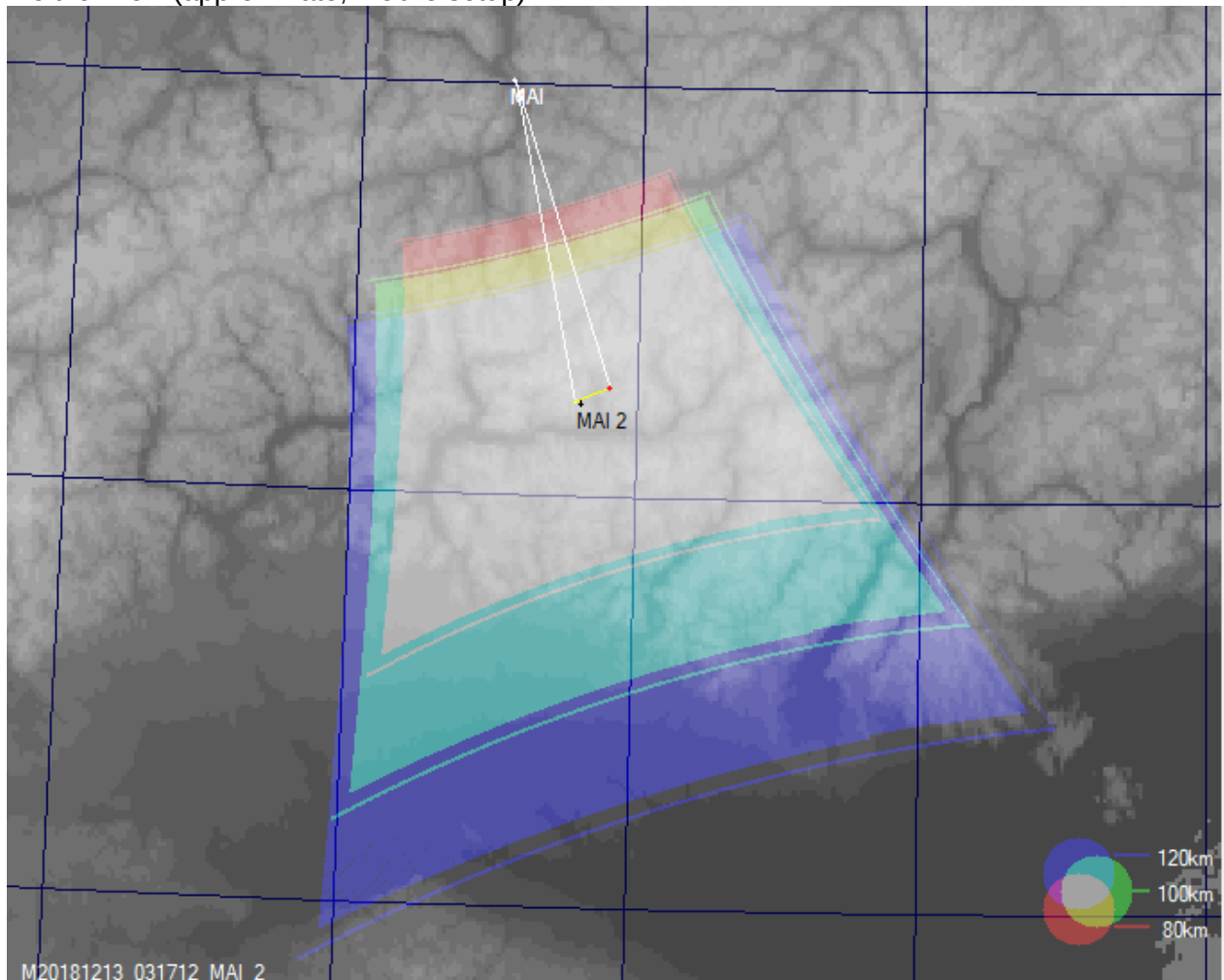


Meteor spectra 2018

This is a collection of meteor spectra obtained at Maienfeld (MAI_2), with a Watec 902H2 ultimate, lens Fujinon YV F/0.95 mit $f \approx 8$ mm, grating 600 L/mm

Field of view (approximate, mobile setup):



Spectra analyzed with IRIS, SpectraTools, ISIS before 2018, June 20

Spectra after 2018, April 23 analyzed with Python

April 23, April 25, June 20: comparison IRIS – Python

IRIS, SpectroTools, ISIS

M20180124_045937_MAI_2, spo, -3.4m



Virtual Dub Video filter: BOB doubler BFF doubler none

Export BMP

m_0...m_70.BMP

Preprocessing with IRIS

>loadbmp24bw m_70

>RUN M_BACK m_ back 40 0.025

>visu 50 0

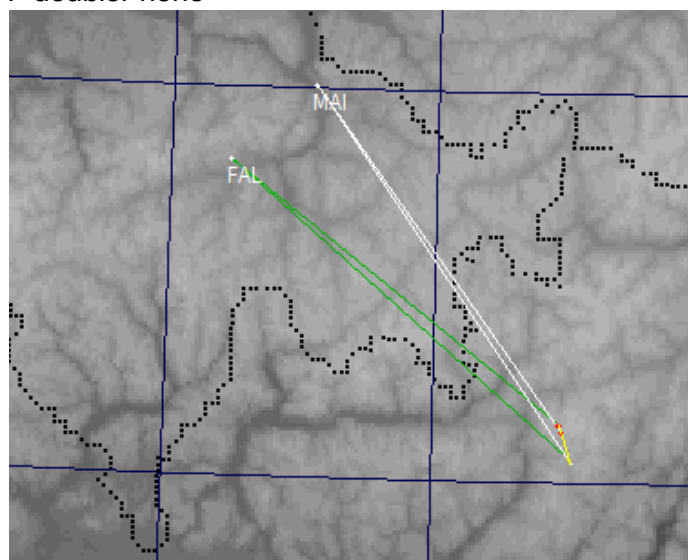
>savejpg back 2

>RUN M_DARK m_ back mb 51 20

>add2 mb 20

>visu 500 -100

>savejpg madd20 2



Transformation to orthographic projection with ImageTools (P. Schlatter proprietary software)

[..\..\IRIS\ImageTools\ImageTools_d11_Martin.ini](#)

Meteor Spectra

File(s): C:\Daten\Meteor\spectrum\Meteor\2017\M20171012\mb1.fit

Scaling factor in y: 2 Prefix: d11

Center of symmetry x: 364.3

Center of symmetry y: 171.15

3rd order coeff.: 2.026e-7

5th order coeff.: 6.159e-14

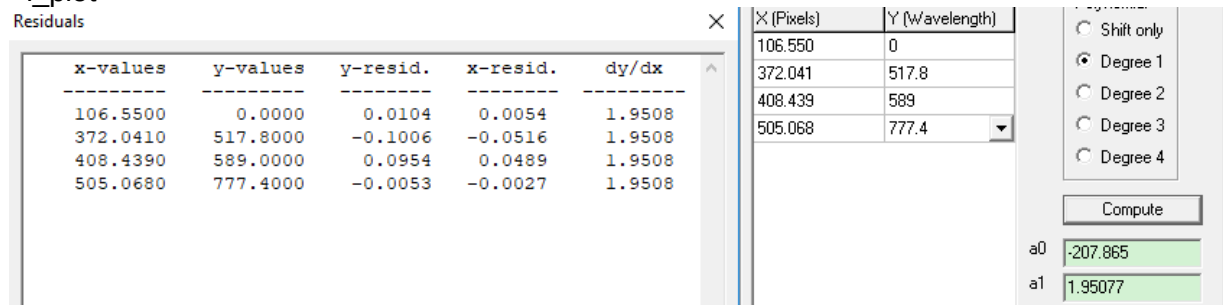
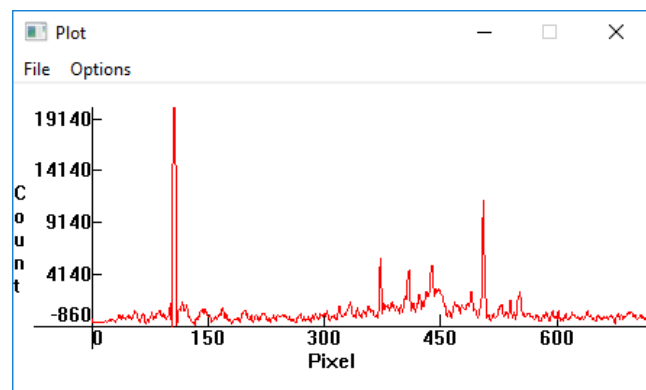
☐ $r' = r(1 + \dots)$

☒ $r = r'(1 + \dots)$

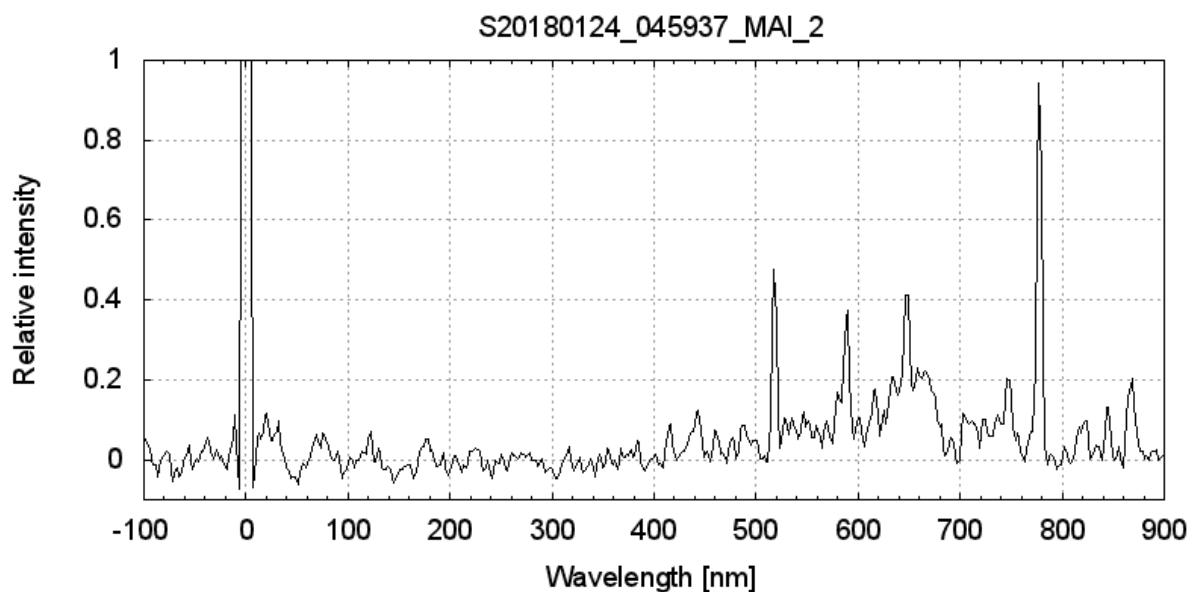
OK Cancel

Registering and stacking in IRIS, extraction of raw spectrum

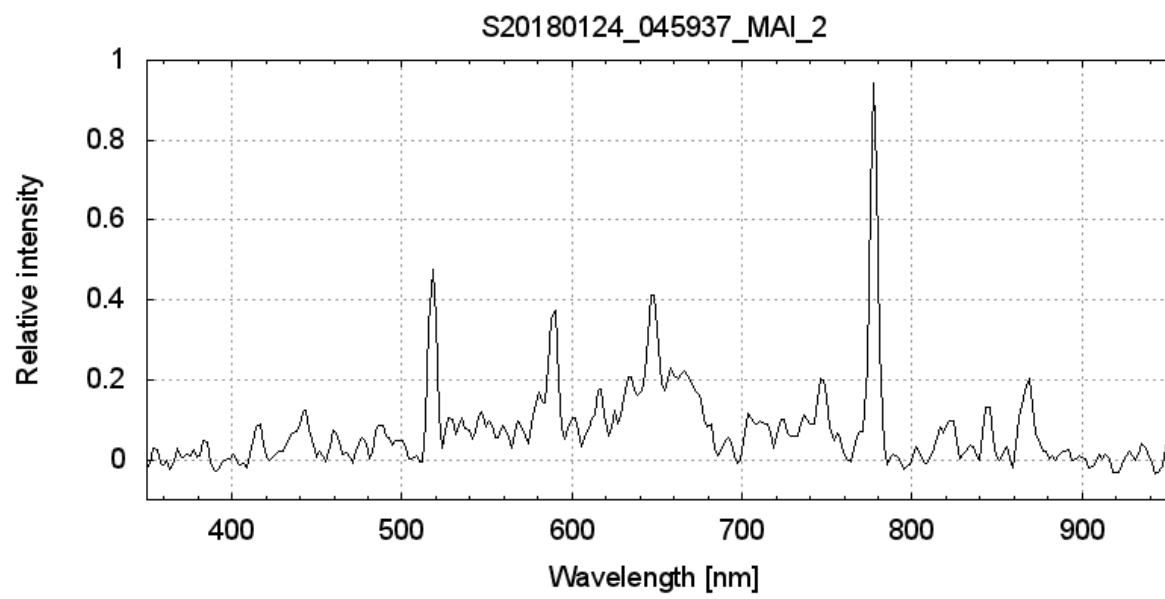
```
>load d11_mb1
>register d11_mb r 20
>add2 r 18
>offset -6
>visu 1000 0
>save addr18o
>slant 310 -10
>load addr18o
>save addr18os
>savejpg addr20os 2
>l_add 306 314
>l_plot
```



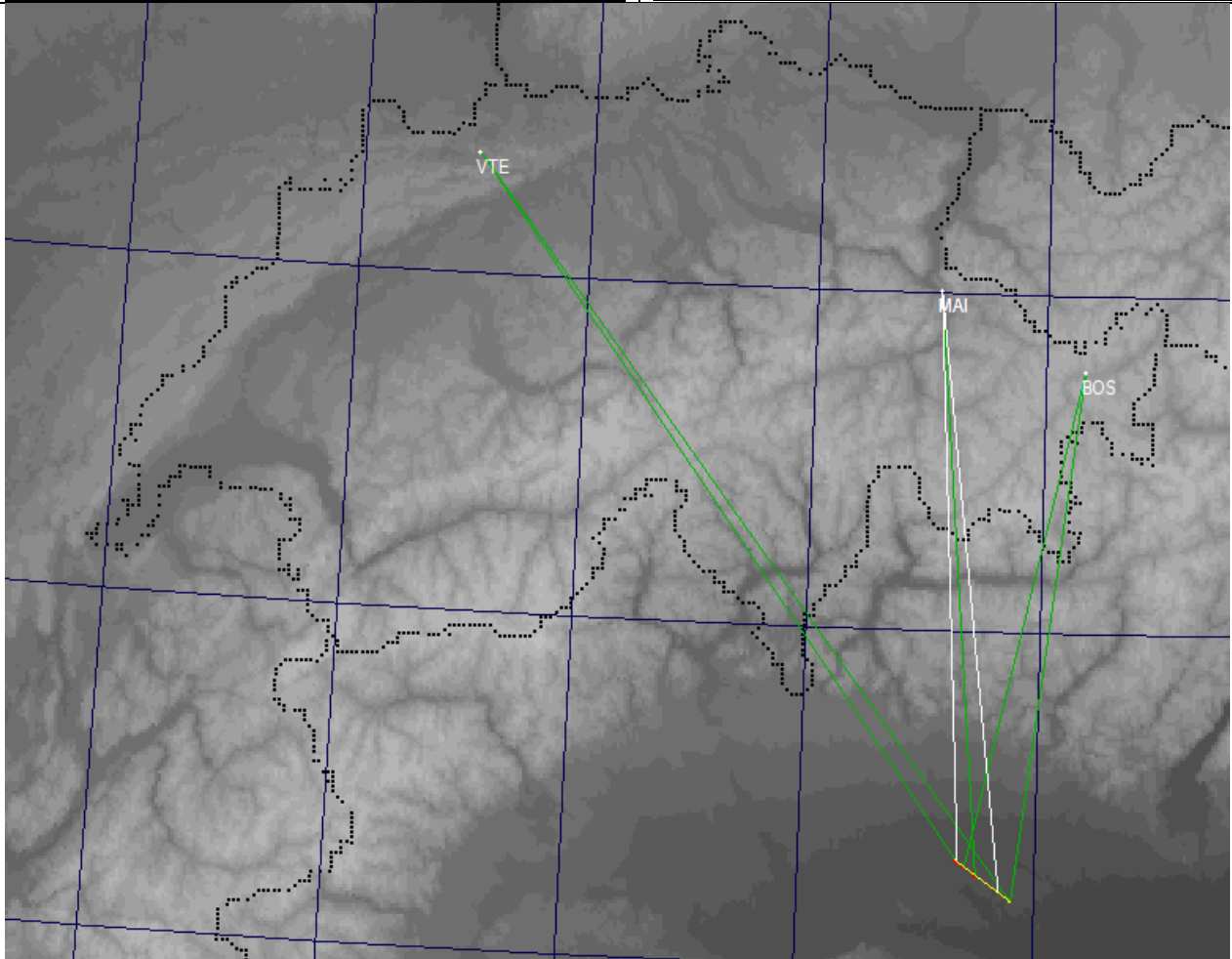
Full spectrum:



1st order:



M20180131_030534_MAI_2, spo, -3.8m (MAI_2)

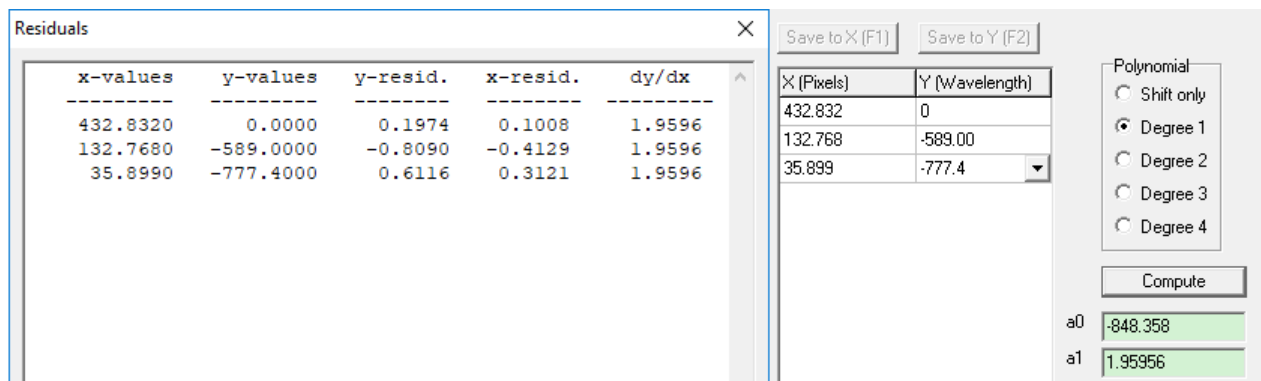
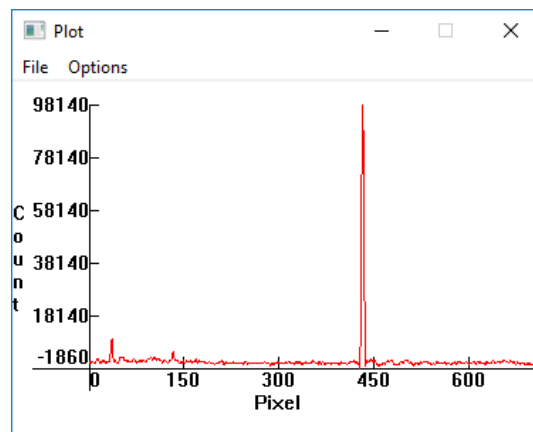


VirtualDub Export BMP: m_0...m_120.BMP

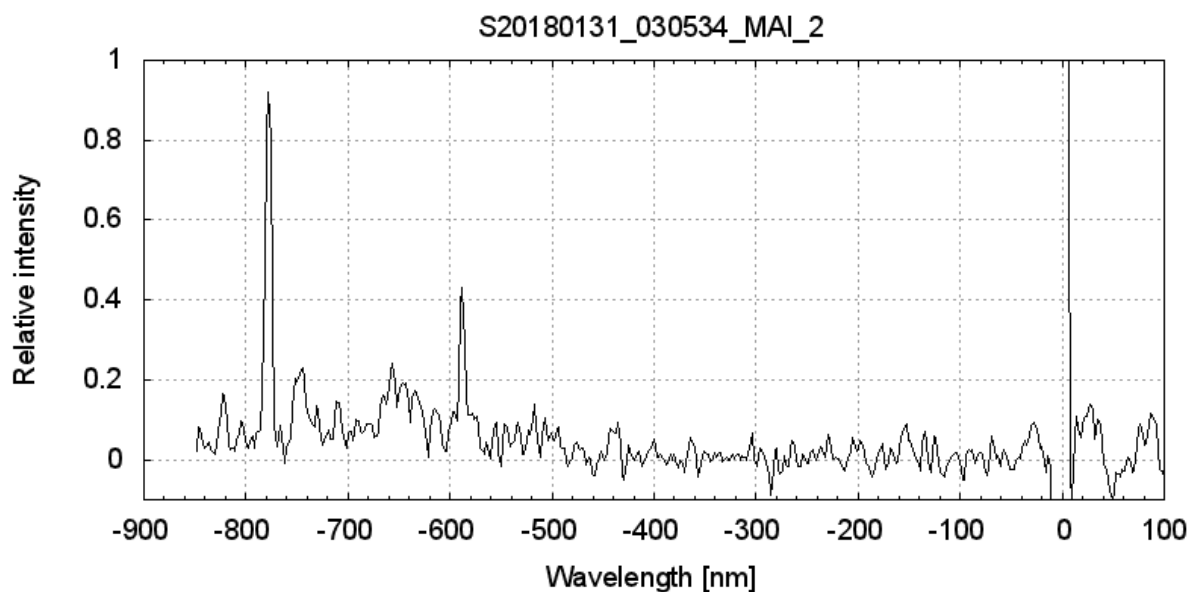
```
>loadbmp24bw m_50
>RUN M_BACK m_back 40 0.025
>visu 50 0
>savejpg back 2
>RUN M_DARK m_back mb 51 20
>add2 mb 20
>visu 500 -100
>savejpg madd20 2
```

