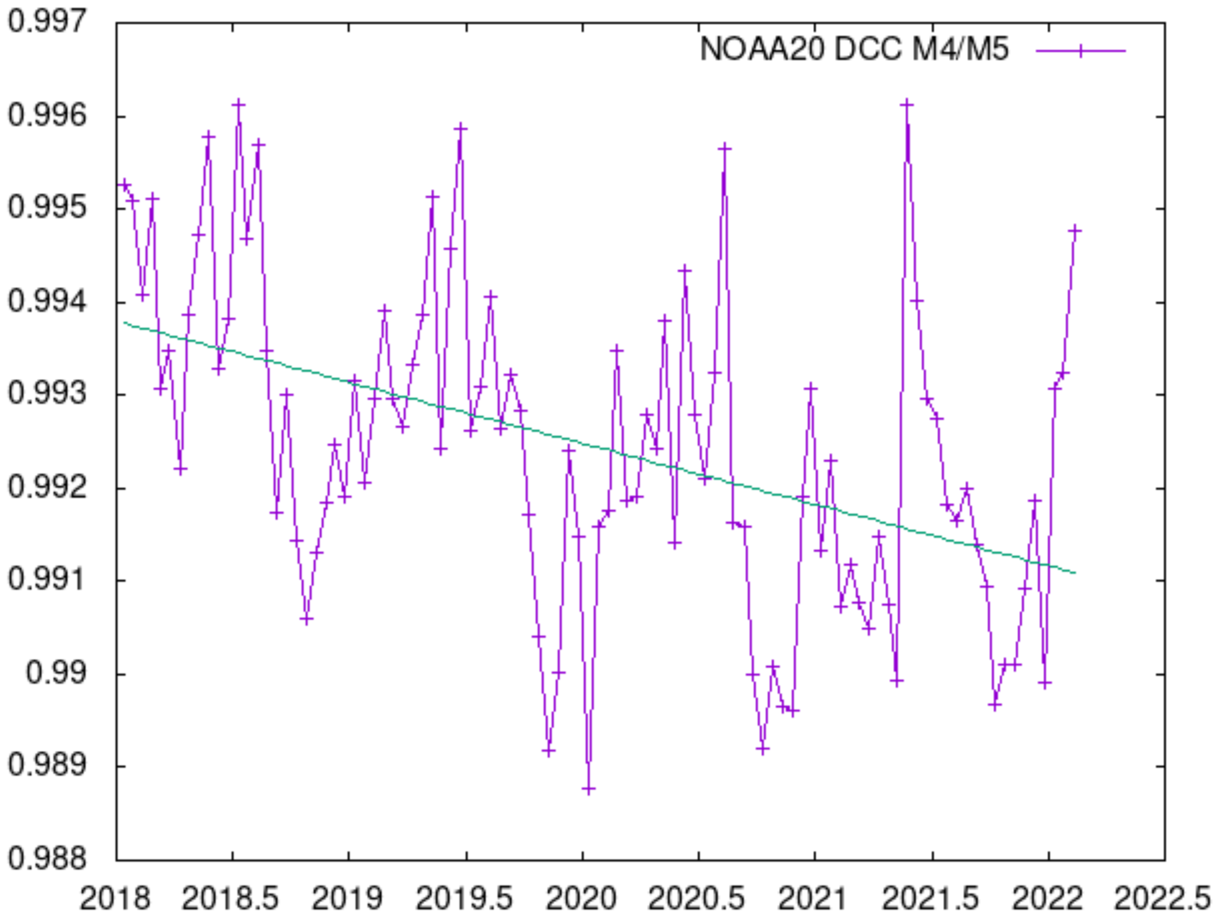
SNPP M7



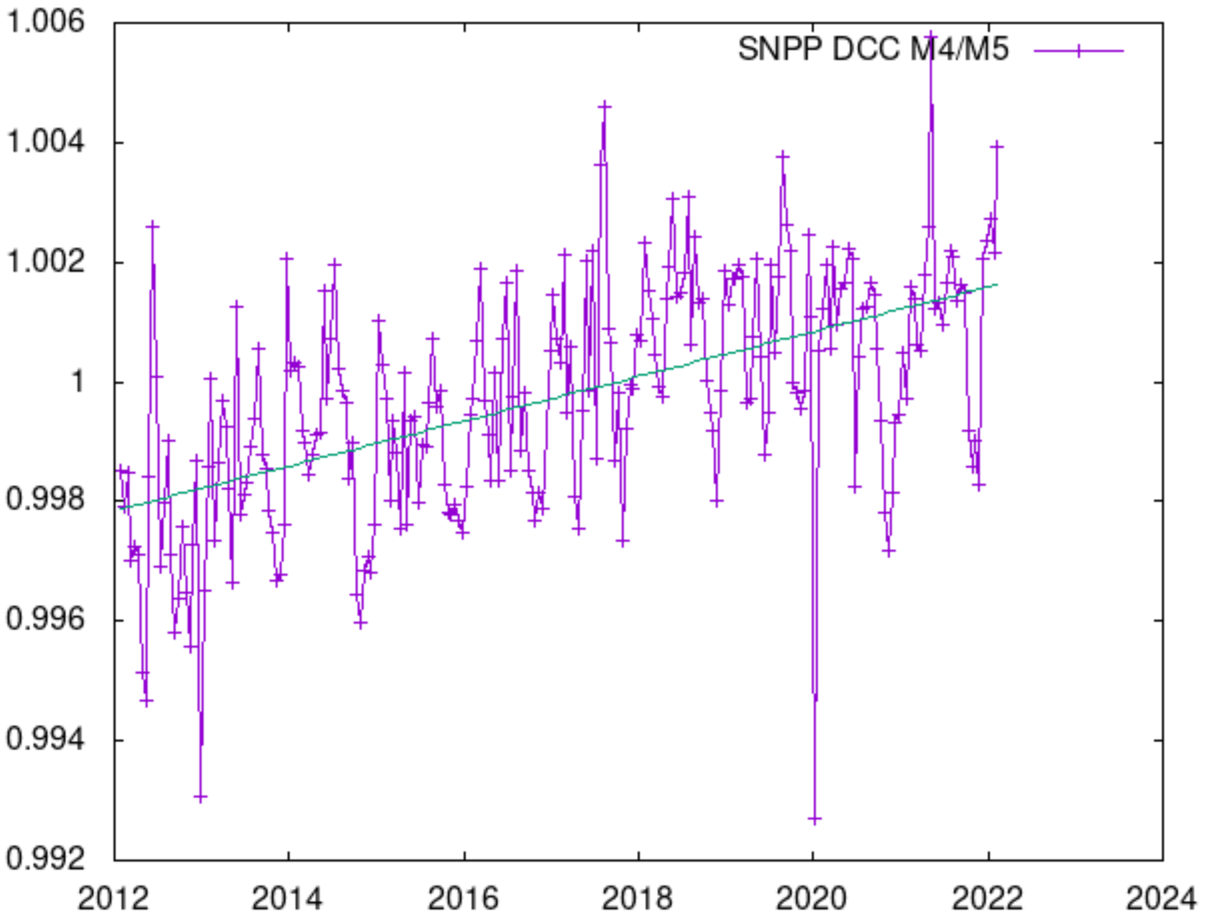
Xcal=0.9723+0.000821x(Year-2012)

Ratio over Deep Convective Clouds (VIIRS M4/M5)