Transformation to orthographic projection with ImageTools (P. Schlatter proprietary software)

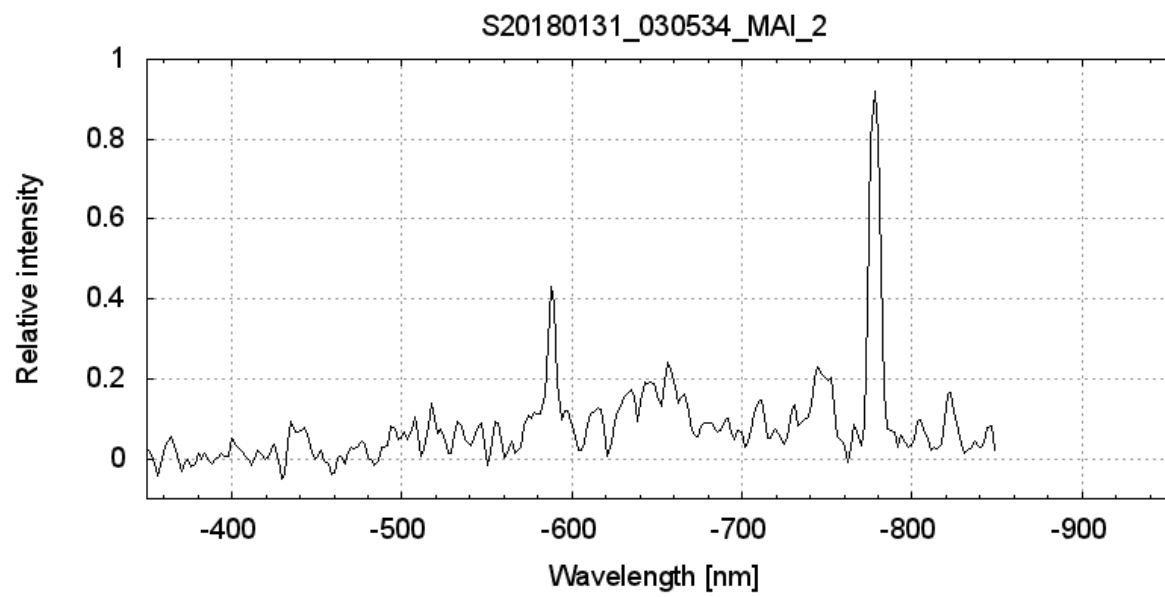
```
>load d11_mb1
>register d11_mb r 20
>add2 r 18
>offset -6
>visu 500 0
>save addr18o
>slant 94 10
>load addr18o
>save addr18os
>savejpg addr18os 2
>l_add 91 99
>l_plot
```



Full spectrum:



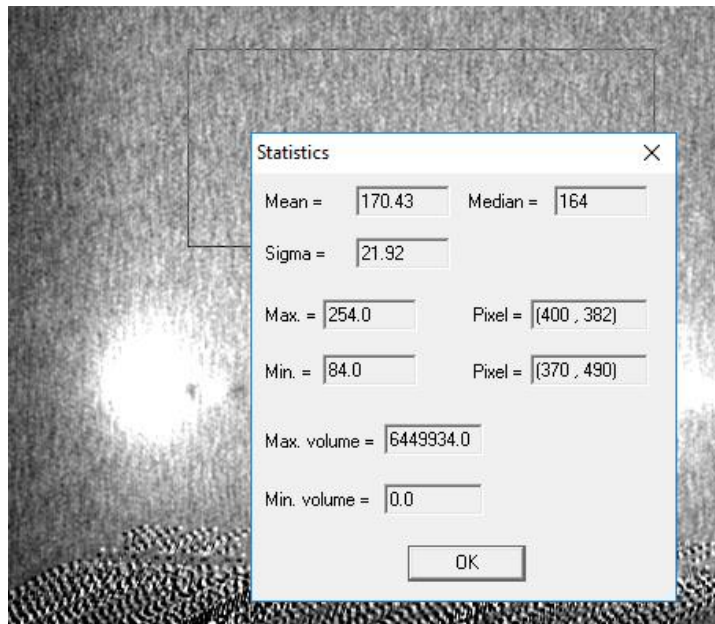
Negative 1st Order:



M20180207_020515_MAI_2, spo, -5.6m

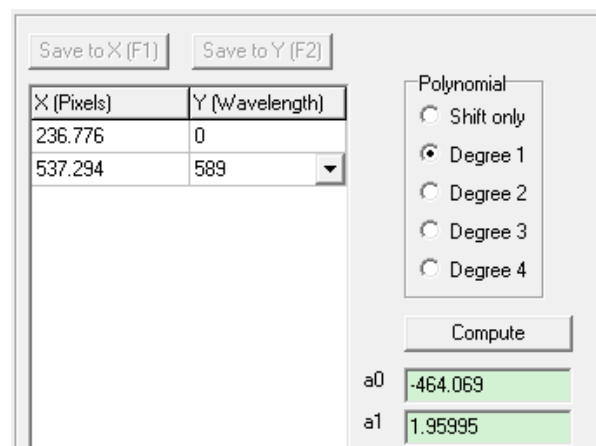


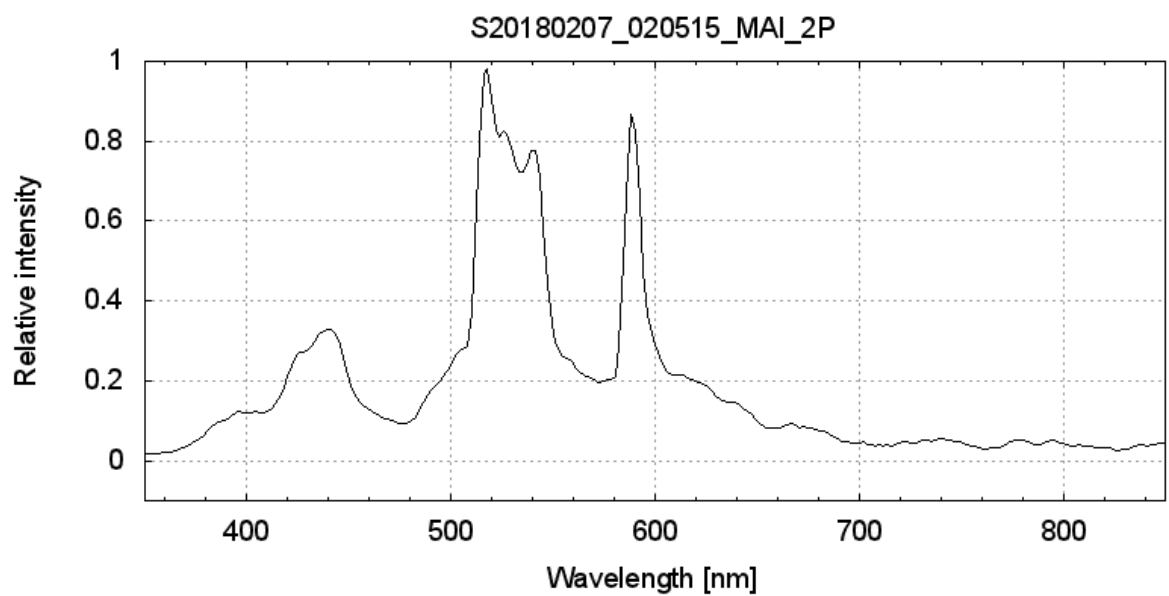
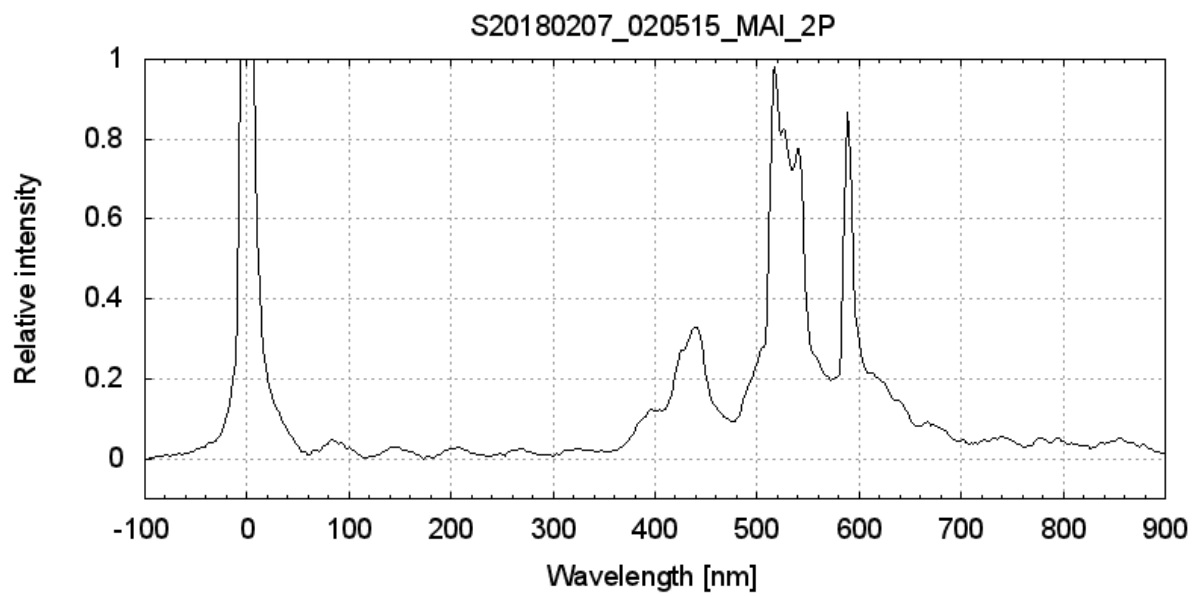
```
>loadbmp24bw m_50
>RUN M_BACK m_ back 40 0.025
>visu 50 0
>savejpg back 2
>RUN M_DARK m_ back mb 51 140
>add2 mb 140
>visu 1000 0
>savejpg mbadd140 2
ImageTools same as previous (d11_)
>load d11_mb1
>register d11_mb r 140
>add2 r 132 → →
>offset2 r ro -1.3 140
>add2 ro 132
>visu 10000 0
>save addro132
>savejpg addro132 2
>offset -80
>save addroo132
>l_add 272 280
>l_plot
>load r132
```



Ohne 1. Teil, grösserer Bereich

```
>load d11_mb31
>reindex d11_mb rr 51 1 90
>offset2 rr rro -2 90
>load rro1
>register rro rrr 90
>add2 rrr 86
>save add2rro86
>savejpg add2rro86 2
>visu 7000 0
>l_add 221 229
>l_plot
```





M20180406_233426_MAI_2, spo, -2.7m



Problem with storage of spectrum: harddisk storage interrupted, file cannot be opened with VLC or XmediaRecode. Solution: use VirtualDub to clip file to useful length, only 37 fields, part of the spectrum missing (0.5 sec duration instead of 1.4 sec)!

VirtualDub: Bob Doubler none (alternate fields, 0 – 71)

>loadbmp24bw m_52

>RUN M_BACK m_ back 40 0.025

>visu 50 0

>savejpg back 2

>RUN M_DARK m_ back mb 53 10

>add2 mb 19

>visu 255 0

>savejpg mbadd19 2

ImageTools d11_

>load d11_mb1

>register d11_mb r 19

>add2 r 19

>offset2 r ro -0.3 19

>offset -6

>visu 1000 0

>save addr19

>savejpg addr19 2

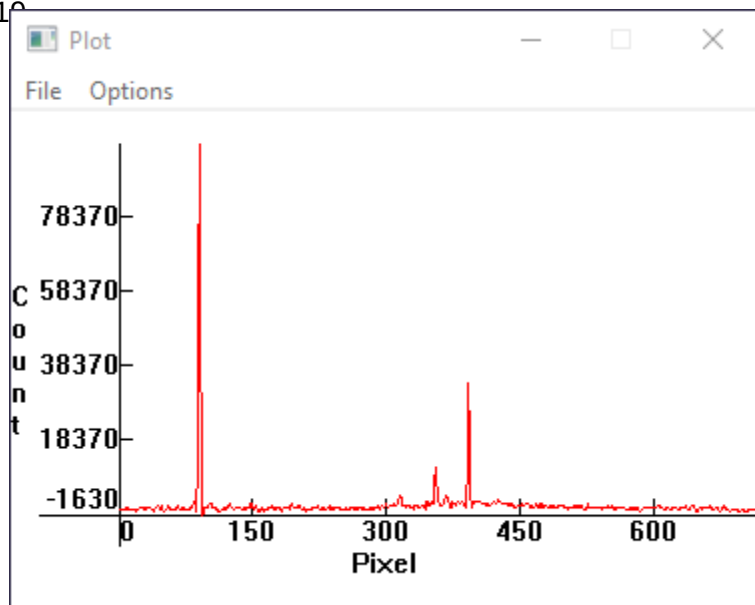
>load addr19

>slant 554 12

>save addr19s

>I_add 550 560

>I_plot



Residuals

x-values	y-values	y-resid.	x-resid.	dy/dx
90.4740	0.0000	-0.0028	-0.0014	1.9487
356.1740	517.8000	0.0230	0.0118	1.9487
392.7330	589.0000	-0.0202	-0.0104	1.9487

Save to X [F1]

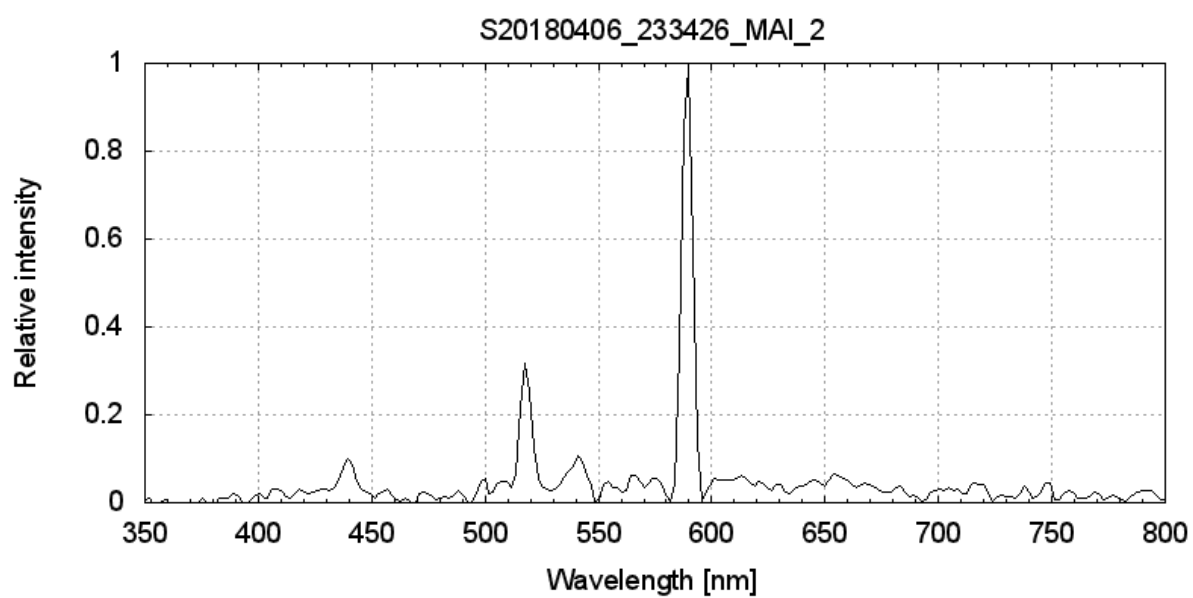
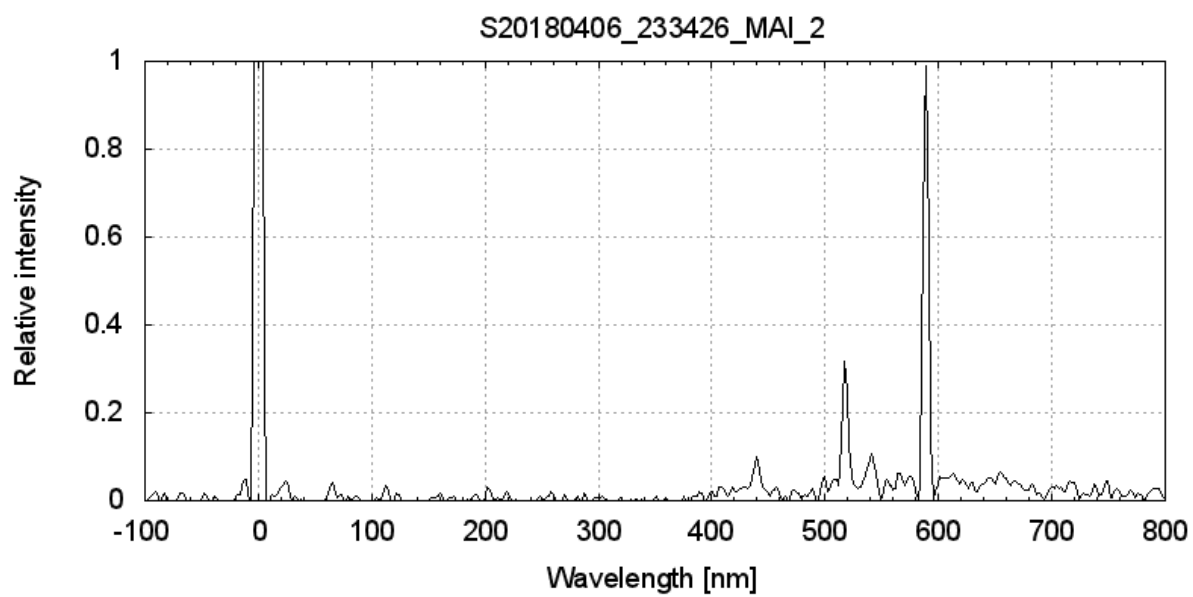
Save to Y [F2]

X (Pixels)	Y (Wavelength)
90.474	0.00
356.174	517.8
392.733	589

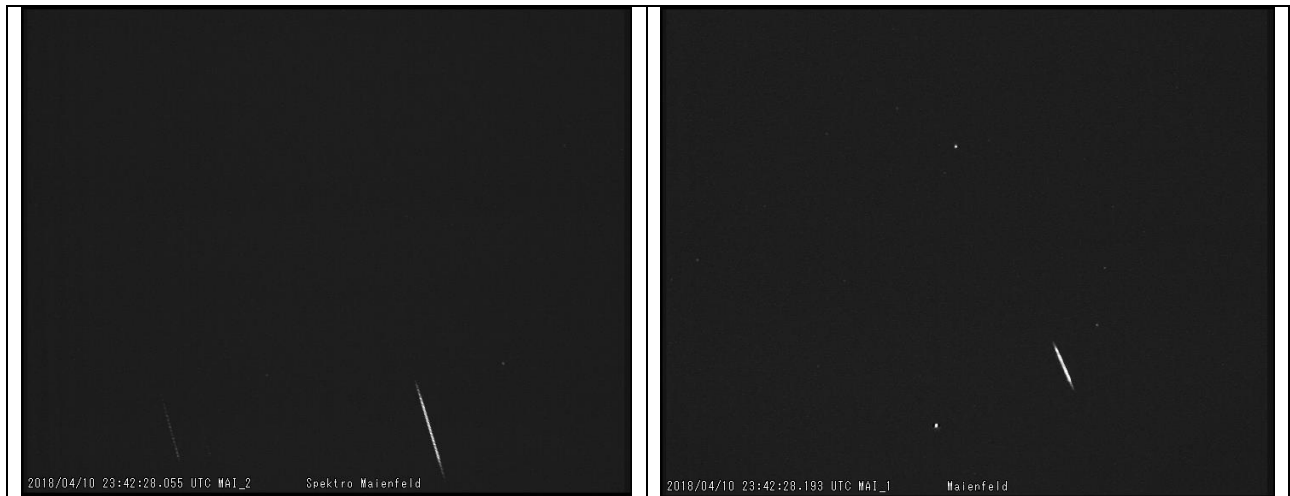
Polynomial
☐ Shift only
☒ Degree 1
☐ Degree 2
☐ Degree 3
☐ Degree 4

Compute

a0: -176.305
a1: 1.94872



M20180410_234228_MAI_2, spo, -2.4m



```
>loadbmp24bw m_110
>RUN M_BACK m_ back 40 0.025
>visu 50 0
>savejpg back 2
>RUN M_DARK m_ back mb 51 60
>add2 mb 60
>visu 512 0
>savejpg mbadd60 2
```

```
>load d11_mb1
>register d11_mb r 70
>add2 r 50
>offset -18
>visu 1000 0
>save addr50
>savejpg addr50 2
>load addr50
>slant 136 12
>save addr50s
>I_add 134 142
>I_plot
```

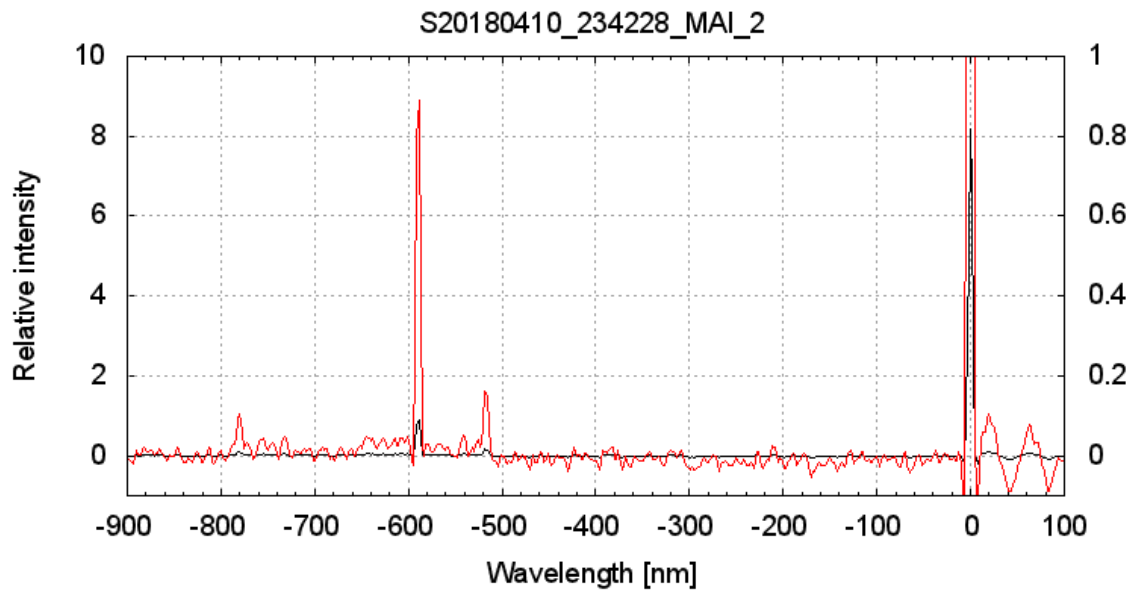
x-values	y-values	y-resid.	x-resid.	dy/dx
464.1990	0.0000	0.0798	0.0405	1.9678
201.4340	-517.8000	-0.6495	-0.3301	1.9678
164.6320	-589.0000	0.5697	0.2895	1.9678

X (Pixels)	Y (Wavelength)
464.199	0.00
201.434	-517.8
164.632	-589.00

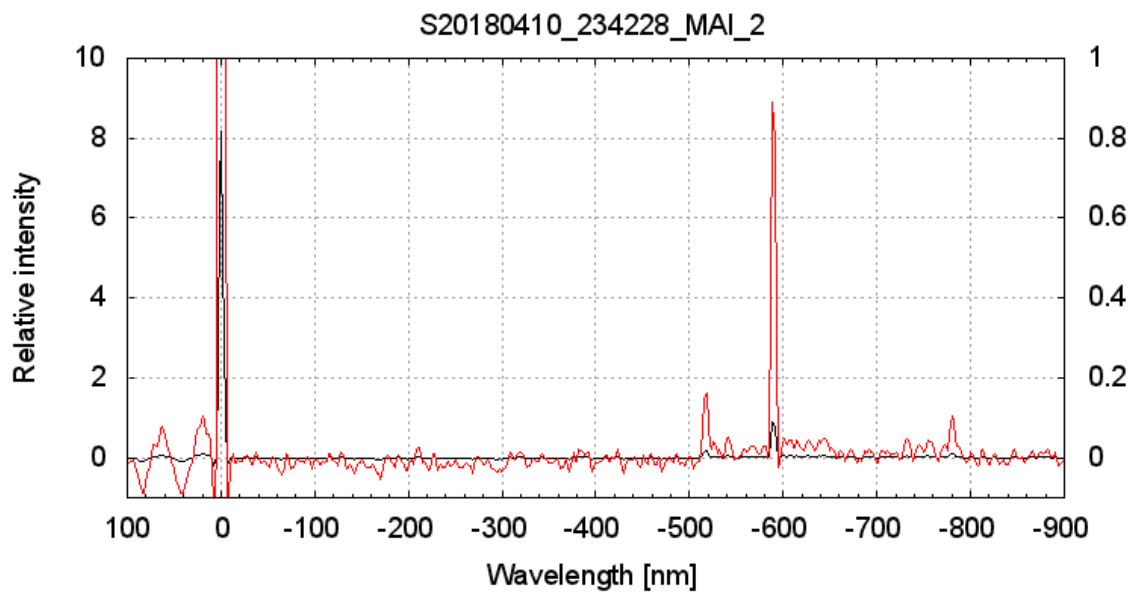
Polynomial
☐ Shift only
☒ Degree 1
☐ Degree 2
☐ Degree 3
☐ Degree 4

Compute

a0
a1



Full spectrum, -1st order (red: x10 scaled)



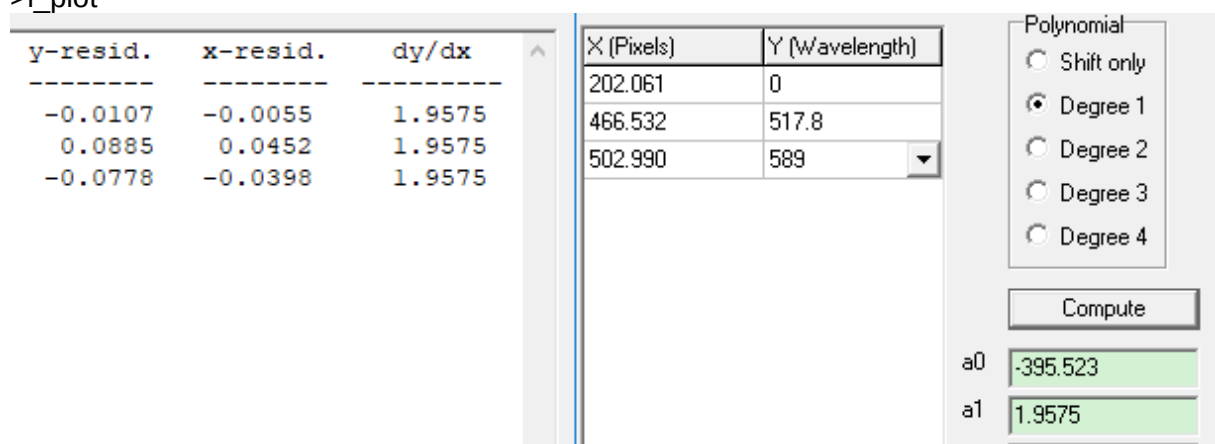
-1st order, scale inverted

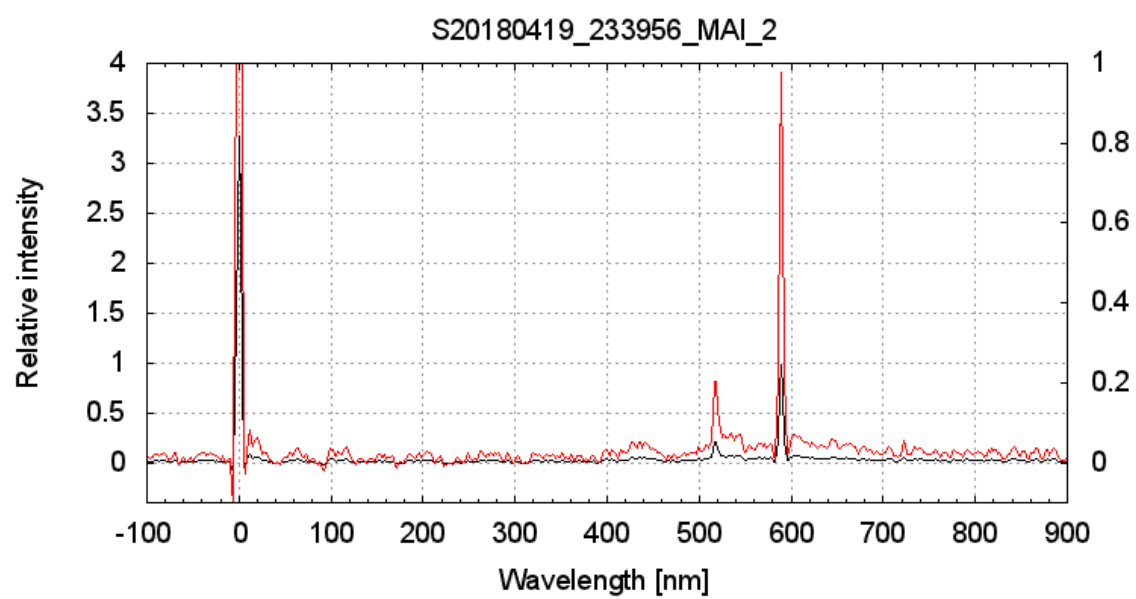
M20180419_233956_MAI_2, spo, -2.4m



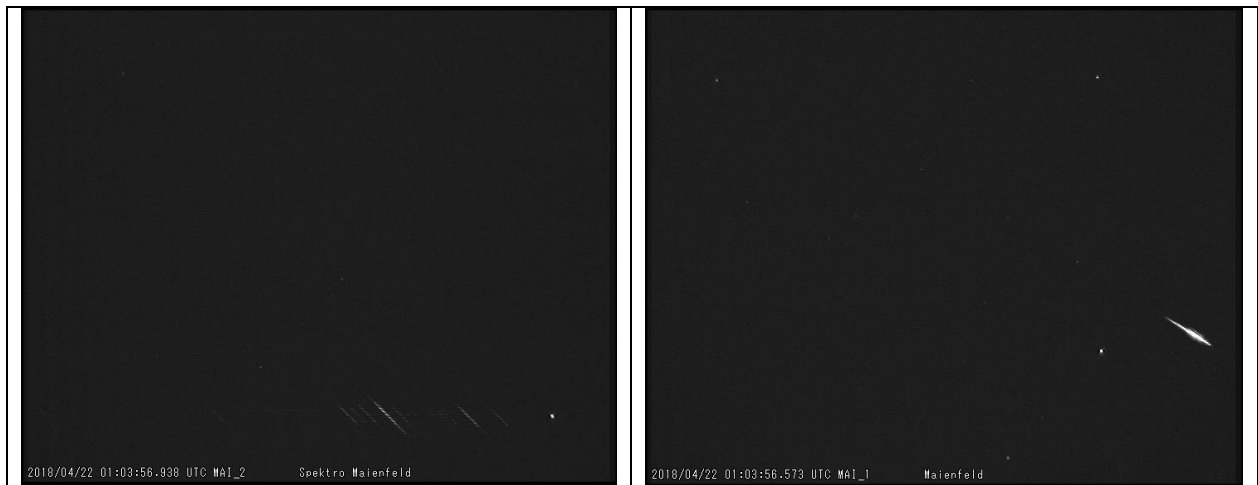
```
>loadbmp24bw m_120
>RUN M_BACK m_back 40 0.025
>visu 50 0
>savejpg back 2
>RUN M_DARK m_back mb 51 70
>add2 mb 70
>visu 512 0
>savejpg mbadd70 2
```

```
>load d11_mb1
>register d11_mb r 70
>add2 r 70
>offset -14
>visu 1000 0
>save addr70
>savejpg addr70 2
>l_add 215 223
>l_plot
```





M20180422_010356_MAI_2, LYR, -3.1m



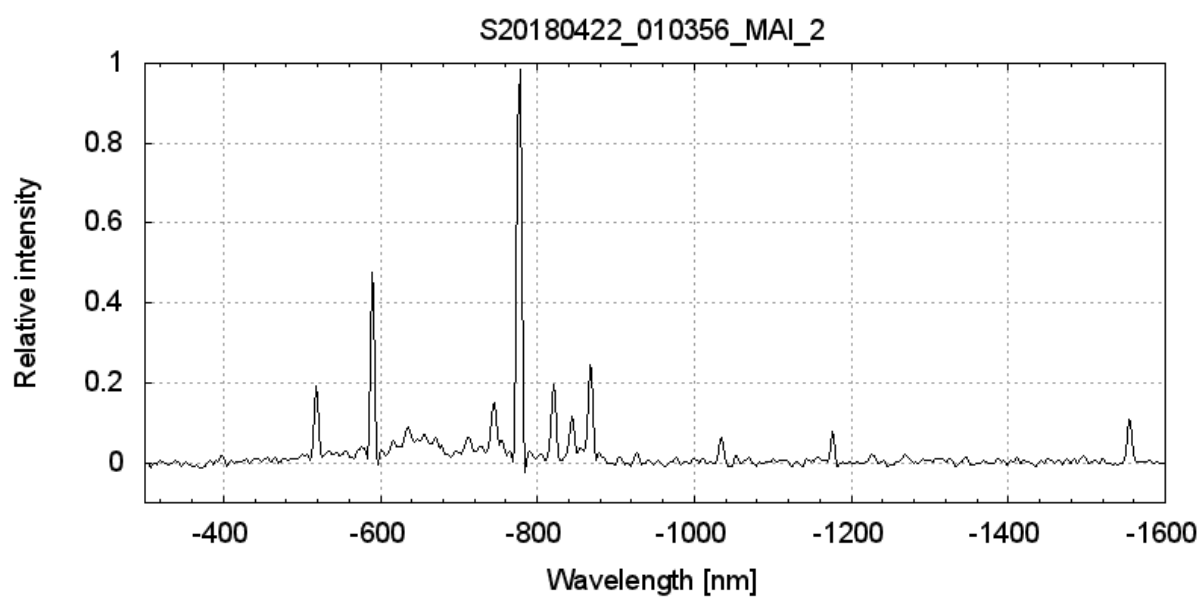
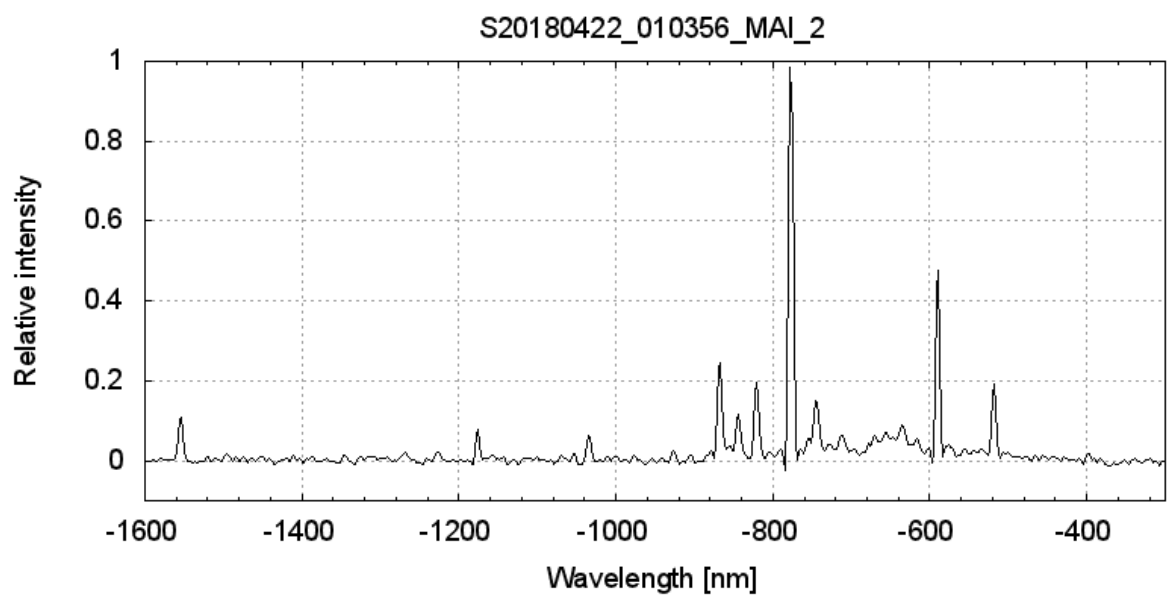
```
>loadbmp24bw m_51
>RUN M_BACK m_ back 40 0.025
>visu 50 0
>savejpg back 2
>RUN M_DARK m_ back mb 51 20
>add2 mb 20
>savejpg mbadd20 2
```

```
>load d11_mb1
>register d11_mb r 20
>add2 r 20
>offset -7
>visu 1000 0
>save addr20
>savejpg addr20 2
>load addr20
>slant 104 20
>save addr20s
>l_add 100 108
>l_plot
```

y-resid.	x-resid.	dy/dx
0.9116	0.4645	1.9623
0.6109	0.3113	1.9623
-1.6704	-0.8512	1.9623
-1.7517	-0.8927	1.9623
1.8996	0.9680	1.9623

X (Pixels)	Y (Wavelength)
557.821	-517.8
521.691	-589.00
295.268	-1035.6
222.743	-1178.00
29.580	-1553.4

Polynomial	
☐	Shift only
☒	Degree 1
☐	Degree 2
☐	Degree 3
☐	Degree 4
Compute	
a0	-1613.346
a1	1.96234



M20180423_005849_MAI_2, ?,(-4.4m)



```
>loadbmp24bw m_55
>RUN M_BACK m_ back 40 0.025
>visu 50 0
>savejpg back 2
>RUN M_DARK m_ back mb 51 20
>add2 mb 20
>savejpg mbadd20 2
```

```
>load d11_mb1
>register d11_mb r 20
>add2 r 20
>offset -7
>visu 1000 0
>save addr20
>savejpg addr20 2
>load addr20
>slant 278 10
>save addr20s
>l_add 274 282
>l_plot
```

y-resid.	x-resid.	dy/dx
0.0016	0.0008	1.9634
-0.0022	-0.0011	1.9634
0.0006	0.0003	1.9634

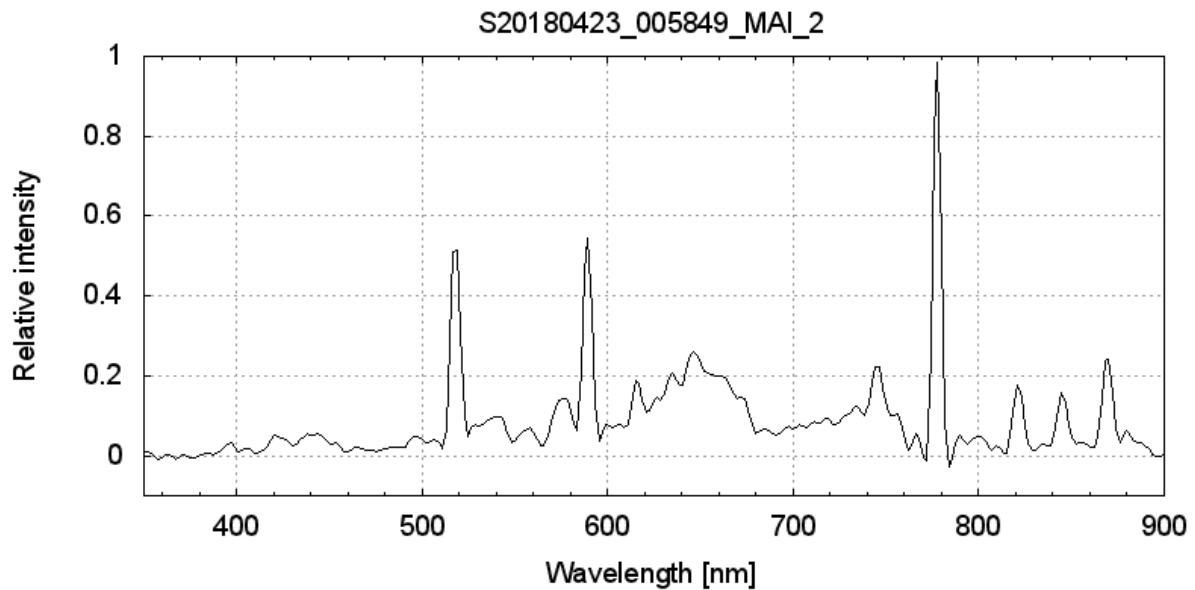
X (Pixels)	Y (Wavelength)
263.541	517.8
299.806	589
395.759	777.4