NOAA20 DCC M4/M5

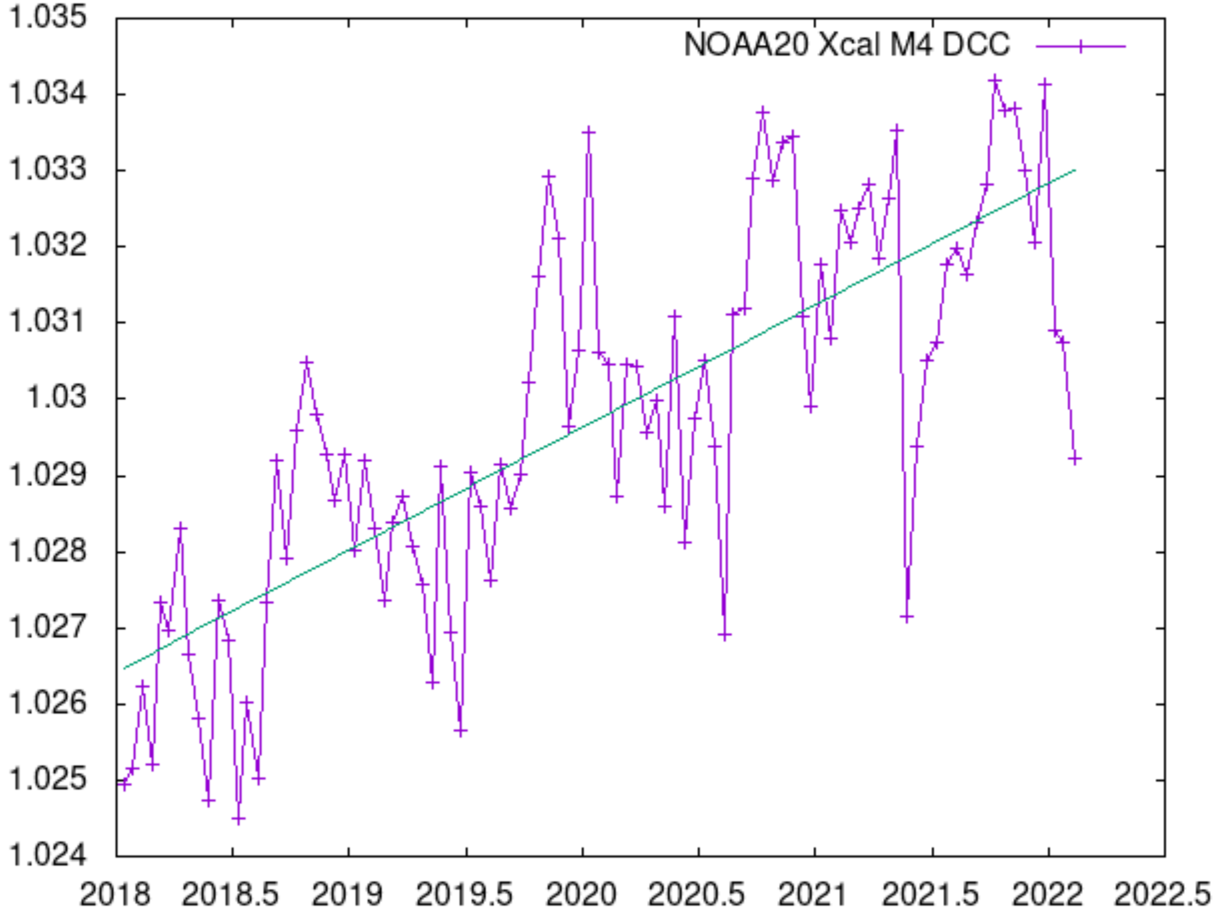


SNPP DCC M4/M5



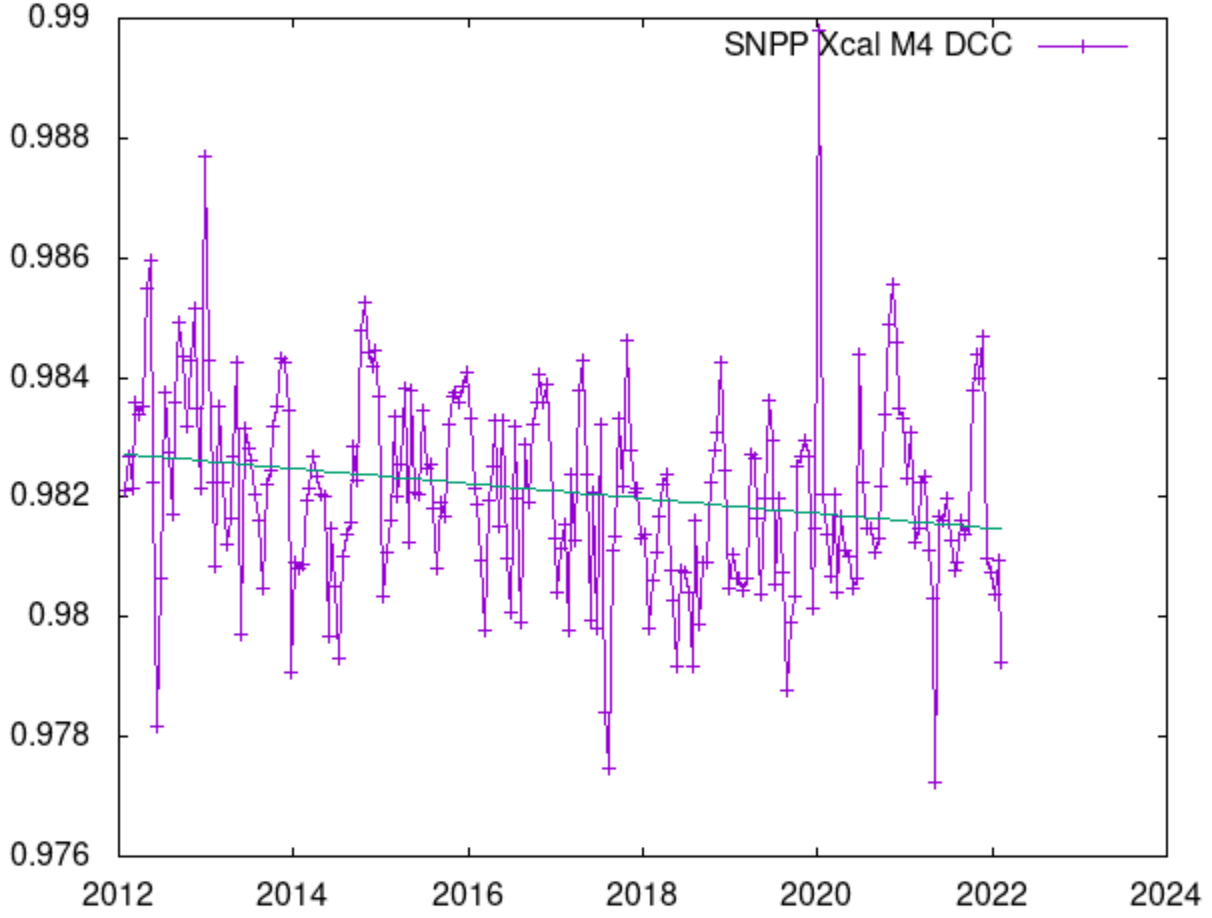
Cross Calibration coefficient Deep Convective Clouds (VIIRS M4)

NOAA20 M4



Xcal=1.0264+0.001605x(Year-2018)