☐ Shift only
☒ Degree 1
☐ Degree 2
☐ Degree 3
☐ Degree 4

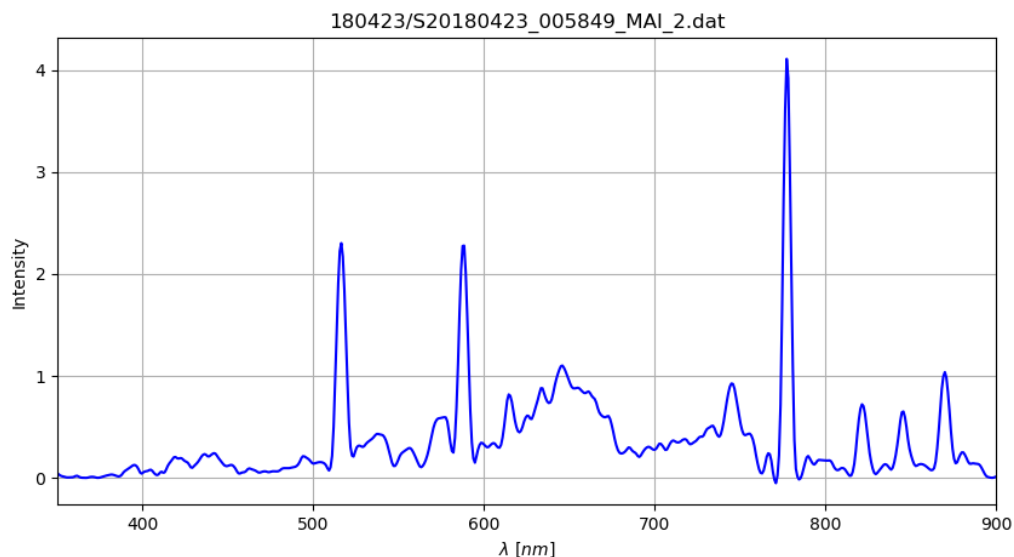
Compute

a0 0.354

a1 1.96343



Processed with IRIS, ImageTools and Python:



The file addr20.fit was renamed into Python format r_add20.fit The image format (3color 8bit image was not read correctly in Python because it accepts only values 0-255, but intensity was in the range -262 to +1496. It was multiplied by 0.17 in order to eliminate overflow →rc_add20.fit

```
>>> run m_spec.py
```

```
***-> path processed images: [out]: 180423
```

```
***-> registered file name: [r]: rc
```

```
***-> select added file for spectrum: [180423/rc_add] add number: 20
```

```
DATE-OBS 2018-04-23T12:00:00.000
```

```
OBSERVER Martin Dubs
```

```
INSTRUME Watec902H2ultimate
```

```
TELESCOP Fujinon_YV
```

```
BSCALE 1
```

```
BZERO 32768
```

```
278 +/- 5 0 0
```

```
278 +/- 4 0 0
```

```
278 +/- 4 0 0
```

```
lmin = 274, lmax = 282, 9 rows
```

```

tilt = 0, slant = 0
FWHMP = 4.451 G = 4.576
***-> line wavelength [nm]: 515.5
FWHMP = 4.228 G = 4.613
***-> line wavelength [nm]: 589
FWHMP = 3.751 G = 3.534
***-> line wavelength [nm]: 777.4
table
[(263.4327599605832, 515.5), (299.8338450948564, 589.0), (395.9356070721282, 777.4)]
saved as 180423/rc_add20.txt,
edit if necessary before proceeding with calibration
***-> line list: [180423/rc_add20], .txt added:
***-> polynom degree: [1] set 0 for single line calibration:
c Peak =: [ 1.973 -3.581]
rms_x = 0.7104
pixel lambda error
[[263.43 515.5 0.705]
[299.83 589. -0.972]
[395.94 777.4 0.267]]
***-> plot spectrum, path and filename [180423/rc_add20cal2].dat, q for quit:
180423/S20180423_005849_MAI_2
***-> min Lambda: [-2]nm, enter new value: 350
***-> max Lambda: [1415]nm, enter new value: 900
***-> repeat calibration: [r] or quit q:

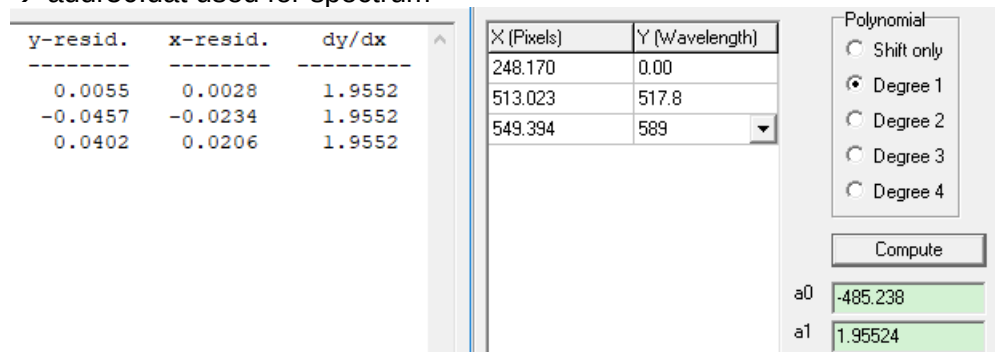
```

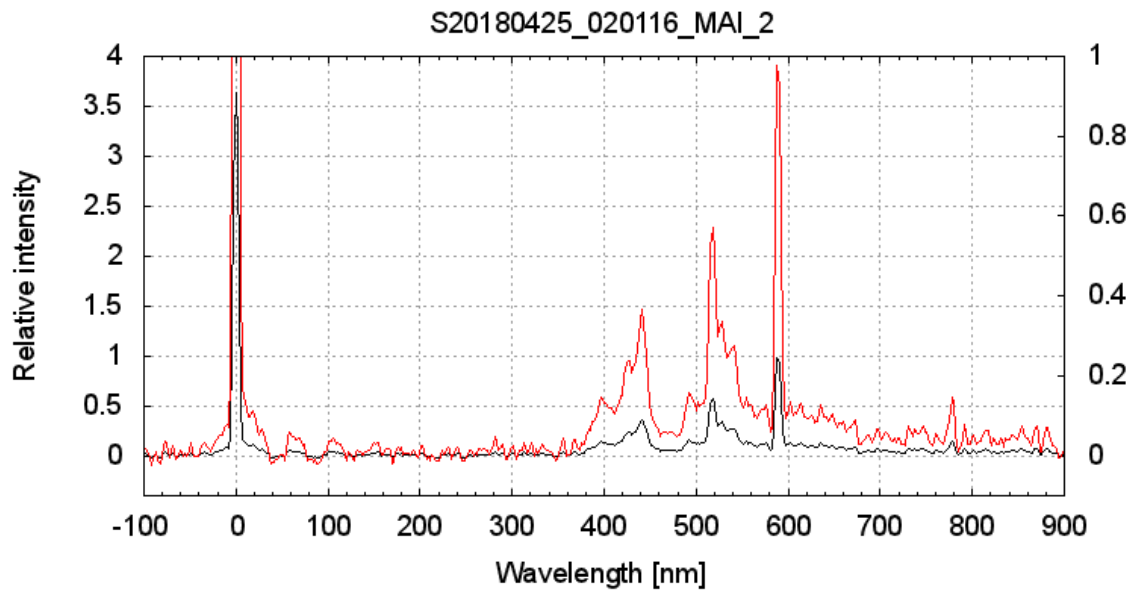
M20180425_020116_MAI_2, spo, -4.3m



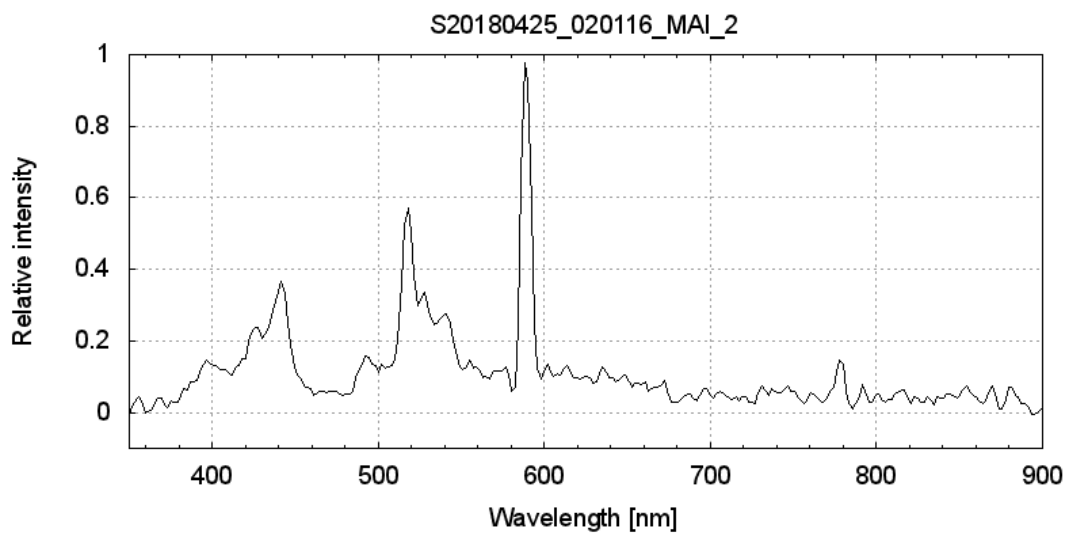
```
>loadbmp24bw m_120
>RUN M_BACK m_ back 40 0.025
>visu 50 0
>savejpg back 2
>RUN M_DARK m_ back mb 51 70
>add2 mb 70
>visu 512 0
>savejpg mbadd70 2
```

```
>load d11_mb1
>register d11_mb r 70
>add2 r 70
>offset -13
>visu 1000 0
>save addr70
>savejpg addr70 2
>l_add 289 297
>l_plot
>reindex d11_mb rr 21 1 50
>load rr1
>register rr ri 50
>add2 ri 50
>offset -11
>save addr50
>savejpg addr50 2
>l_add 277 285
>l_plot
→ addr50.dat used for spectrum
```

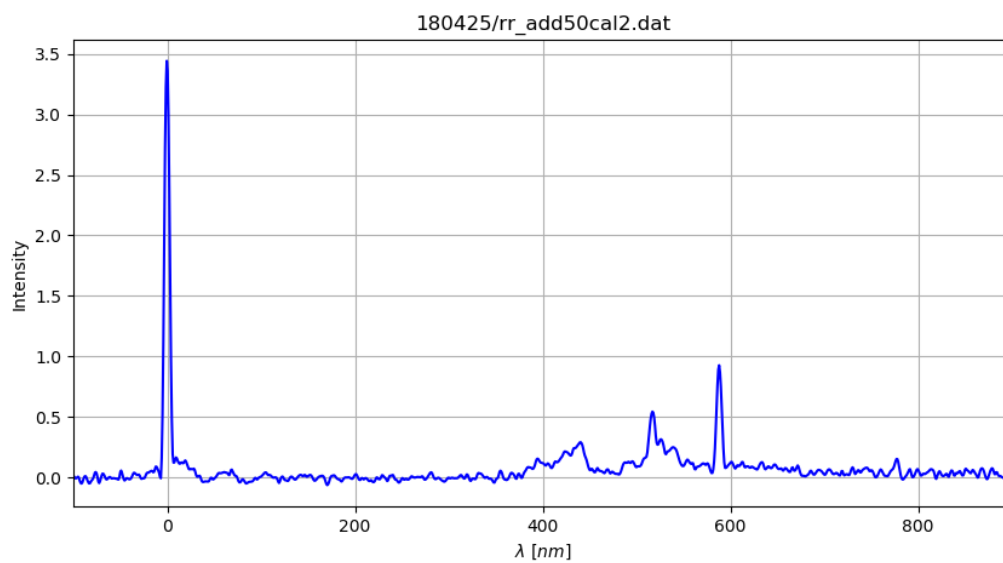




Red: 4x scaled



Processed with Python:

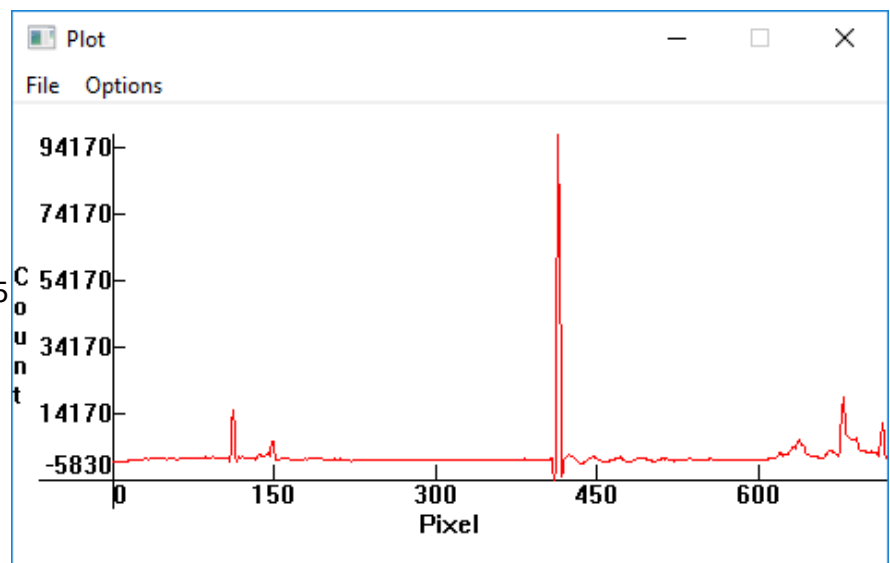


M20180620_204043_MAI_2, spo, -3.5m



```
>loadbmp24bw m_51
>RUN M_BACK m_ back 40 0.025
>visu 200 0
>savejpg back 2
>RUN M_DARK m_ back mb 51 80
>add2 mb 80
>visu 512 0
>savejpg mbadd80 2
```

```
>load d11_mb25
>register d11_mb r 80
>add2 r 80
>offset -30
>visu 3000 0
>save addr80
>savejpg addr80 2
>l_add 555 565
>l_plot
>reindex d11_mb rr 26 1 55
>load rr1
>register rr ri 55
>add2 ri 55
>offset -21
>save addr55
>savejpg addr55 2
>l_add 447 457
>l_plot → →
```



x-values	y-values	y-resid.	x-resid.	dy/dx
111.8550	-589.0000	0.4502	0.2304	1.9545
148.5670	-517.8000	-0.1027	-0.0525	1.9545
413.8080	0.0000	-0.7110	-0.3638	1.9545
678.3650	517.8000	0.0175	0.0089	1.9545
714.6260	589.0000	0.3460	0.1770	1.9545

X (Pixels)	Y (Wavelength)
111.855	-589.00
148.567	-517.8
413.808	0.00
678.365	517.8
714.626	589

Polynomial

☐ Shift only

☒ Degree 1

☐ Degree 2

☐ Degree 3

☐ Degree 4

Compute

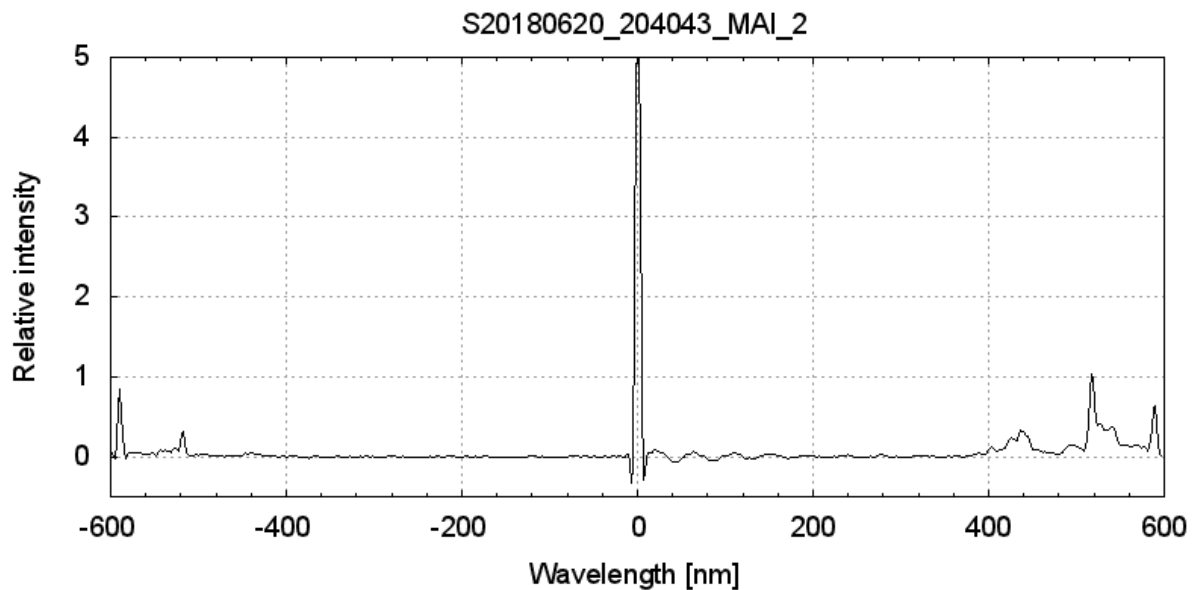
a0 -808.069

a1 1.95448

D11_mbxx Fits Editor incorrect observation date time.

Spectrum addr55.dat analyzed.

Upper part of spectrum partly cut-off (out of image area), intensity of Na-line not representative



Python, full spectrum analyzed, therefore longer wavelengths missing (out of image area after registering)

c Peak =: [1.9557 -835.57437]

rms_x = 0.9558

pixel lambda fit error

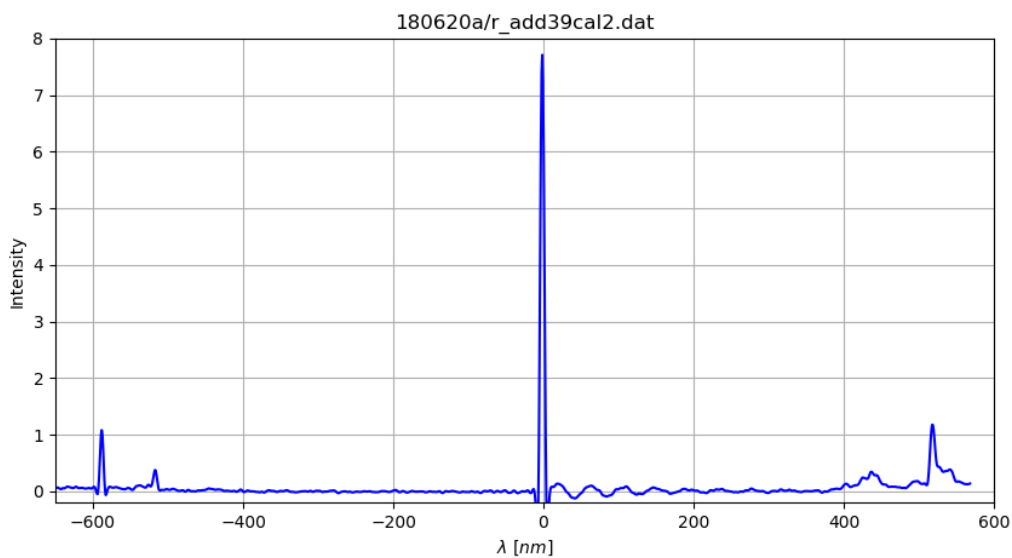
[[126.31 -589. -588.55 0.45]

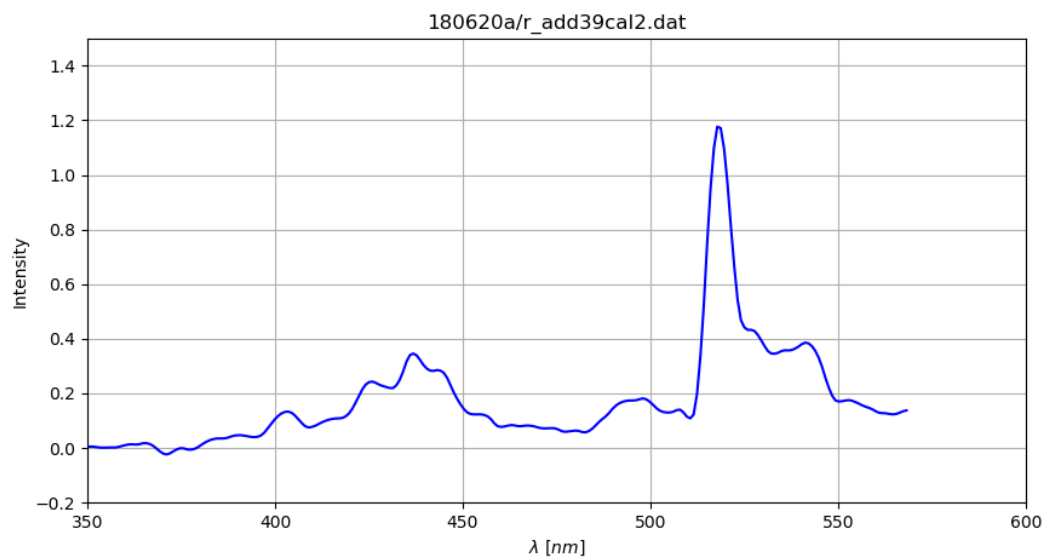
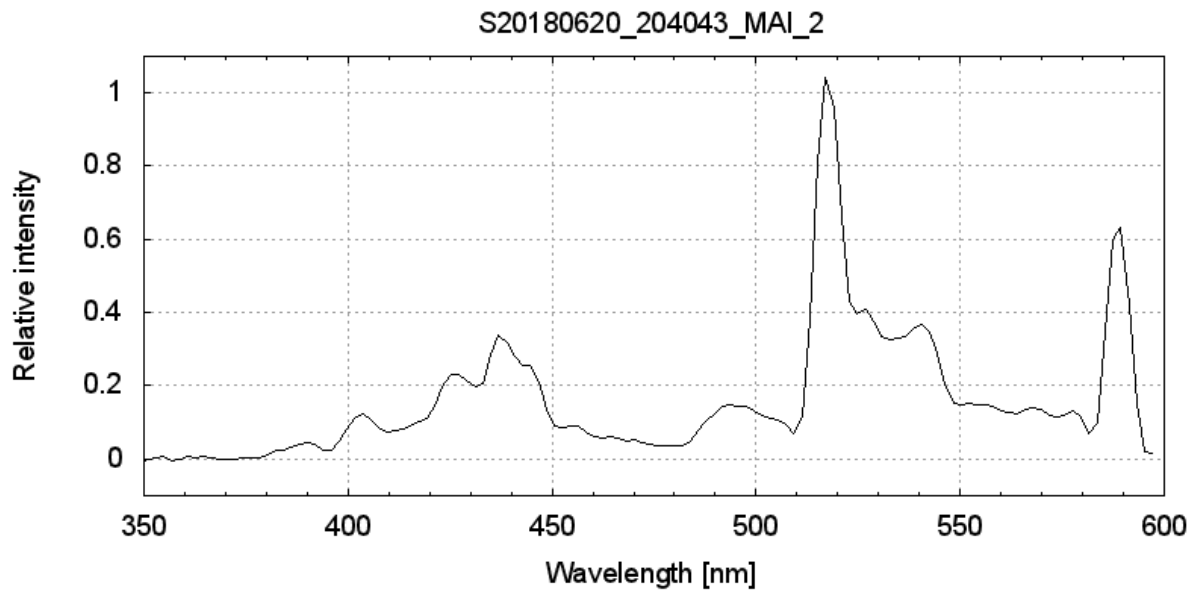
[162.81 -517.5 -517.166 0.334]

[426.42 0. -1.623 -1.623]

[692.29 517.5 518.339 0.839]]

with





Python

M20180813_000444_MAI_2, PER

Analyzed with Python, no slant, bobdoubler 12 images, no MAI_1 image



c Peak =: [1.991 113.634]

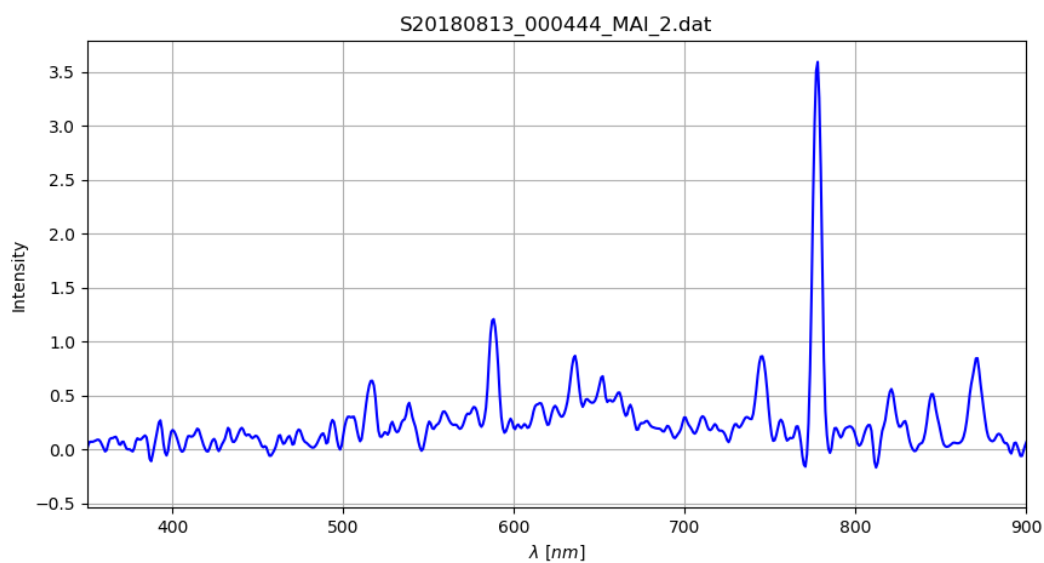
rms_x = 0.0895

pixel lambda error

[[202.86 517.5 0.089]

[238.66 589. -0.123]

[333.35 777.4 0.034]]



Little improvement of resolution with slant 0.35 included

M20180813_011130_MAI_2, PER, -3.9m



c Peak =: [1.965 -970.715]

rms_x = 0.4314

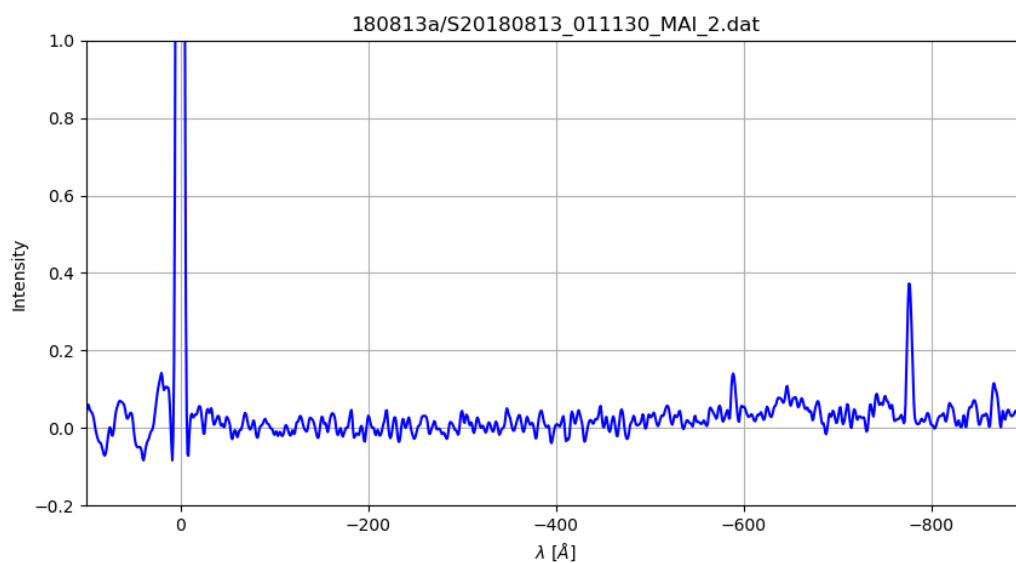
pixel lambda error

[[494.05 0. 0.141]

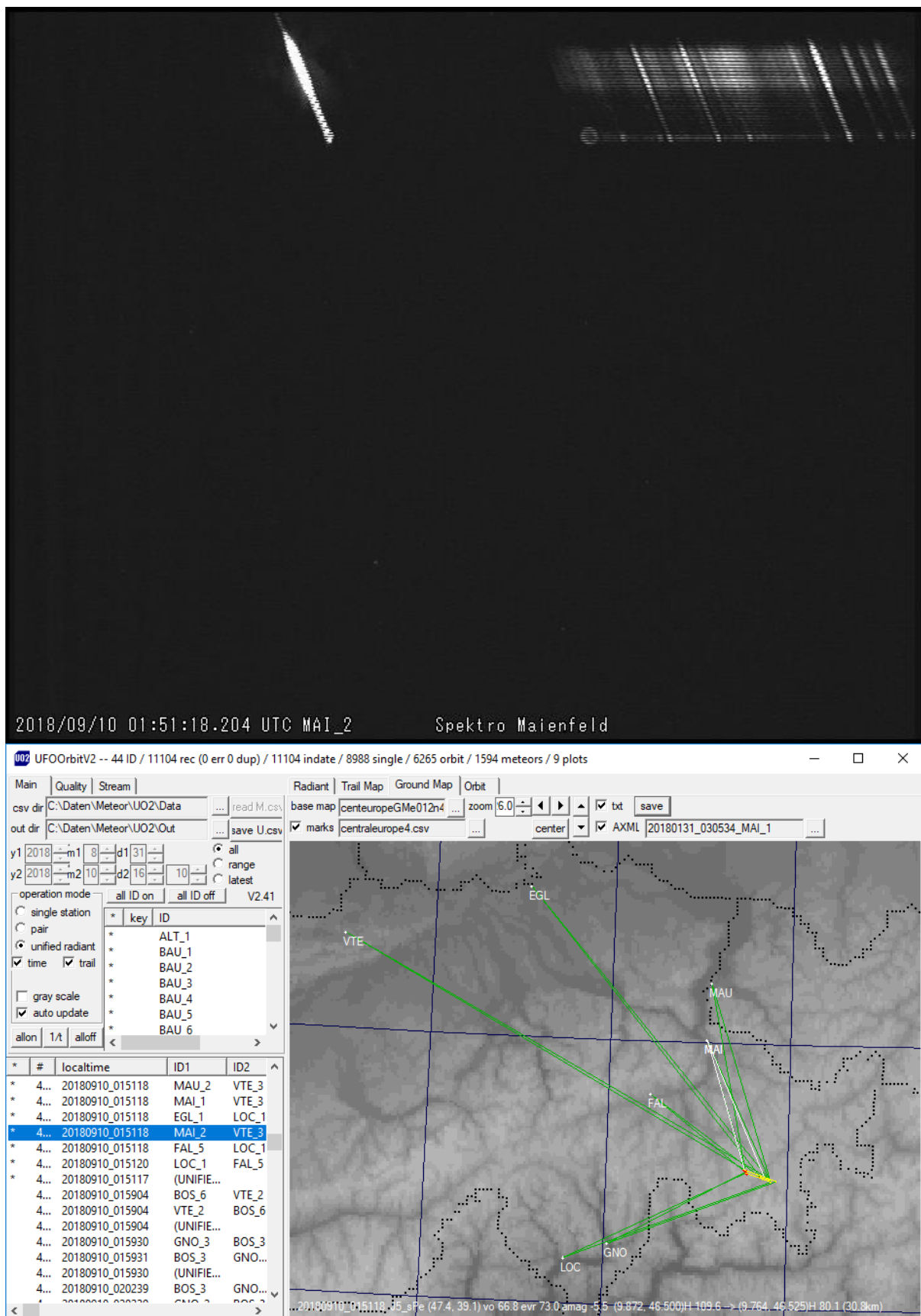
[193.95 -589. -0.584]

[98.6 -777.4 0.444]]

spectrum inverted below, -1st order

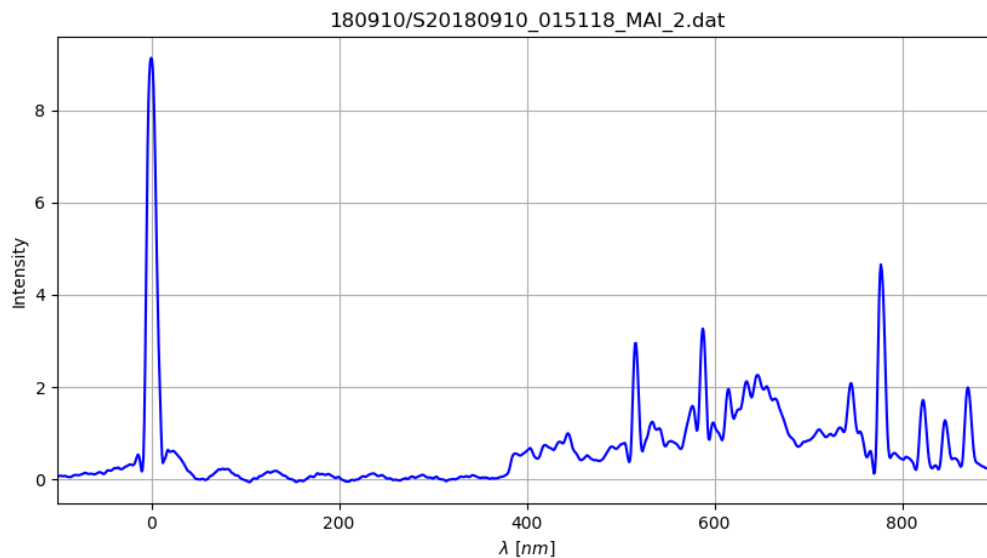


M20180910_015118_MAI_2, SPE, -5.3m

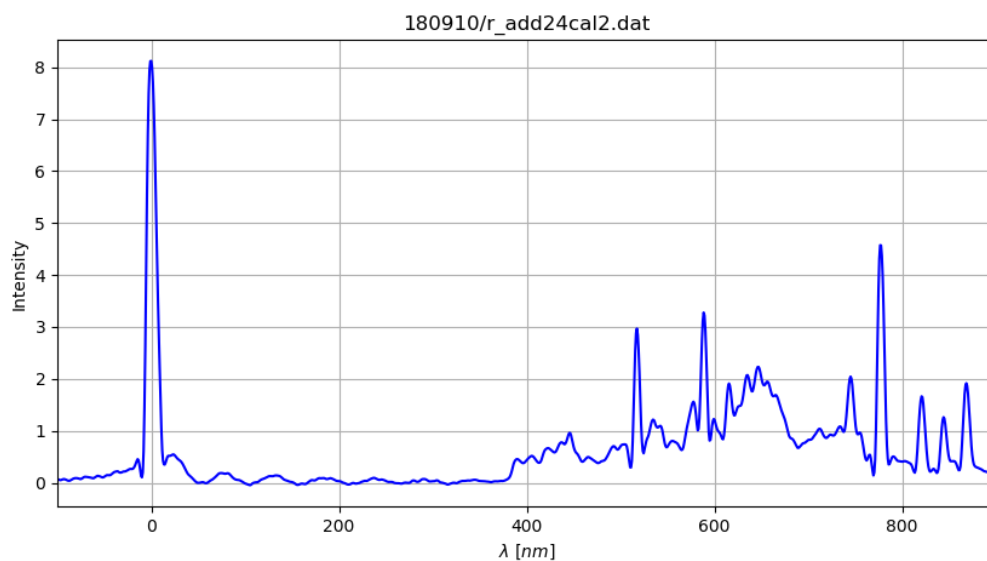


c Peak =: [1.951 -417.35]
 rms_x = 0.8674
 pixel lambda error
 [[214.13 0. 0.475]
 [478.71 517.5 -0.758]
 [515.28 589. -0.9]
 [612.9 777.4 1.183]]

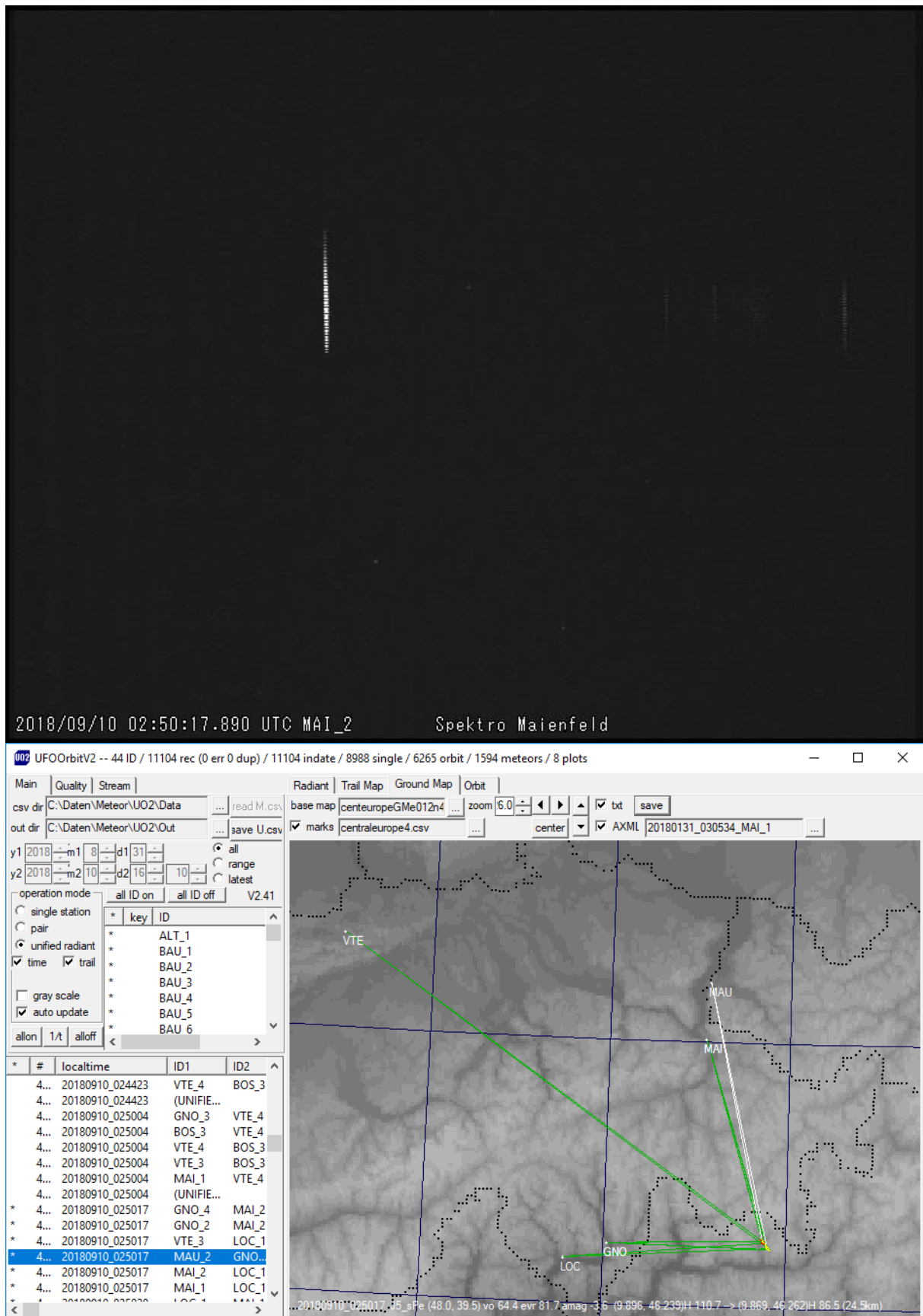
Notice out of focus spectral line of Ca



Improved calibration 2nd order poly: c Peak =: [-5.368e-05 1.994e+00 -4.245e+02]
 rms_x = 0.1900
 pixel lambda error
 [[214.13 0. -0.01]
 [478.71 517.5 0.239]
 [515.28 589. -0.289]
 [612.9 777.4 0.059]]



M20180910_025017_MAI_2, SPE, -3.8m



c Peak =: [1.953 -487.289]

rms_x = 0.6910

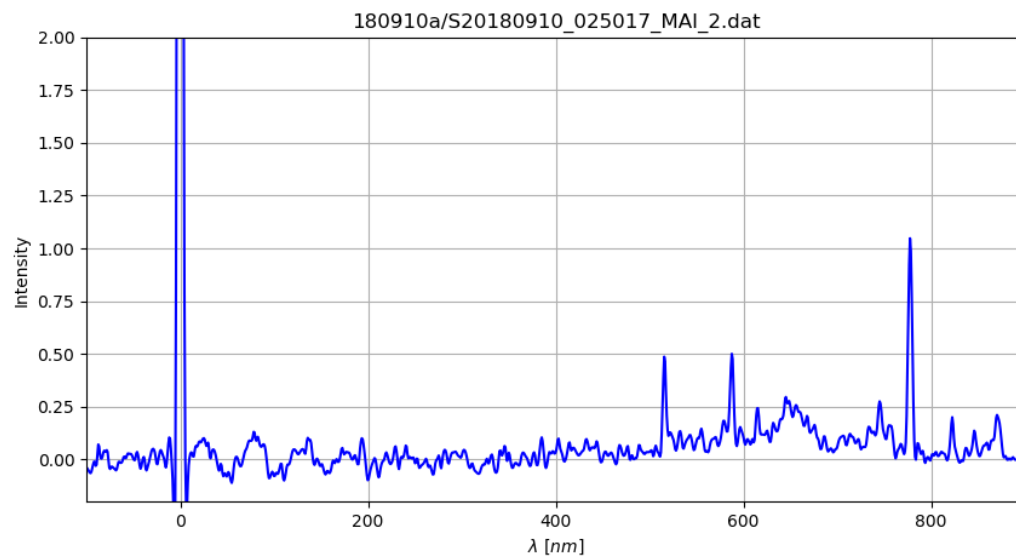
pixel lambda error

[[249.69 0. 0.395]