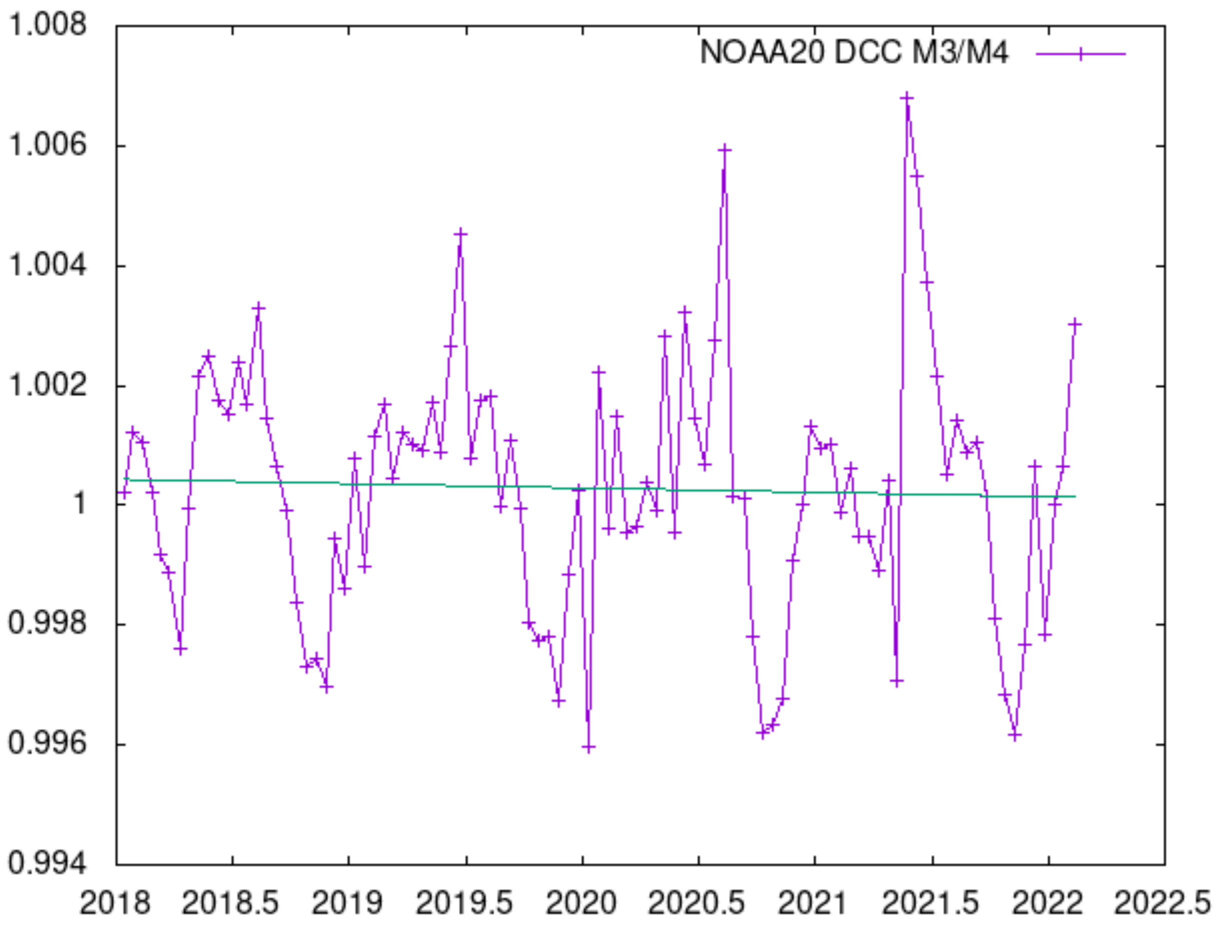
SNPP M4



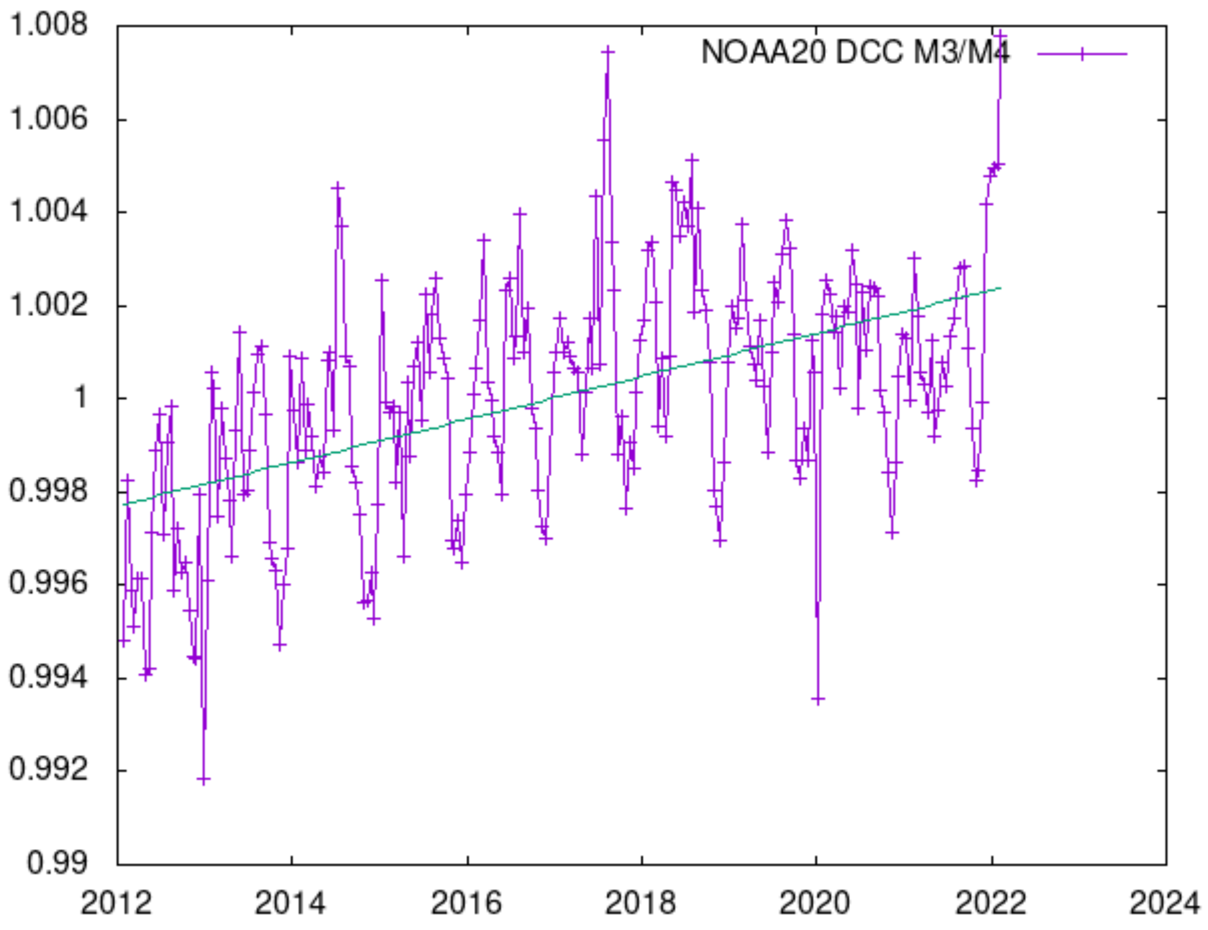
Xcal=0.9827-0.000125x(Year-2012)

Ratio over Deep Convective Clouds (VIIRS M3/M4)

NOAA20 DCC M3/M4

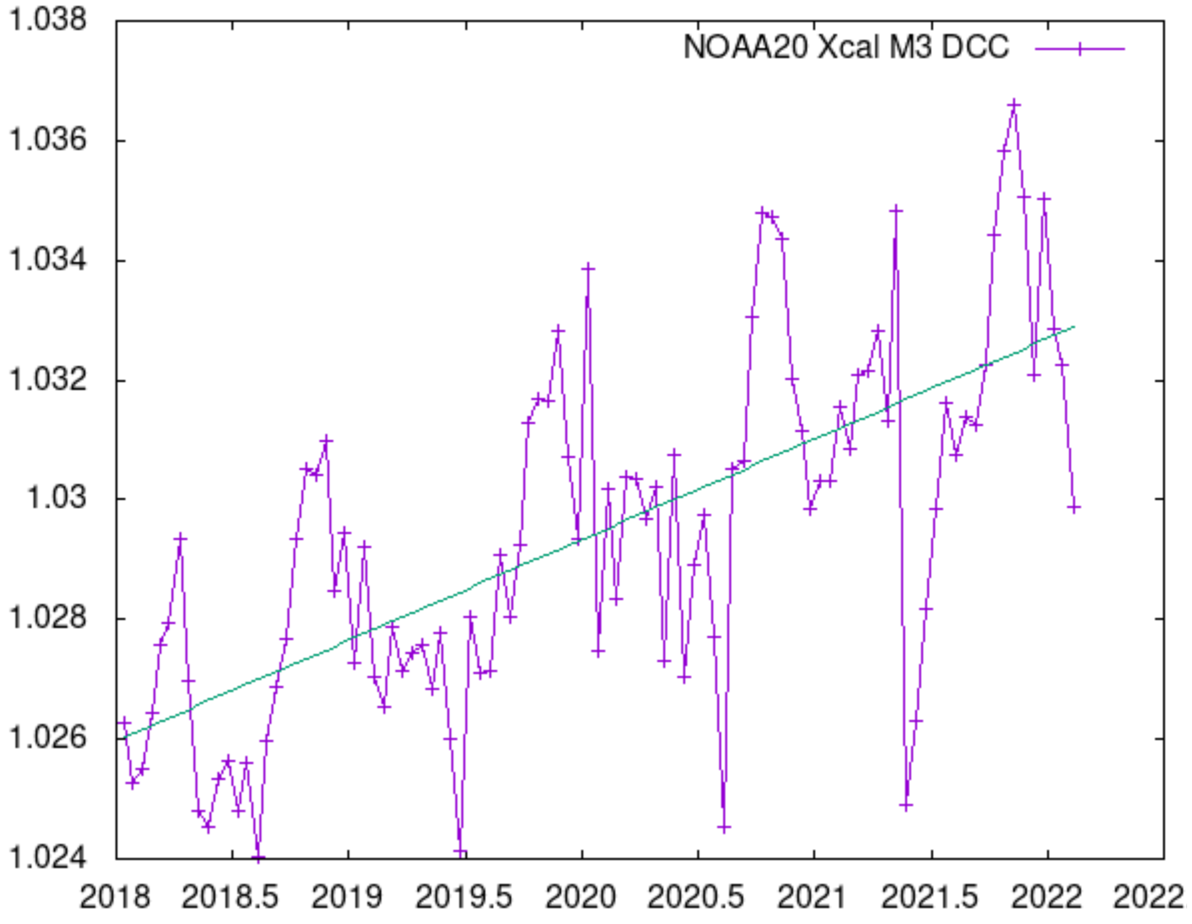


SNPP DCC M3/M4



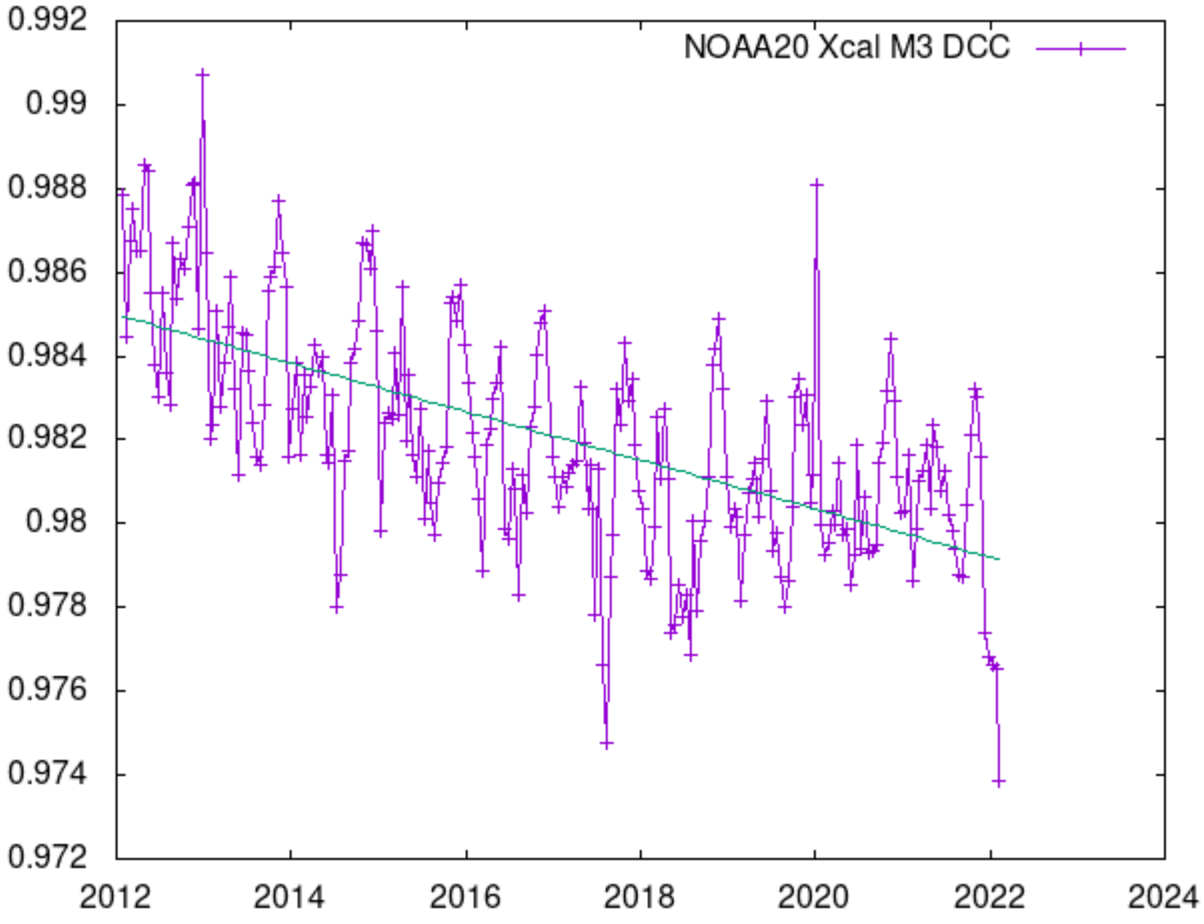
Cross Calibration coefficient Deep Convective Clouds (VIIRS M3)

NOAA20 M3



Xcal=1.0260+0.001680x(Year-2018)

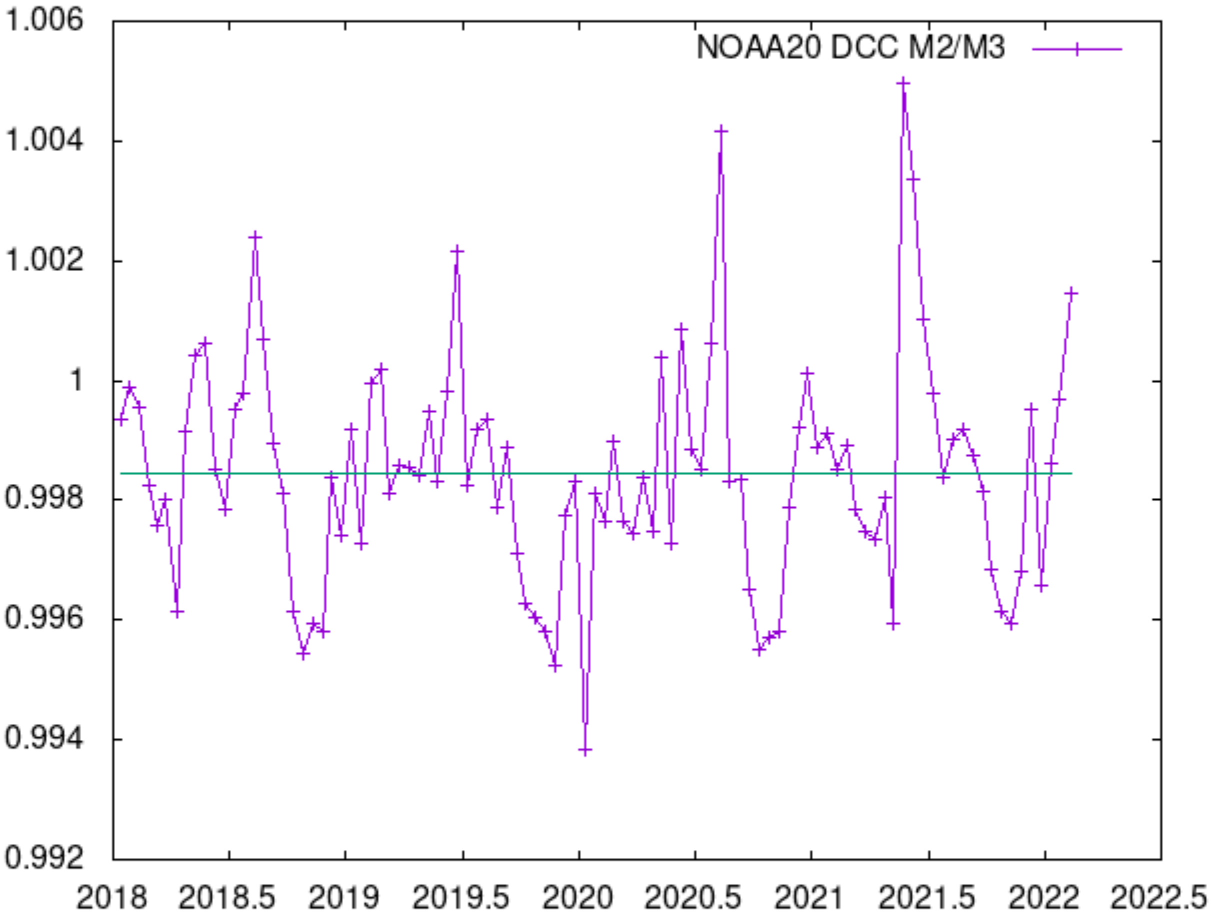
SNPP M3



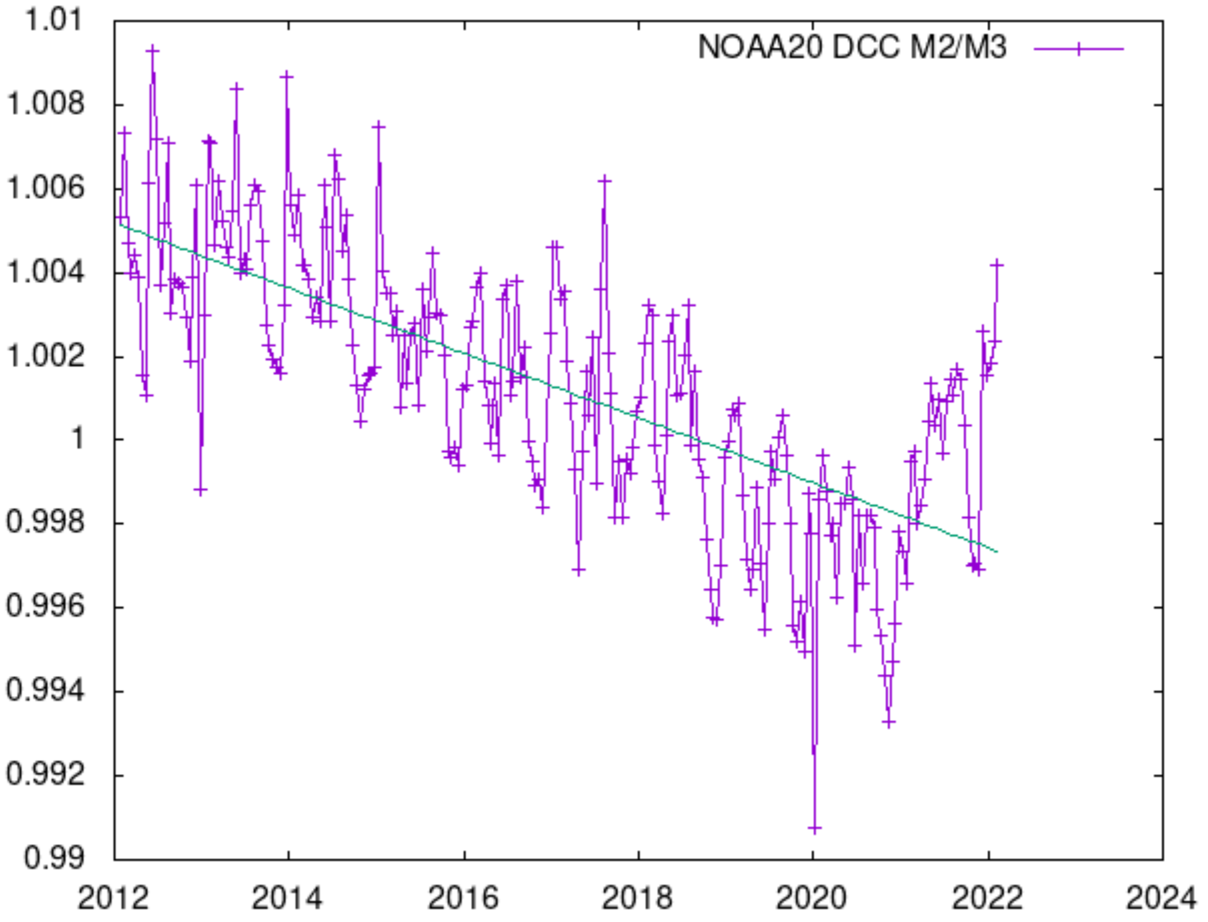
Xcal=0.9850-0.000579x(Year-2012)