[514.03 517.5 -0.806]

[550.79 589. -0.508]

[647.98 777.4 0.919]]



2nd order pol is better

c Peak =: [-4.398e-05 1.991e+00 -4.945e+02]

rms_x = 0.0073

pixel lambda error

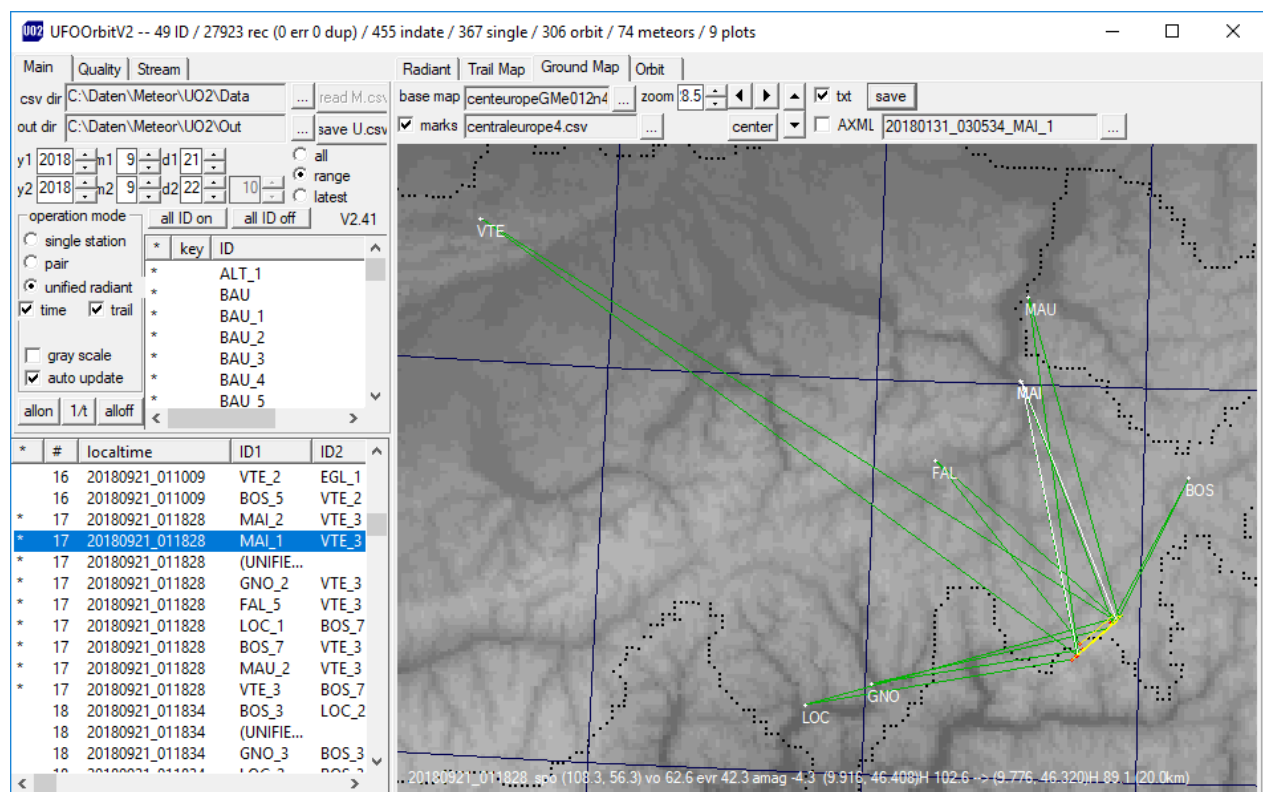
[[249.69 0. -0.]

[514.03 517.5 0.009]

[550.79 589. -0.011]

[647.98 777.4 0.002]]

M20180921_011828_MAI_2 , spo, -3.8m



No slant

lmin = 437, lmax = 449, 13 rows

tilt = 0, slant = 0

FWHMp = 5.300 G = 5.488

***-> line wavelength [nm]: 0

FWHMp = 4.243 G = 4.913

***-> line wavelength [nm]: 515.5

FWHMp = 4.250 G = 5.729

***-> line wavelength [nm]: 777.4

c Peak =: [1.95 -441.146]

rms_x = 0.0612

pixel lambda error

[[226.26 0. 0.029]

Slant corrected

lmin = 437, lmax = 449, 13 rows

tilt = 0, slant = 0.65

FWHMp = 3.393 G = 3.430

***-> line wavelength [nm]: 0

FWHMp = 2.847 G = 2.806

***-> line wavelength [nm]: 515.5

FWHMp = 3.472 G = 4.292

***-> line wavelength [nm]: 777.4

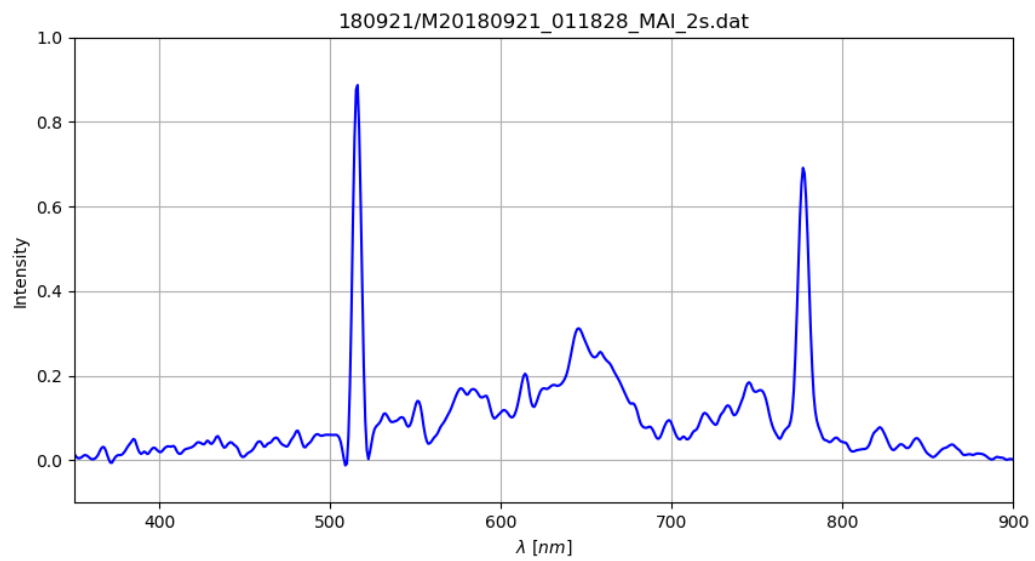
c Peak =: [1.95 -439.847]

rms_x = 0.1521

pixel lambda error

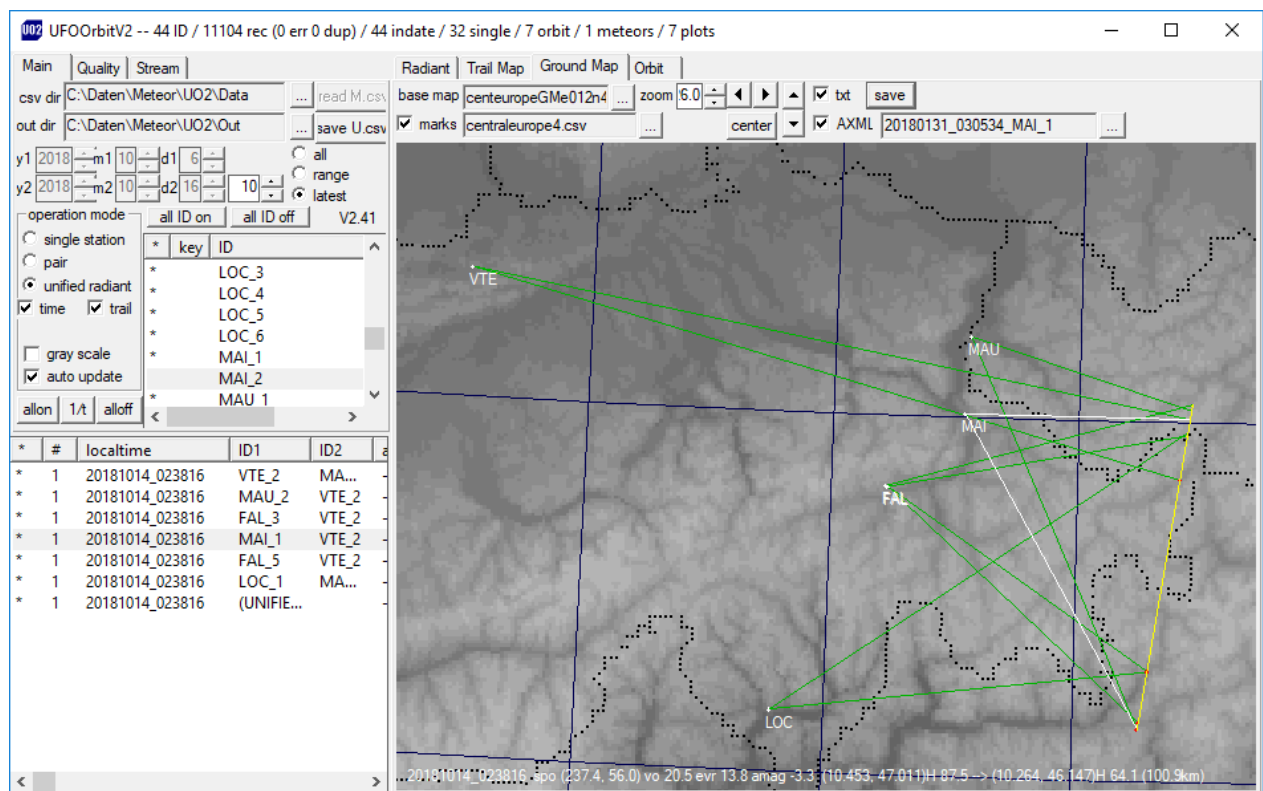
[[225.48 0. -0.071]

[490.58 515.5 -0.085] [624.97 777.4 0.056]]	[489.93 515.5 0.211] [624.03 777.4 -0.14]]
--	--



No Na-line!

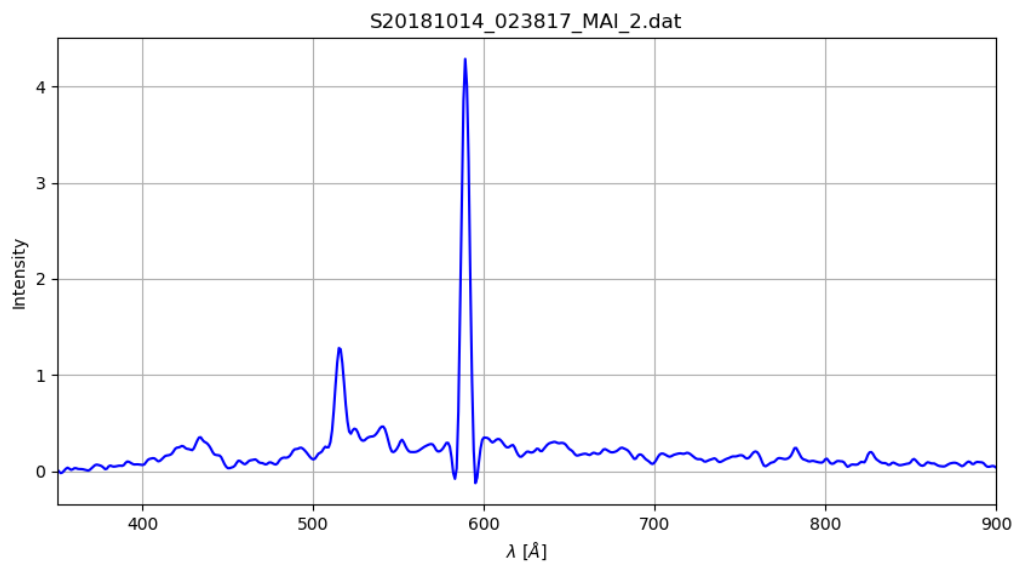
M20181014_023816_MAI_2, spo, -2.9m



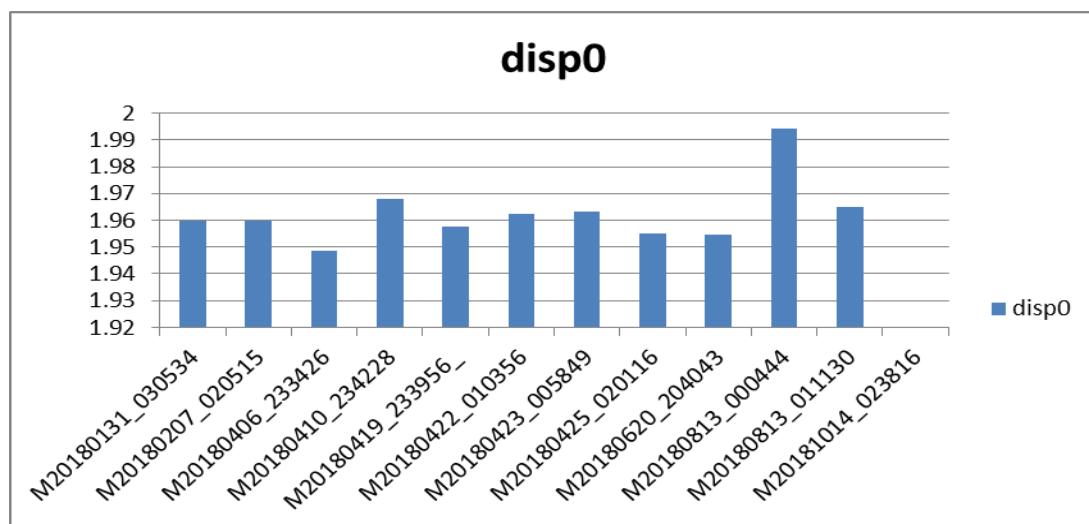
polynom for fit lambda c: [2.04 321.356]

rms_x = 0.0000

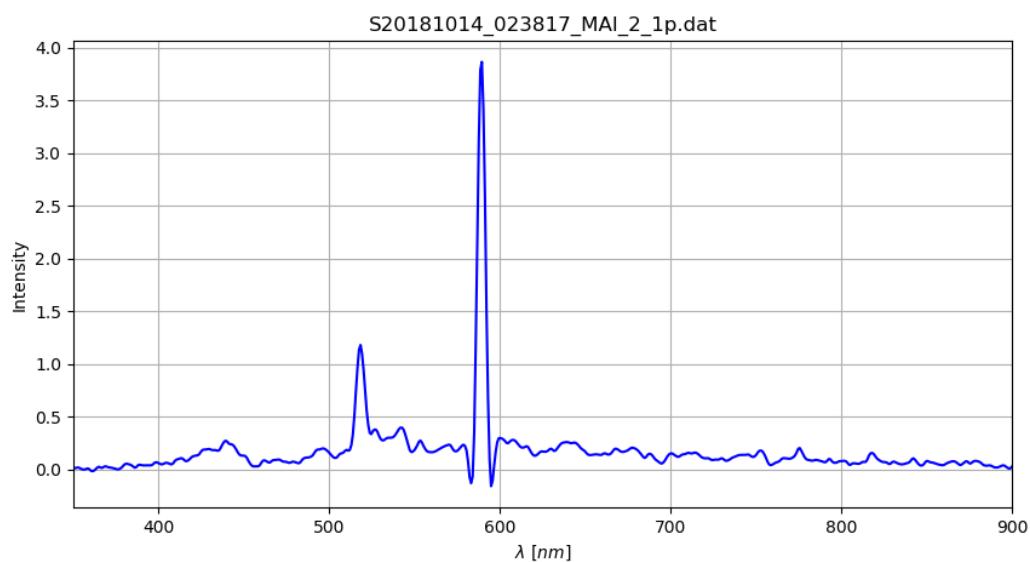
use single line calibration



Dispersion from measured calibration



Average: 1.965 nm/Pixel
 Rms: 0.012 gives improved calibration



Can be improved with 2nd order polynomial, see below
181022, 181106, 181120, 181123
Refine parameters for next meteor spectra

M20181022_221758_MAI_2, spo, -3.5m



14.11.2018

***-> line list: [181022/rr_add23], .txt added: 181022/r_add23

***-> polynom degree: [1] set 0 for single line calibration:

c Peak =: [1.964 -330.588]

rms_x = 0.9677

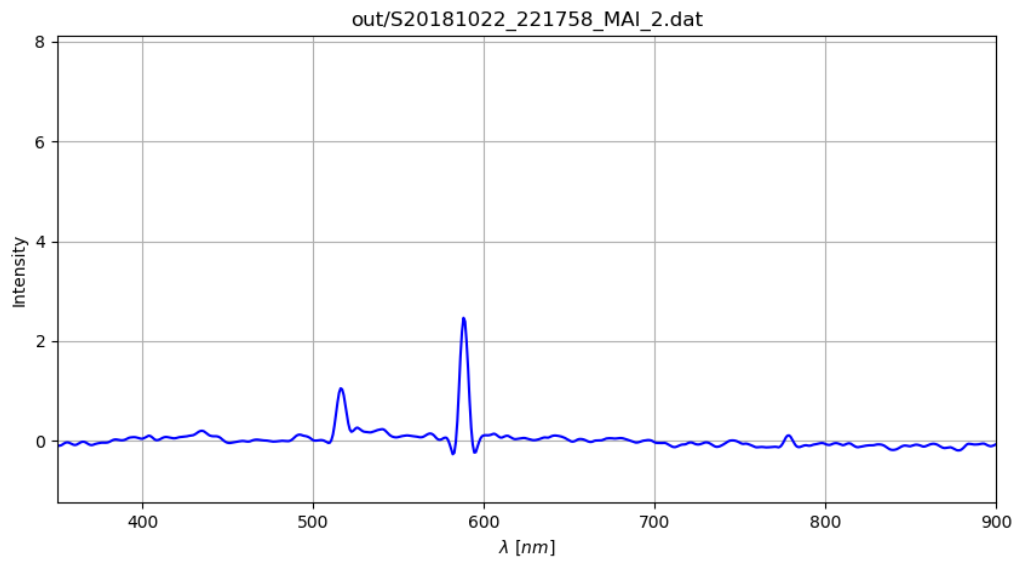
pixel lambda error

[[168.64 0. 0.556]

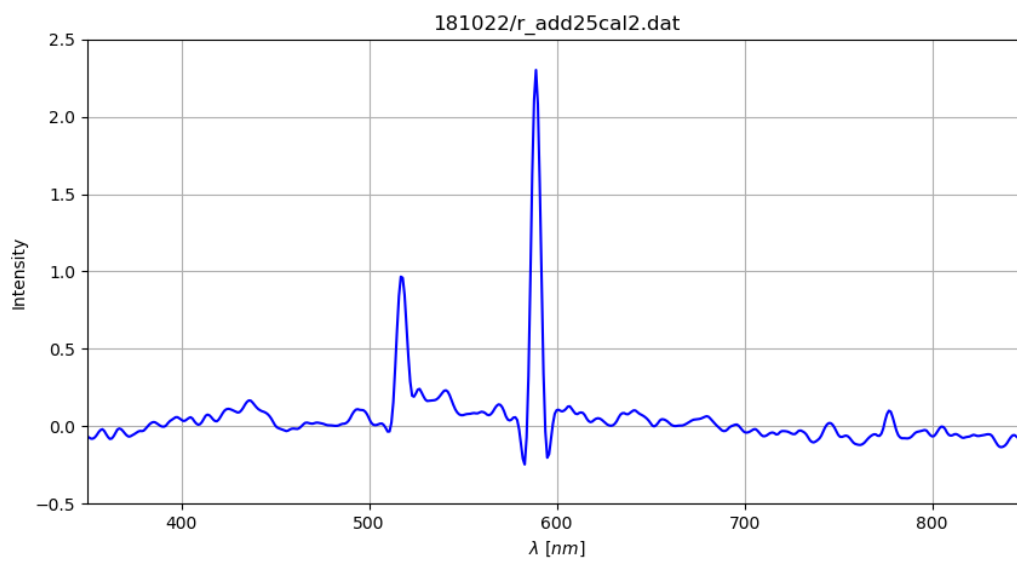
[431.31 517.5 -1.161]

[467.97 589. -0.674]

[564.91 777.4 1.279]]



2nd order polynomial:
 c Peak =: [-6.211e-05 2.007e+00 -3.368e+02]
 rms_x = 0.0149
 pixel lambda error
 [[168.64 0. 0.001]
 [431.31 517.5 -0.019]
 [467.97 589. 0.023]
 [564.91 777.4 -0.005]]



M20181106_032313_MAI_2, AND, -3.7m



Frames, mdist2 – mdist9

***-> line list: [181106/r_add8], .txt added:

***-> polynom degree: [1] set 0 for single line calibration: 2

c Peak =: [-5.531e-05 2.007e+00 -1.583e+02]

rms_x = 0.0151

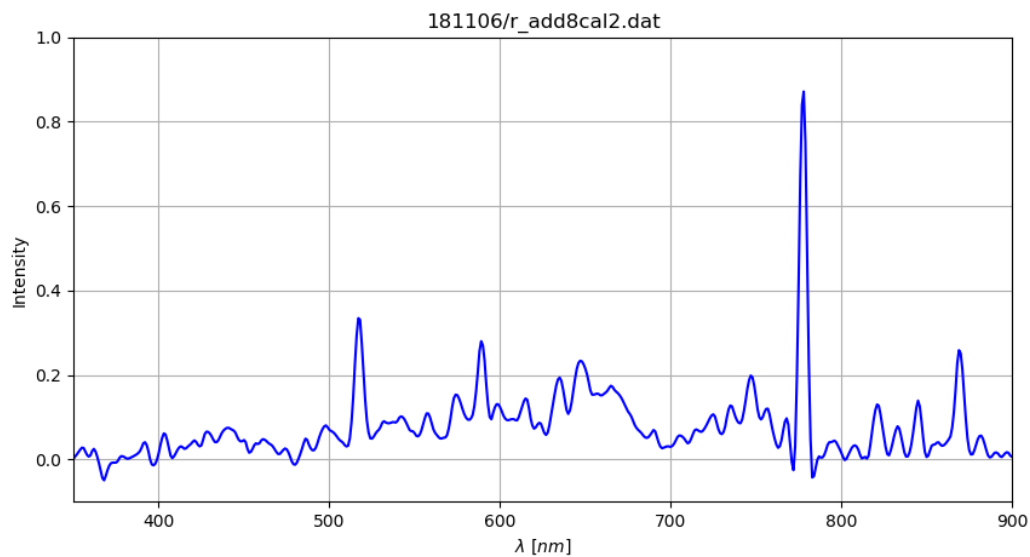
pixel lambda error

[[79.03 0. -0.001]

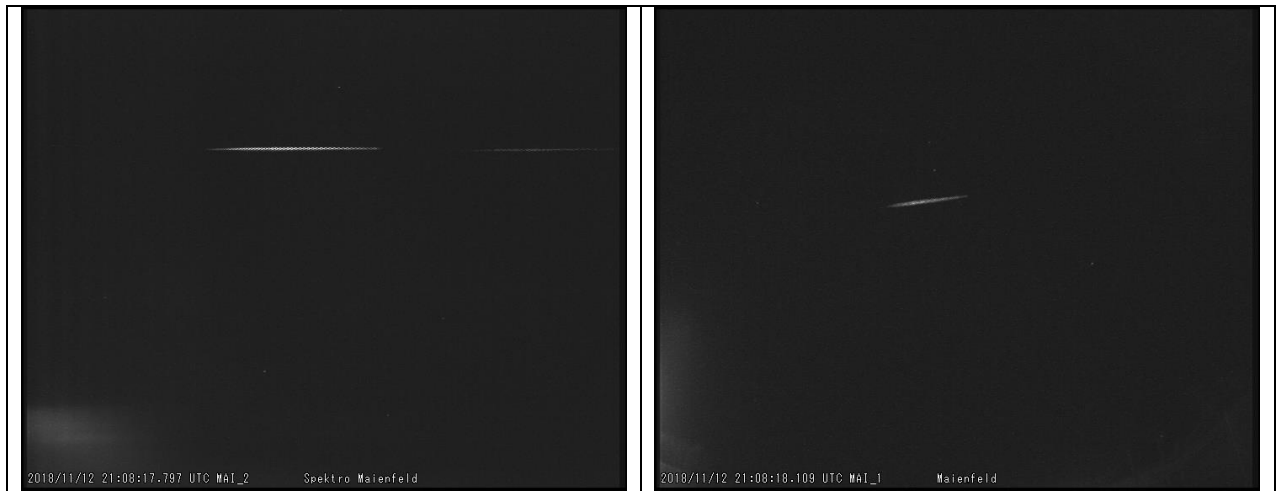
[339.89 517.5 0.019]

[376.21 589. -0.023]

[472.34 777.4 0.005]]



M20181112_210817_MAI_2, STA, -2.8m



With bobdoubler , from mdist3 – mdist70

***-> line list: [181112/r_add68], .txt added:

***-> polynom degree: [1] set 0 for single line calibration:

c Peak =: [1.958 -445.884]

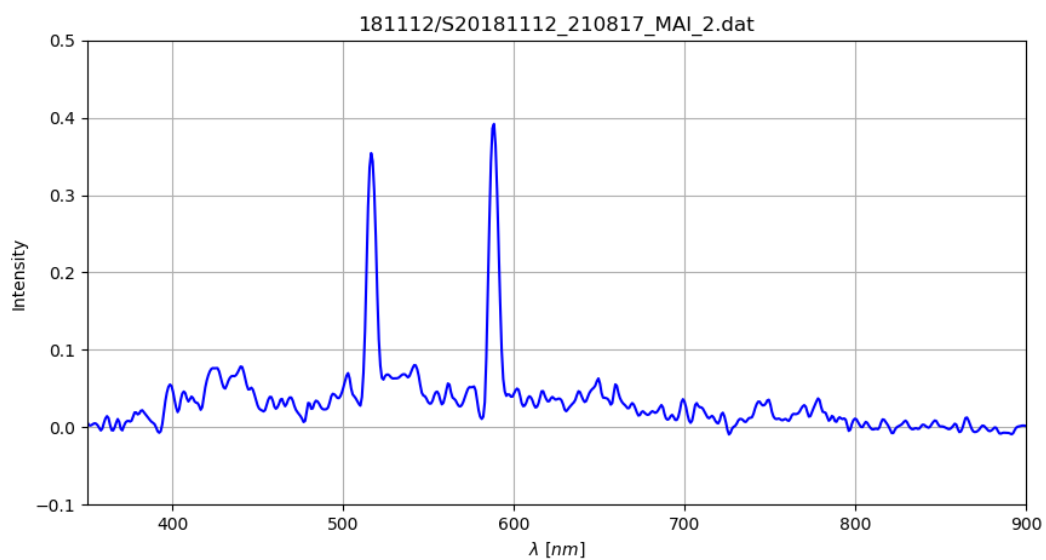
rms_x = 0.1061

pixel lambda error

[[227.74 0. 0.017]

[491.97 517.5 -0.138]

[528.62 589. 0.121]]



M20181120_031150_MAI_2, LEO, -3.6m



With bobdoubler mdist5 – mdist23

***-> line list: [181120/r_add19], .txt added:

***-> polynom degree: [1] set 0 for single line calibration: 2

c Peak =: [-6.733e-05 2.010e+00 -1.096e+02]

rms_x = 0.0073

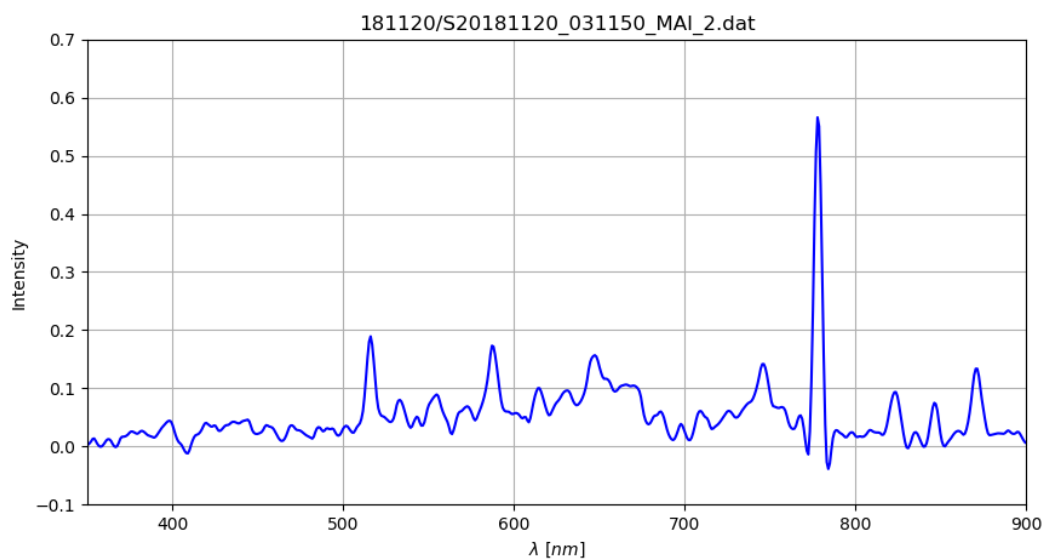
pixel lambda error

[[54.63 0. 0.]

[315.28 517.5 -0.009]

[351.67 589. 0.011]

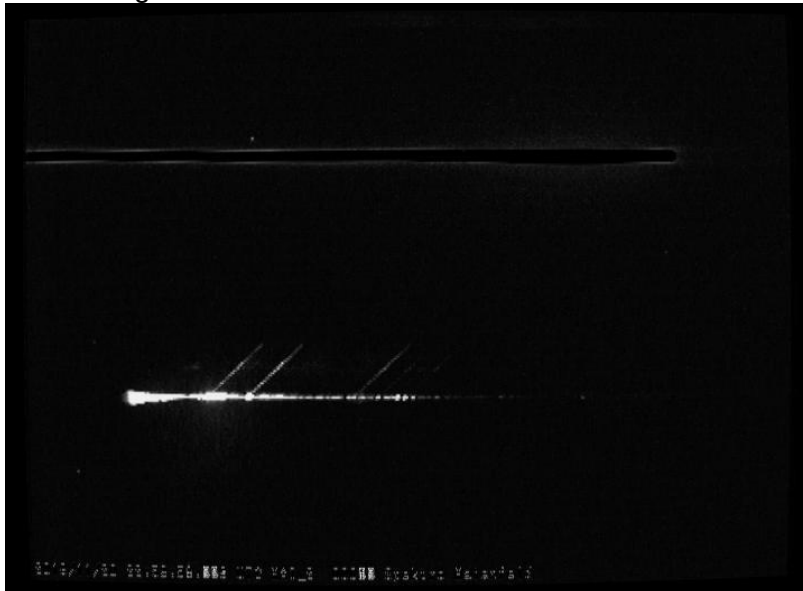
[447.96 777.4 -0.002]]



M20181120_225358_MAI_2, AND, -7.8m



With background subtracted:



Strong violet, UV lines, defocused! Mdist1 – mdist47

***-> line list: [181120/r_add47], .txt added:

***-> polynom degree: [1] set 0 for single line calibration:

c Peak =: [1.984 64.835]

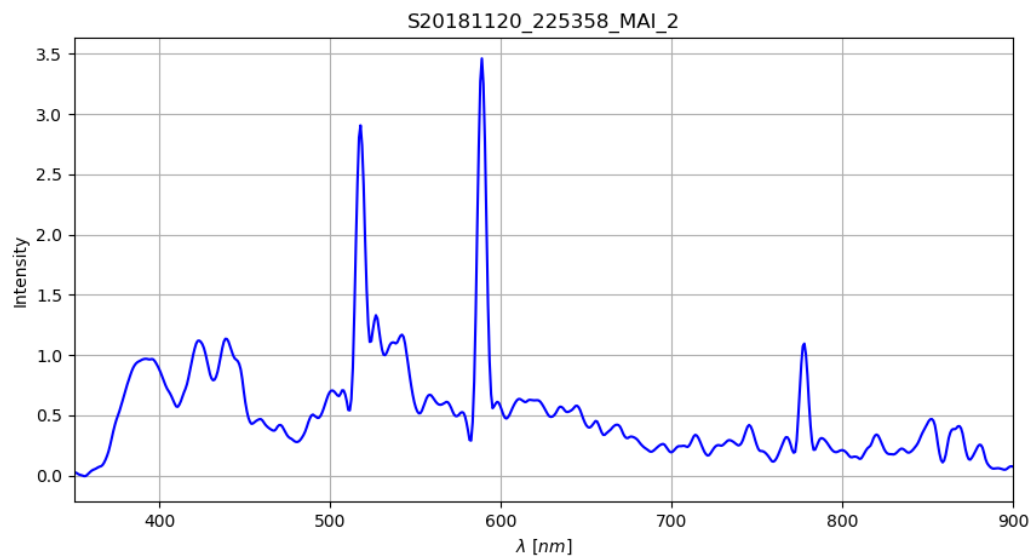
rms_x = 0.1610

pixel lambda error

[[228.26 517.5 0.16]

[264.11 589. -0.22]

[359.22 777.4 0.06]]



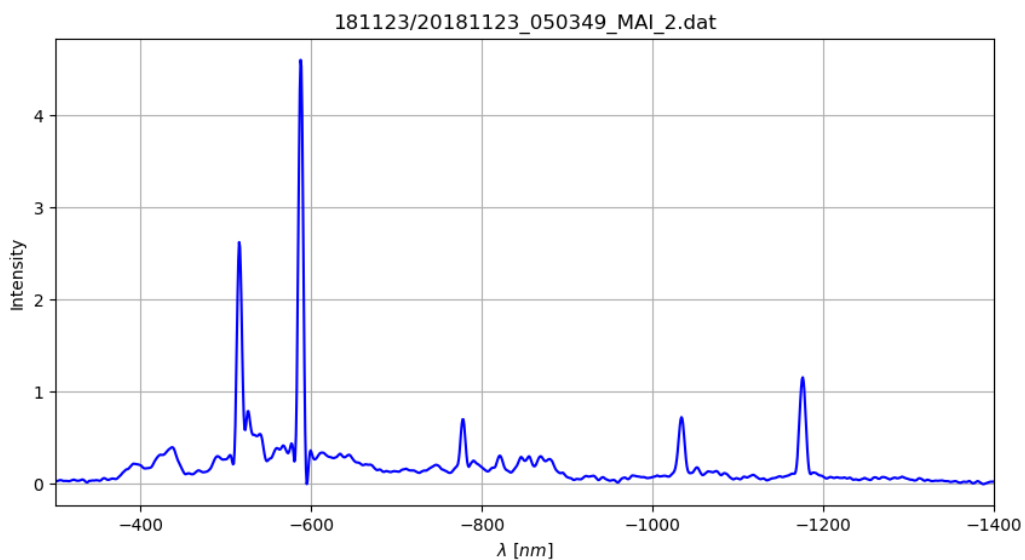
M20181123_050349_MAI_2, NTA?, -4.0m



Mdist1 – mdist85 lmin = 491, lmax = 503, 13 rows

tilt = 0, slant = -0.5

***-> line list: [181123/r_add85], .txt added or quit q:



Mdist46 – mdist101

***-> line list: [181123/rr_add56], .txt added or quit q:

***-> polynom degree: [1] set 0 for single line calibration: 2

c Peak =: [-6.264e-05 2.016e+00 -1.371e+03]

rms_x = 0.2351

pixel lambda error

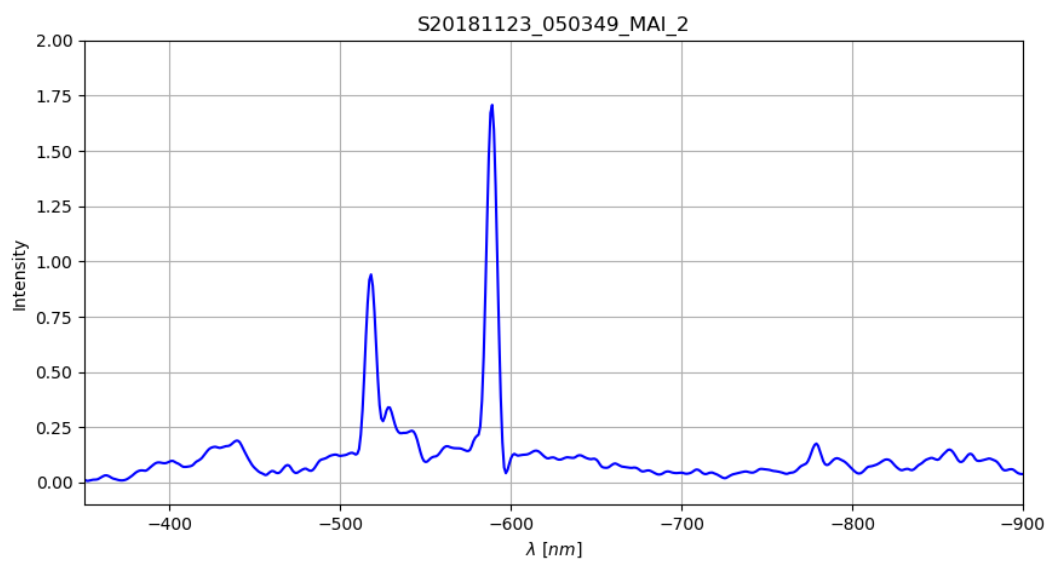
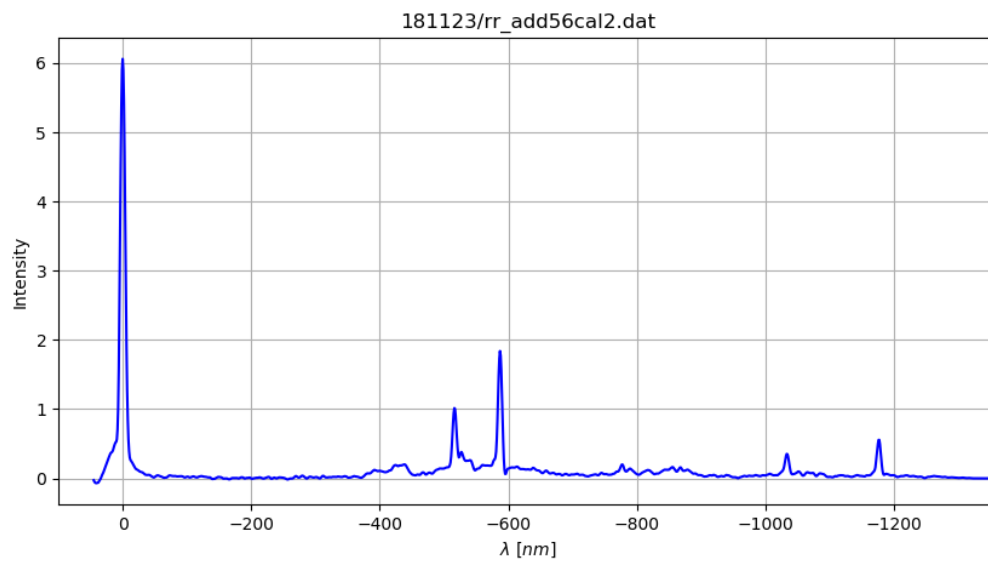
[[694.84 0. 0.001]

[428.72 -517.5 -0.286]

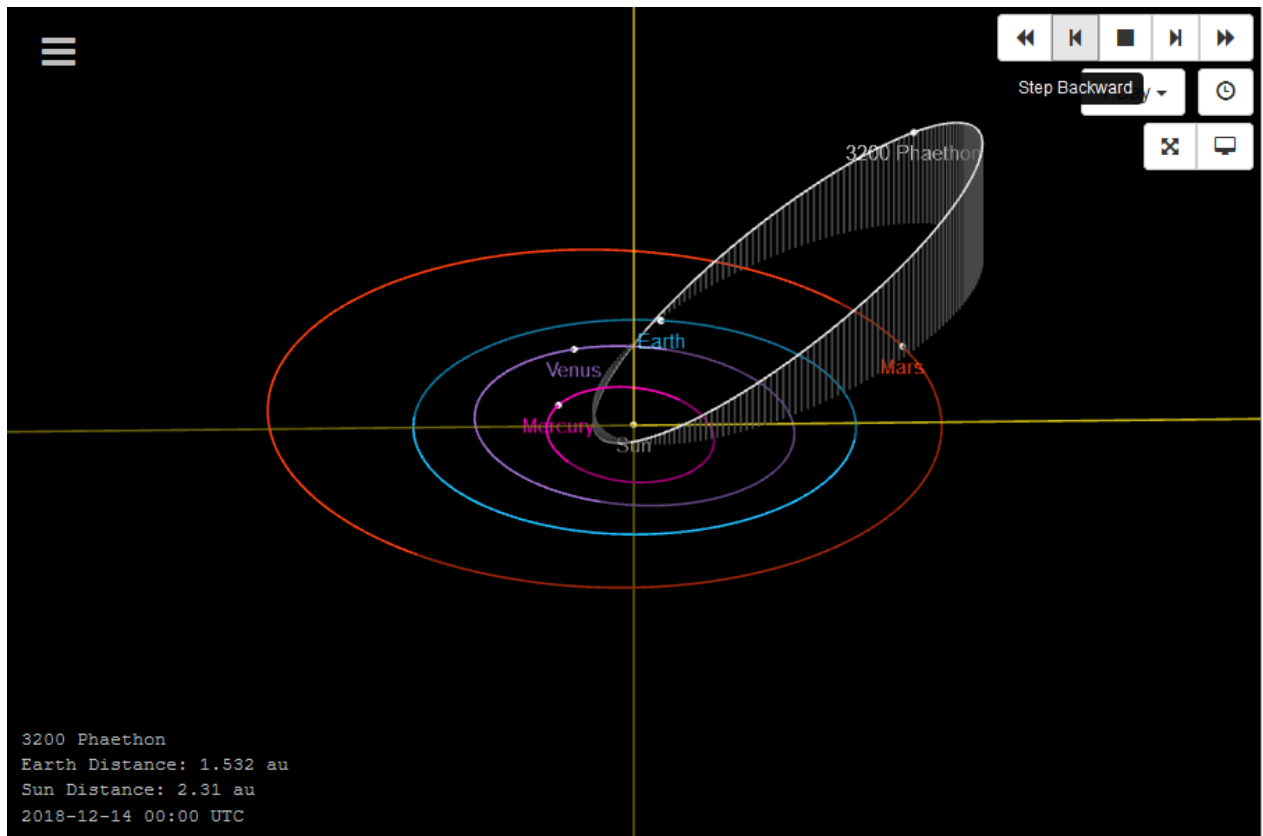
[392.66 -589. 0.37]