Ratio over Deep Convective Clouds (VIIRS M2/M3)

NOAA20 DCC M2/M3

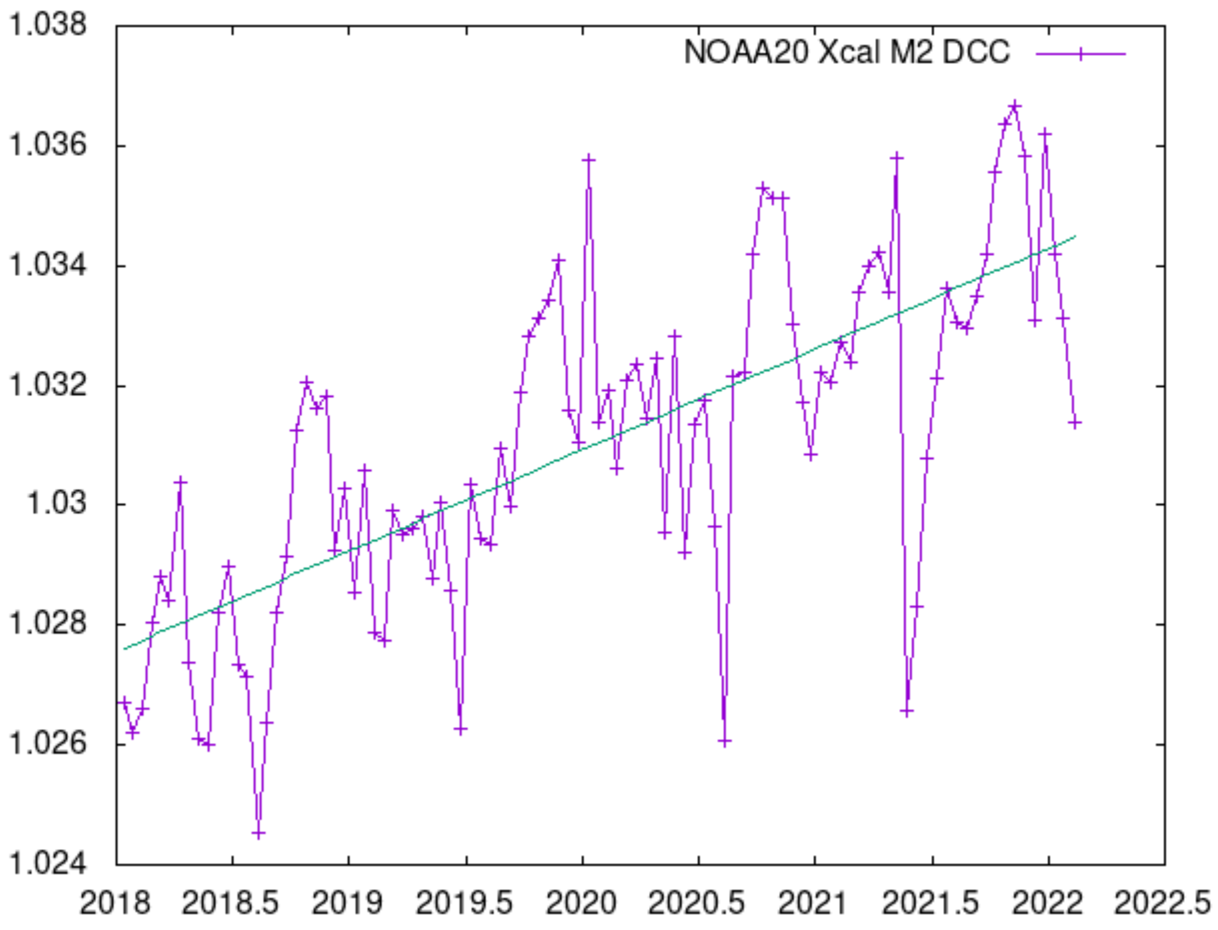


SNPP DCC M2/M3

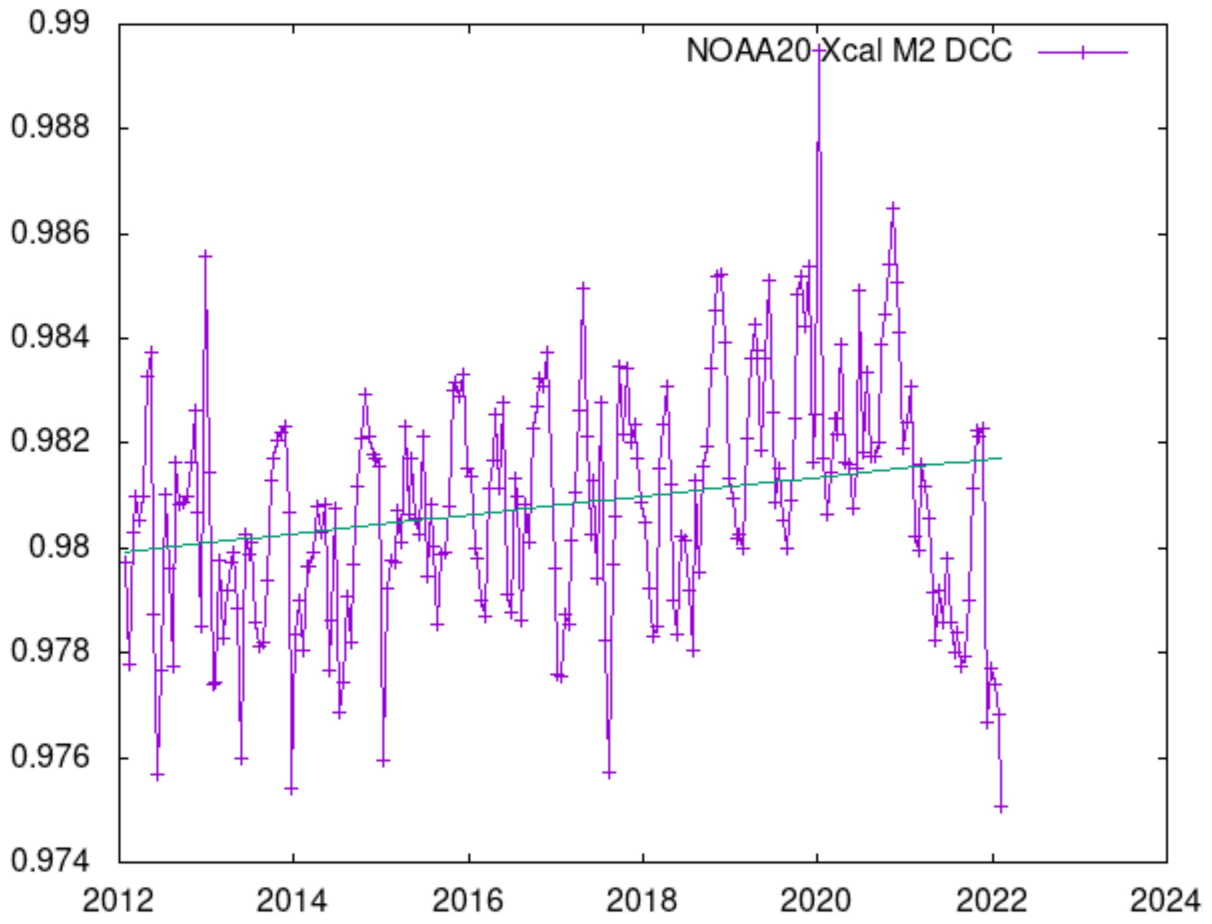


Cross Calibration coefficient Deep Convective Clouds (VIIRS M2)