[167.23 -1035. -0.207]

[95.88 -1178. 0.123]]



Geminids, general remarks



<https://ssd.jpl.nasa.gov/sbdb.cgi?sstr=3200;old=0;orb=1;cov=0;log=0;cad=0#orb>

Spectroscopy of geminid meteors, Borovicka:

<https://www.imo.net/imcs/imc2007/pdf/Borovicka.pdf>

- The Na/Mg ratio shows large variations from meteor to meteor but is always lower than chondritic ($2\times$ to $>10\times$)
- Loss of Na due to heating in the vicinity to the Sun (0.14 AU)

Also observed here, see below

M20181212_235226_MAI_2, GEM, -2.6m



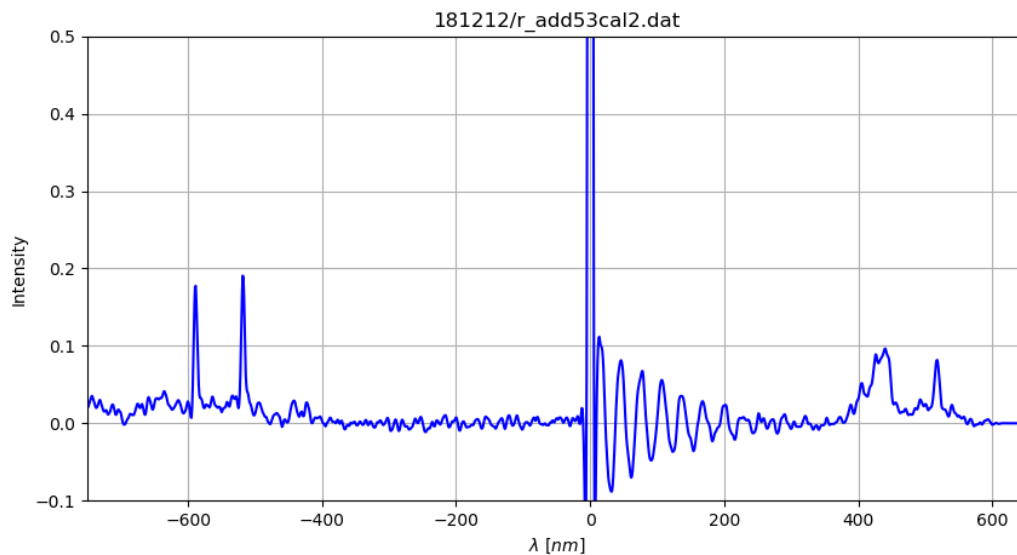
X00=320

polynom for fit lambda c: [3.494e-05 1.951e+00 -7.646e+02]

pixel	lambda	fit	error
389.31,	0.00,	0.11,	0.1080
126.15,	-517.50,	-517.95,	-0.4452
90.05,	-589.00,	-588.63,	0.3662
649.70,	517.50,	517.47,	-0.0290

rms_x = 0.2936

spectrum 181212/r_add53cal.dat saved



New register

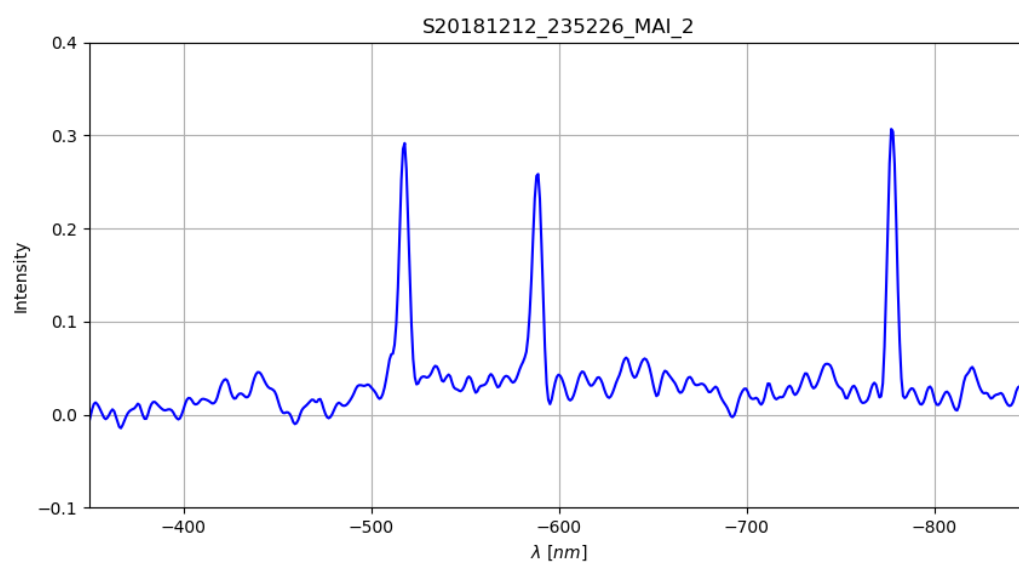
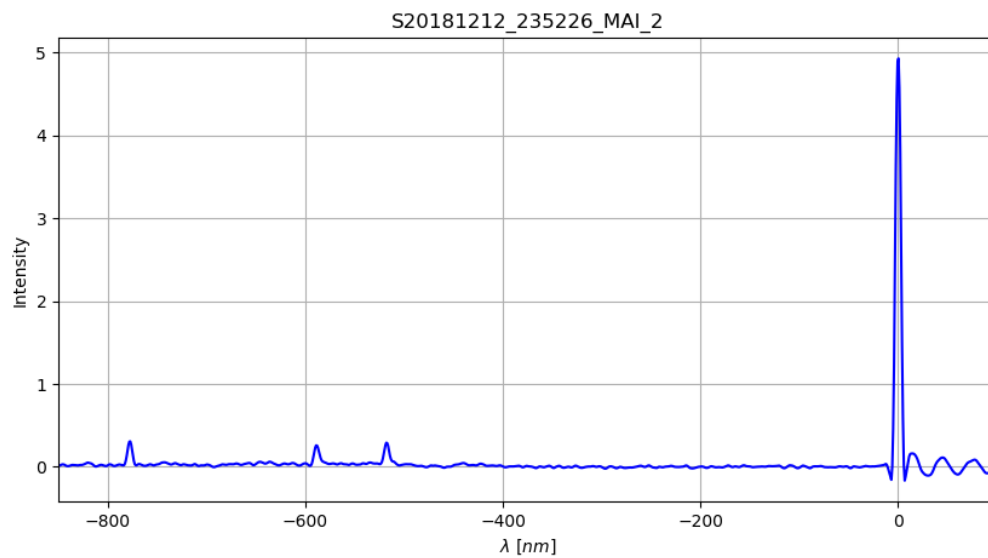
X00=340, mdist30 - 56

polynom for fit lambda c: [-1.015e-05 1.977e+00 -8.619e+02]

pixel	lambda	fit	error
437.05,	0.00,	0.01,	0.0122
174.25,	-517.50,	-517.81,	-0.3050
138.36,	-589.00,	-588.63,	0.3691
42.73,	-777.40,	-777.48,	-0.0763

rms_x = 0.2425

spectrum 181212a/rr_add27cal.dat saved



M20181213_001901_MAI_2, GEM, -2.8m



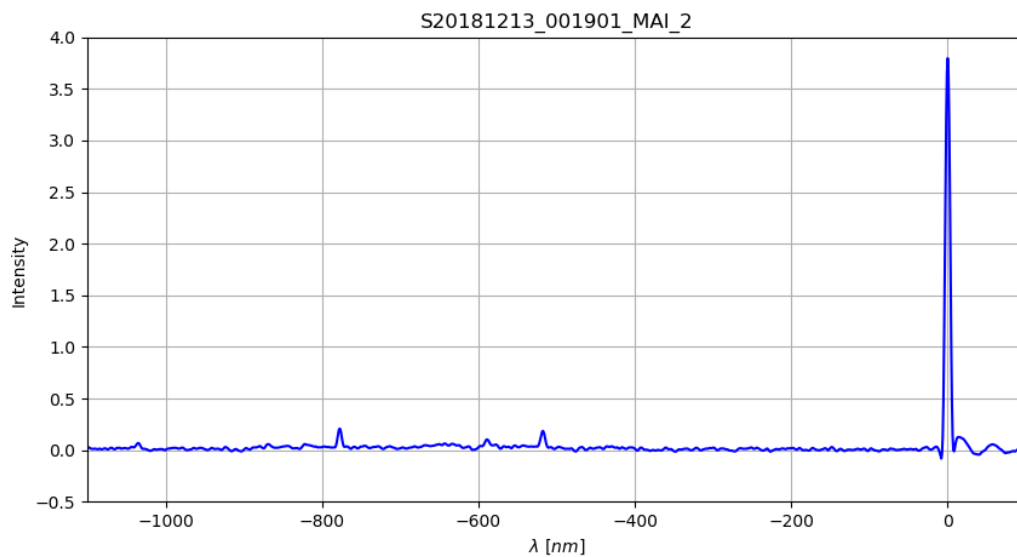
X00 =371.2

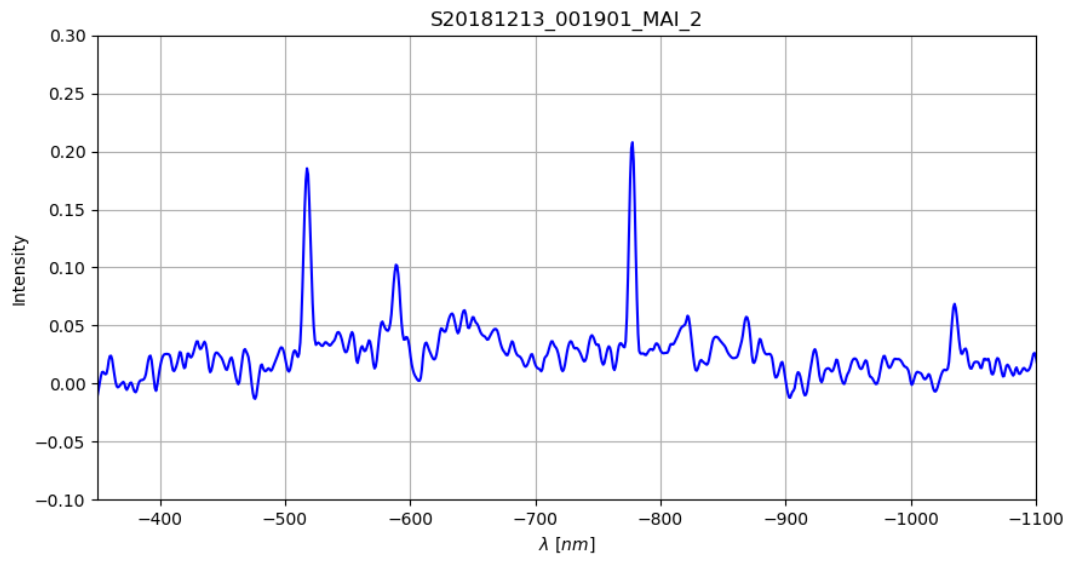
polynom for fit lambda c: [-5.393e-05 1.998e+00 -1.144e+03]

pixel	lambda	fit	error
581.83,	0.00,	0.04,	0.0361
316.21,	-517.50,	-517.81,	-0.3098
184.62,	-777.40,	-777.17,	0.2267
54.69,	-1035.00,	-1035.10,	-0.0974
280.07,	-589.00,	-588.86,	0.1444

rms_x = 0.1892

spectrum 181213/r_add39cal.dat saved





M20181213_031712_MAI_2, GEM, -2.5m



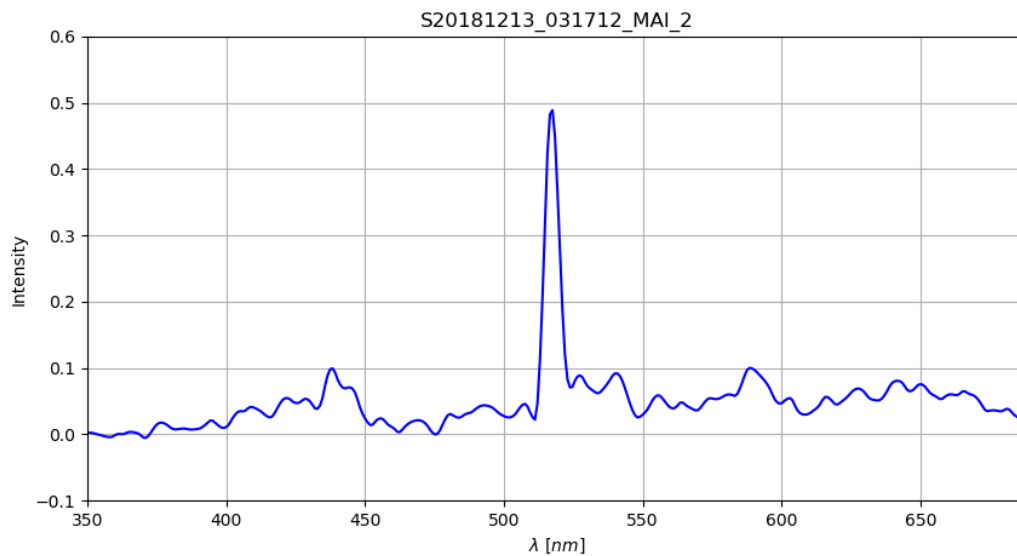
X00 = 320

polynom for fit lambda c: [2.880e-05 1.955e+00 -7.308e+02]

pixel	lambda	fit	error
371.85,	0.00,	0.00,	0.0000
108.94,	-517.50,	-517.50,	-0.0000
632.76,	517.50,	517.50,	0.0000

rms_x = 0.0000

spectrum 181213a/r_add36cal.dat saved



M20181214_183618_MAI_2, NTA, -4.3m



X00 = 340

start = 32, nim = 42

added from 249 to 253, 5 rows

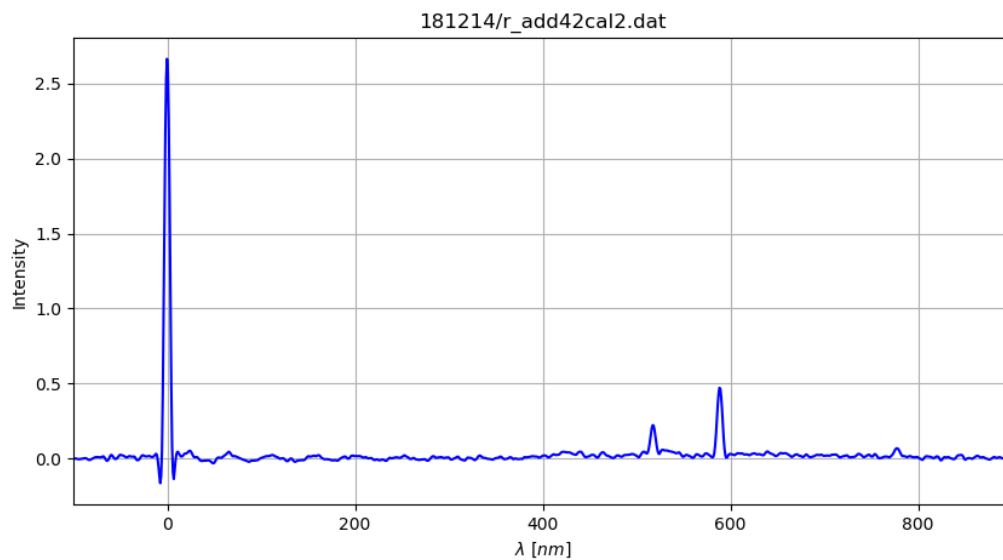
tilt = 0, slant = 0.200000000

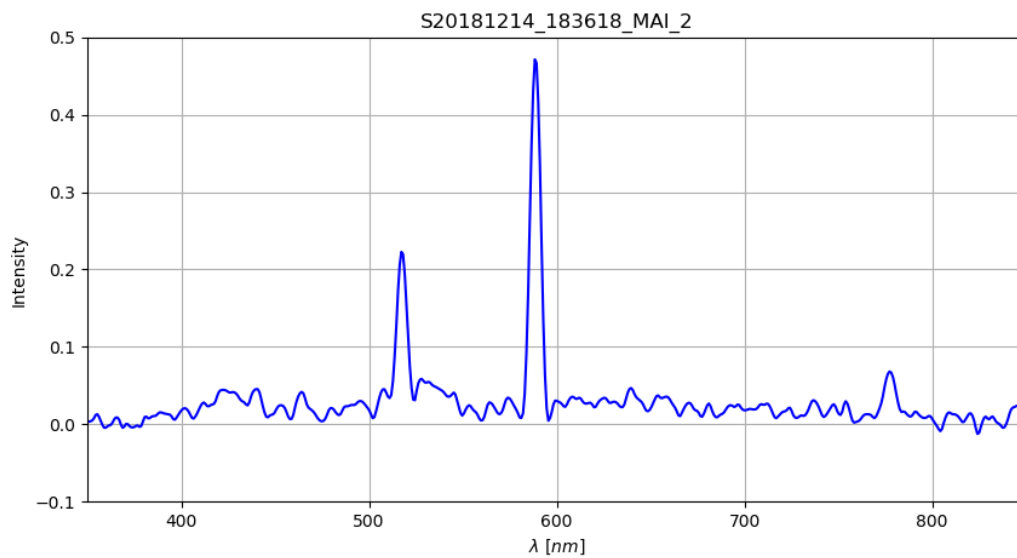
polynom for fit lambda c: [-1.016e-05 1.973e+00 -3.363e+02]

pixel	lambda	fit	error
170.59,	0.00,	-0.01,	-0.0088
433.78,	517.50,	517.72,	0.2168
469.94,	589.00,	588.74,	-0.2623
566.09,	777.40,	777.45,	0.0543

rms_x = 0.1723

spectrum 181214/r_add42cal.dat saved





Content

Meteor spectra 2018	1
IRIS, SpectroTools, ISIS.....	2
M20180124_045937_MAI_2, spo, -3.4m	2
M20180131_030534_MAI_2, spo, -3.8m (MAI_2).....	5
M20180207_020515_MAI_2, spo, -5.6m	8
M20180406_233426_MAI_2, spo, -2.7m	10
M20180410_234228_MAI_2, spo, -2.4m	12
M20180419_233956_MAI_2, spo, -2.4m	14
M20180422_010356_MAI_2, LYR, -3.1m	16
M20180423_005849_MAI_2, ?,(-4.4m).....	18
M20180425_020116_MAI_2, spo, -4.3m	21
M20180620_204043_MAI_2, spo, -3.5m	23
Python.....	26
M20180813_000444_MAI_2, PER.....	26
M20180813_011130_MAI_2, PER, -3.9m.....	27
M20180910_015118_MAI_2, SPE, -5.3m.....	28
M20180910_025017_MAI_2, SPE, -3.8m.....	30
M20180921_011828_MAI_2, spo, -3.8m	32
M20181014_023816_MAI_2, spo, -2.9m	34
Dispersion from measured calibration.....	35
M20181022_221758_MAI_2, spo, -3.5m	36
M20181106_032313_MAI_2, AND, -3.7m	38
M20181112_210817_MAI_2, STA, -2.8m	39
M20181120_031150_MAI_2, LEO, -3.6m.....	40
M20181120_225358_MAI_2, AND, -7.8m	41
M20181123_050349_MAI_2, NTA?, -4.0m.....	43
Geminids, general remarks.....	45
M20181212_235226_MAI_2, GEM, -2.6m.....	46
M20181213_001901_MAI_2, GEM, -2.8m.....	48
M20181213_031712_MAI_2, GEM, -2.5m.....	50
M20181214_183618_MAI_2, NTA, -4.3m.....	51
Content.....	53