NOAA20 M2



SNPP M2

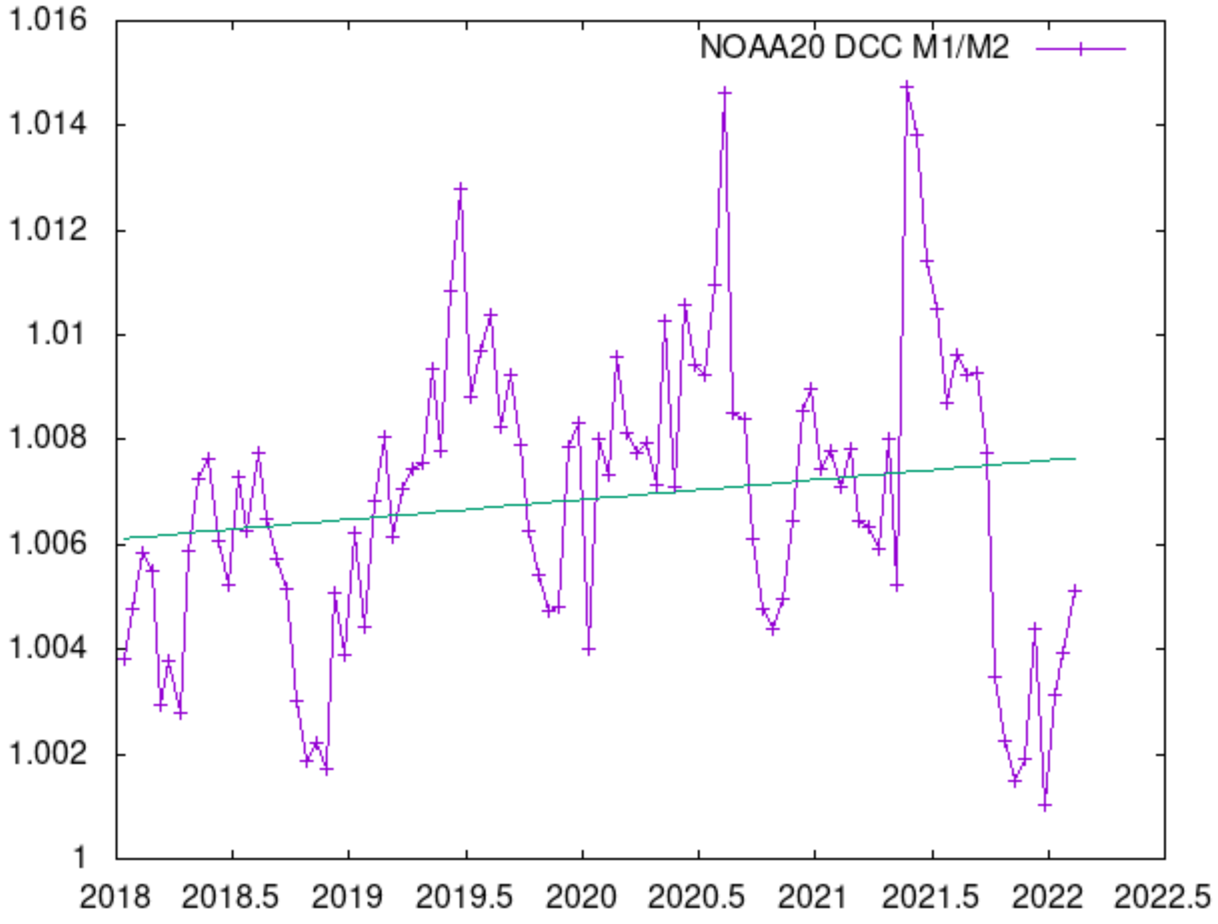


Xcal=1.0276+0.001683x(Year-2018)

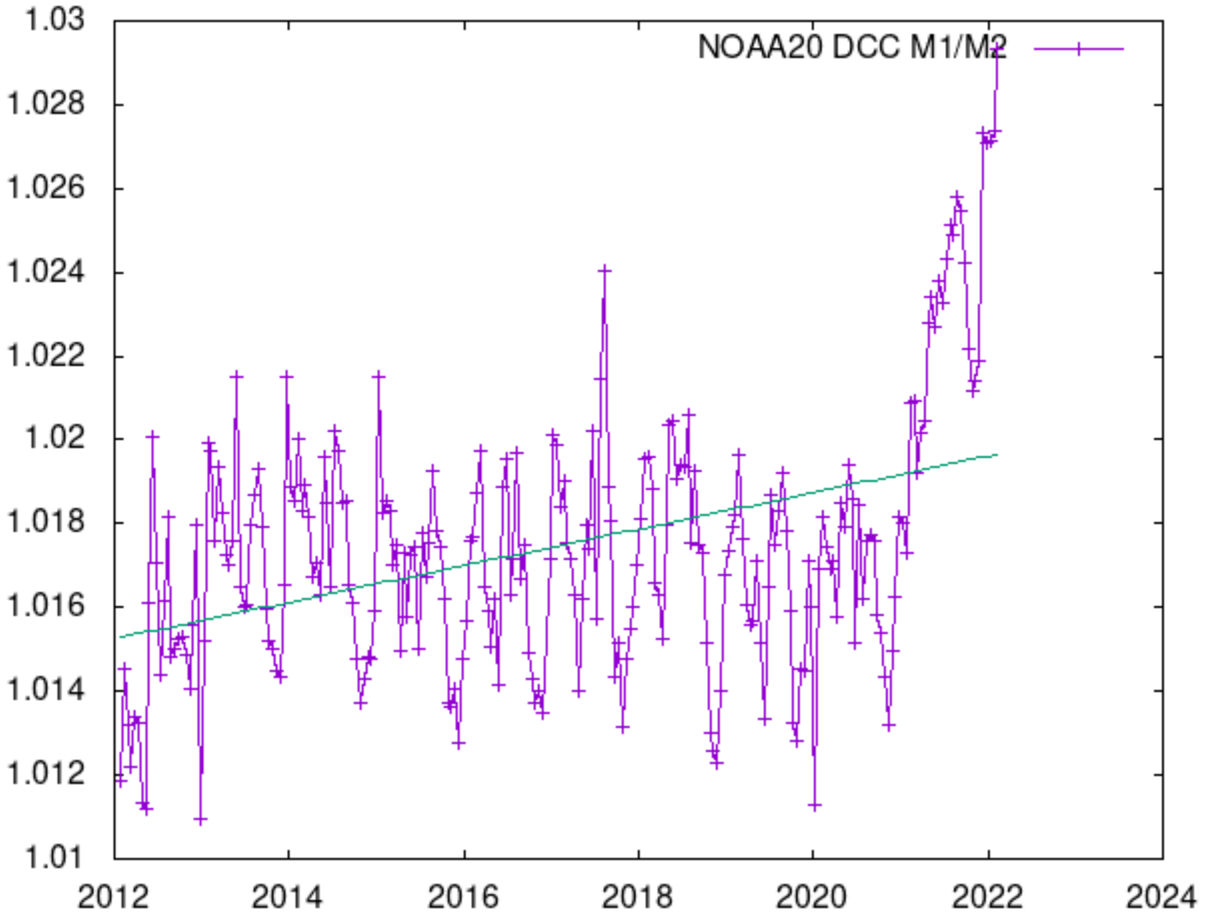
Xcal=0.9799+0.000179x(Year-2012)

Ratio over Deep Convective Clouds (VIIRS M1/M2)

NOAA20 DCC M1/M2

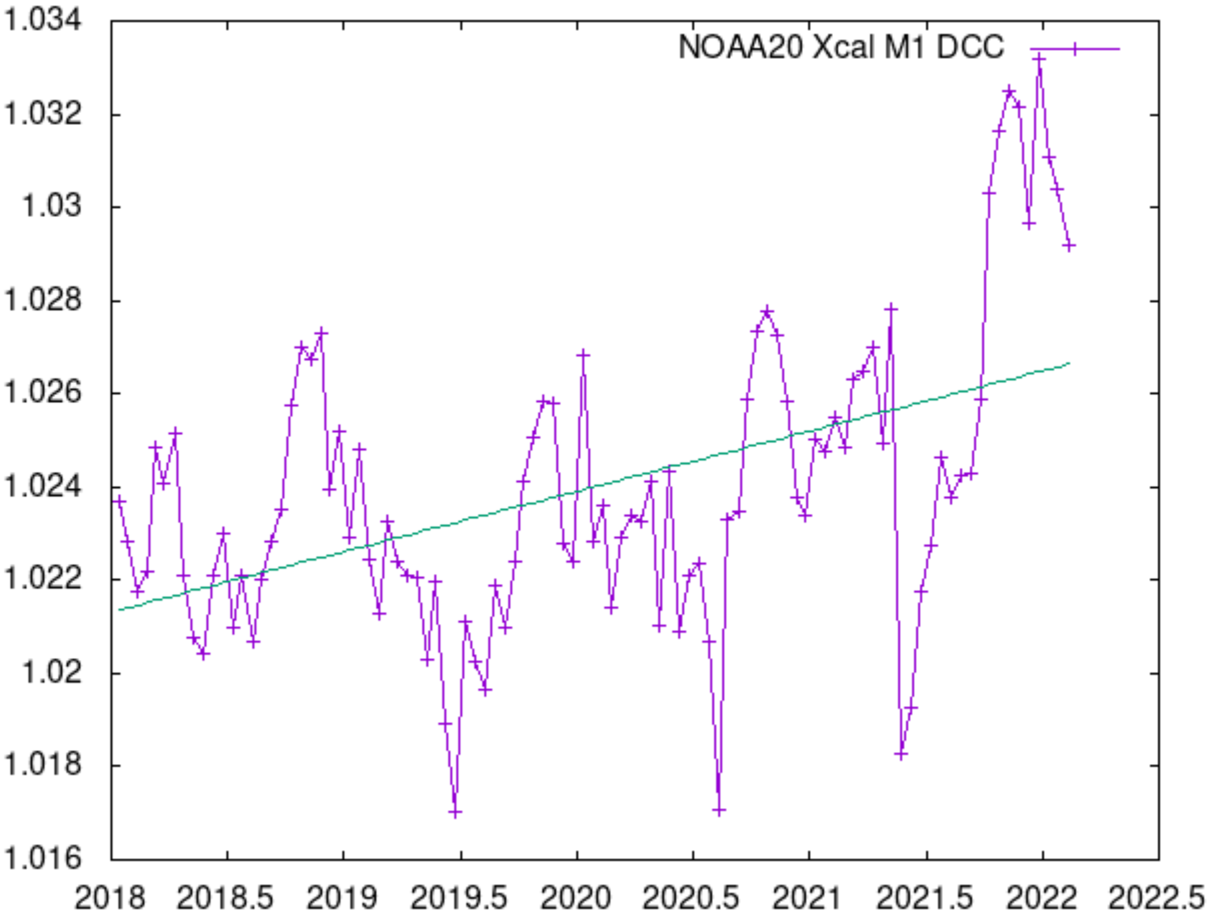


SNPP DCC M1/M2

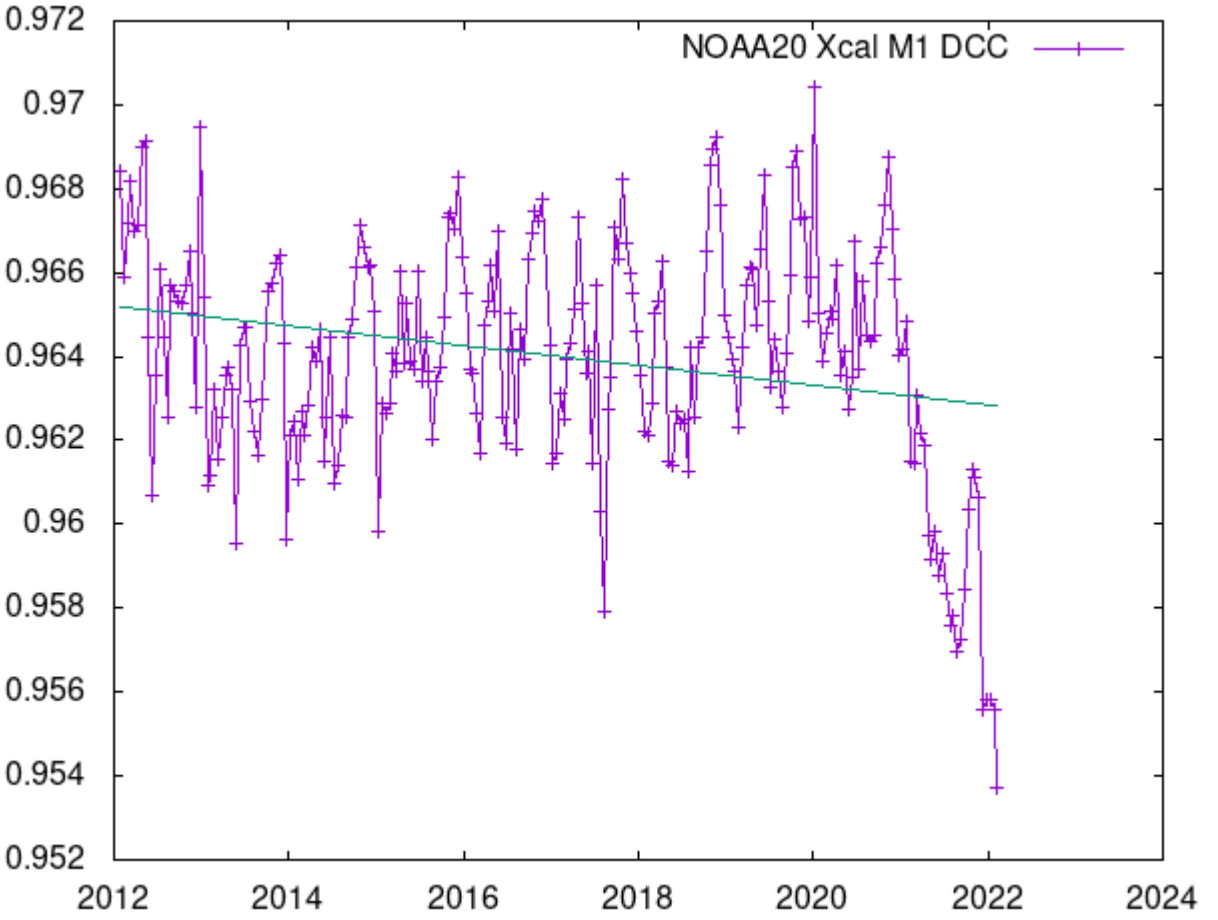


Cross Calibration coefficient Deep Convective Clouds (VIIRS M1)

NOAA20 M1



SNPP M1

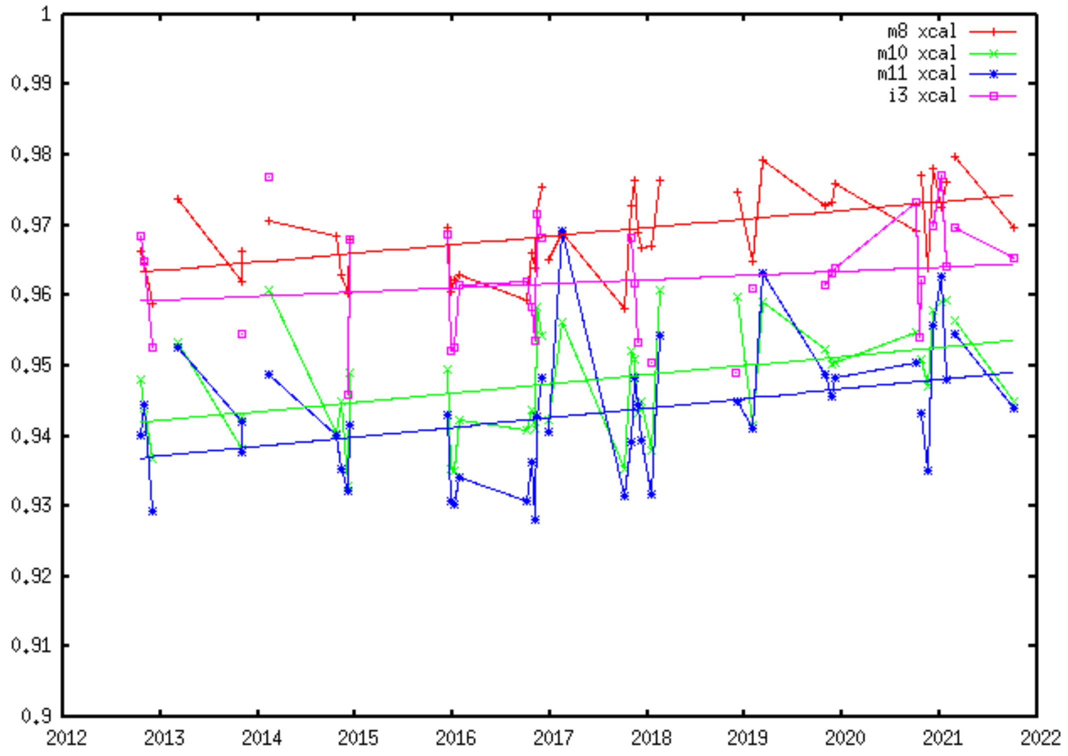


Xcal=1.0213+0.001292x(Year-2018)

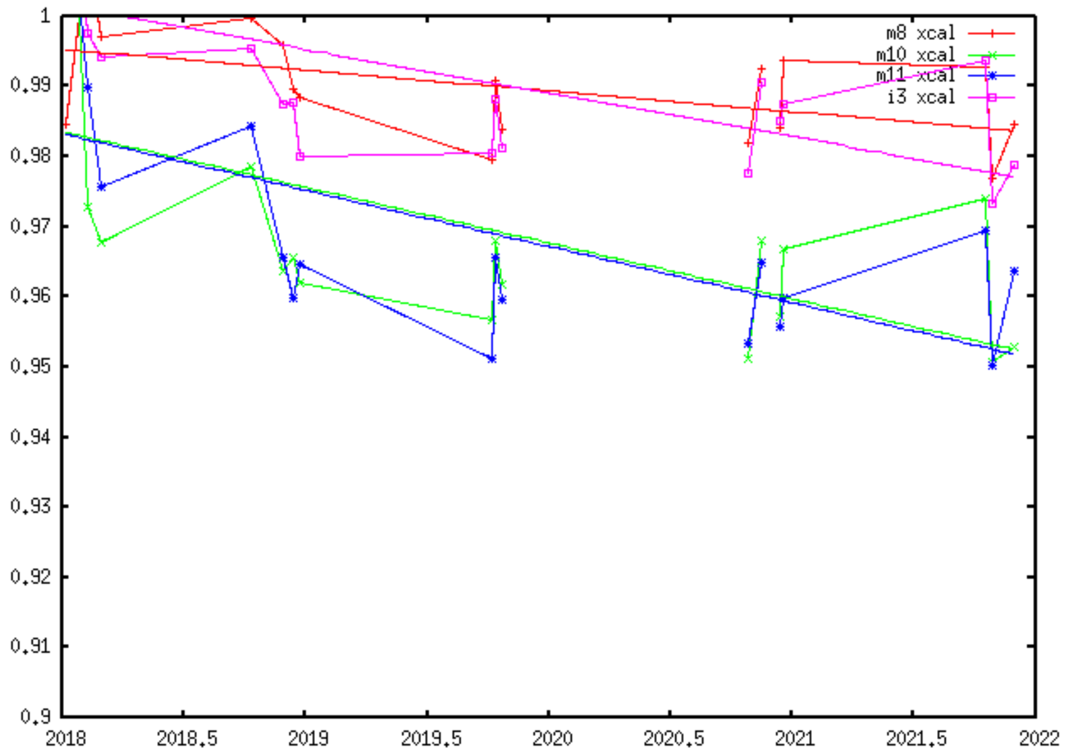
Xcal=0.9652-0.000235x(Year-2012)

VIIRS SWIR/NIR spectral Intercalibration over Sunglint (Lake Titicaca)

SNPP



NOAA 20

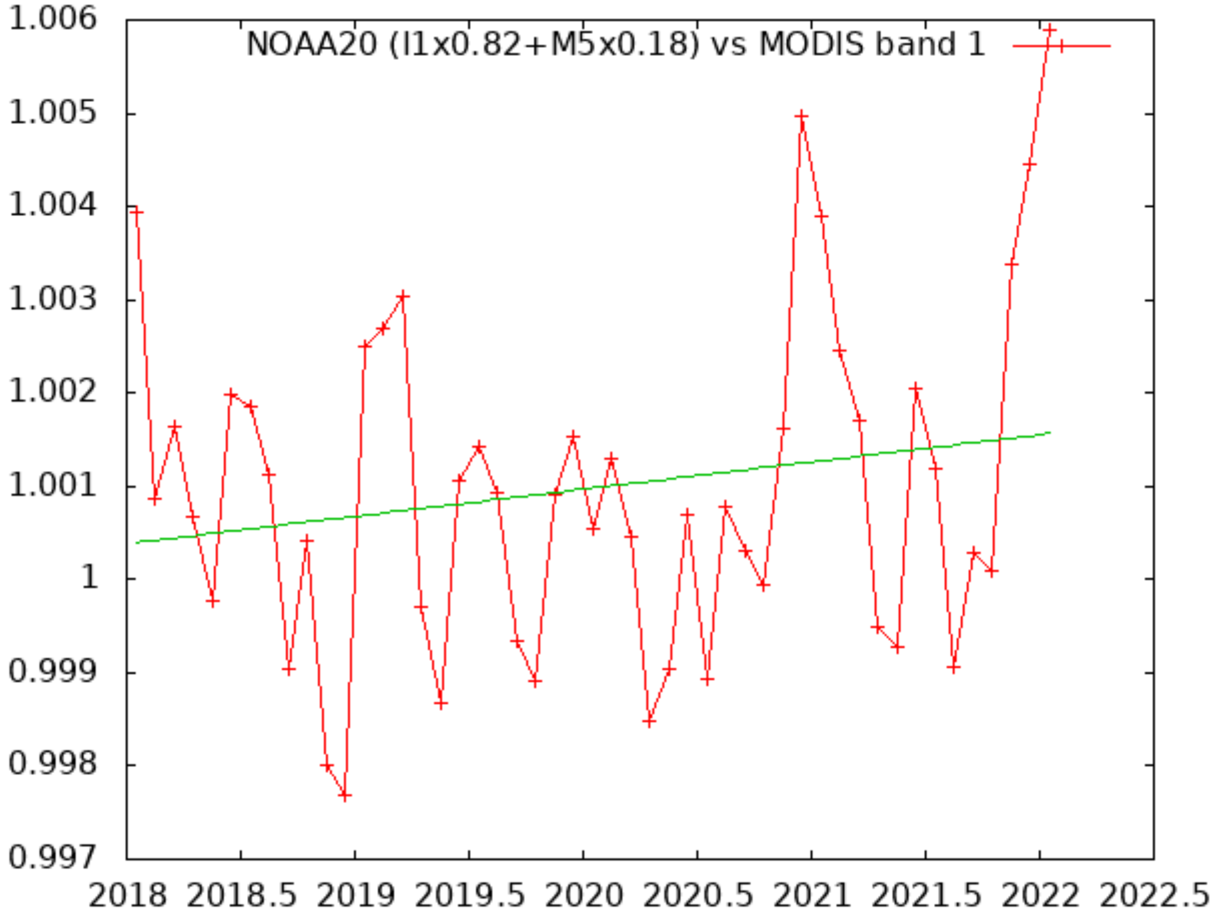


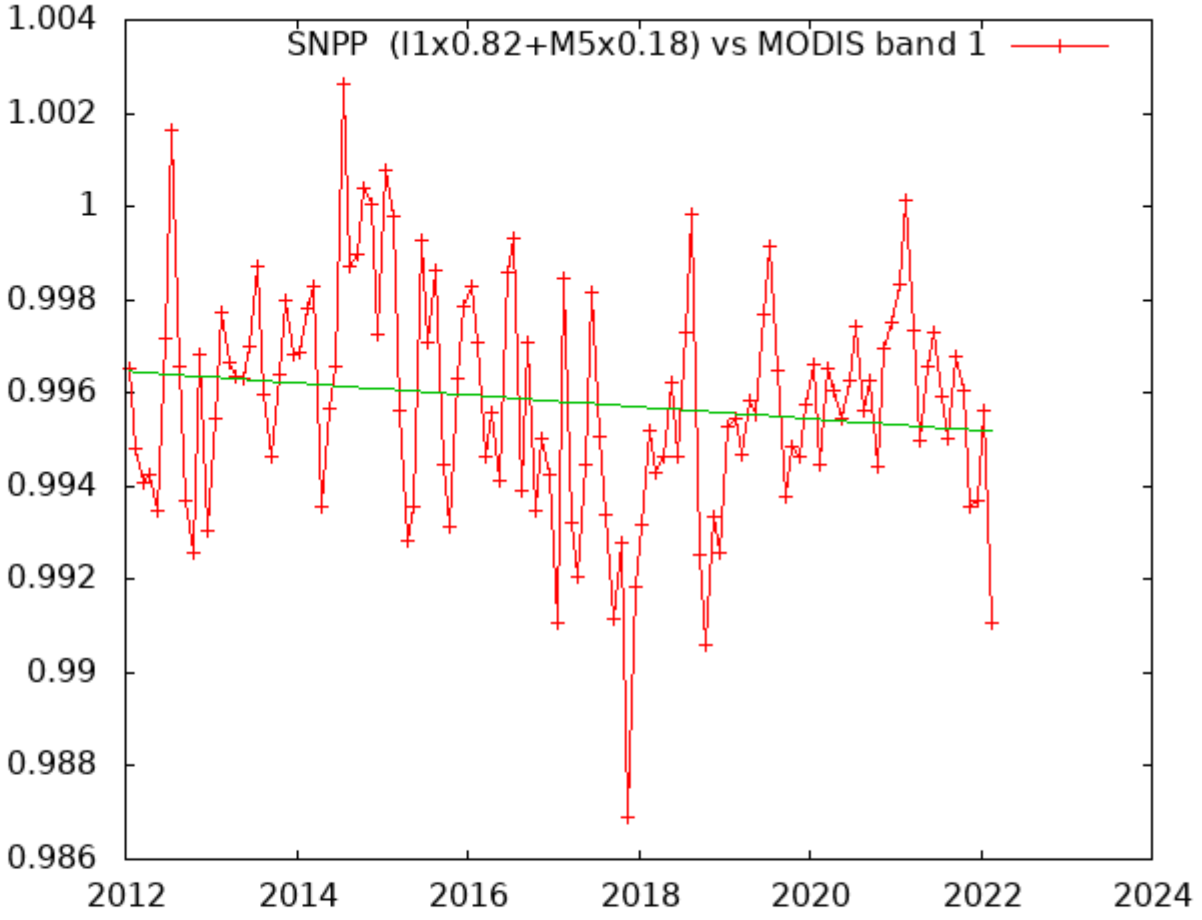
Xcal coefficients table summary

Band	NOAA20	SNPP
M1	1.0213+0.001292x(Year-2018)	0.9652-0.000235x(Year-2012)
M2	1.0276+0.001683x(Year-2018)	0.9799+0.000179x(Year-2012)
M3	1.0260+0.001680x(Year-2018)	0.9850-0.000579x(Year-2012)
M4	1.0264+0.001605x(Year-2018)	0.9827-0.000125x(Year-2012)
M5	1.0201+0.000917x(Year-2018)	0.9806+0.000243x(Year-2012)
M7(I2)*	1.0068+0.000814x(Year-2018)	0.9724+0.000862x(Year-2012)
M7(M5)	1.0080+0.000834x(Year-2018)	0.9723+0.000821x(Year-2012)
M8	0.9953-0.002961x(Year-2018)	0.9624+0.001218x(Year-2012)
M10	0.9836-0.007938x(Year-2018)	0.9409+0.001306x(Year-2012)
M11	0.9832-0.008016x(Year-2018)	0.9358+0.001363x(Year-2012)
I1	1.0333+0.001299x(Year-2018)	0.9948+0.000433x(Year-2012)
I2	1.0121+0.000514x(Year-2018)	0.9731+0.000760x(Year-2012)
I3	1.0015-0.006207x(Year-2018)	0.9588+0.000586x(Year-2012)

M7(I2)* is recommended for use.

Verification (I1,M5) vs Aqua MODIS band1 (BELMANIP)





Conclusions

- A complete approach for harmonization of sensors across visible, NIR and SWIR has been developed
- The approach uses globably distributed representative sites (BELMANIP2), Deep Convective Clouds and Sunglint.
- This combination of methods minimize the problem of spectral responses differences between sensors