testtool-CCD

July 20, 2022

[1]:
```
%matplotlib inline
```

[2]:
```
import matplotlib.pyplot as plt
from os.path import join
```

[3]:
```
%run ../tools/echelle.py
cb = Calibrations('../resources/calibration_files')
```

[4]:
```
cb.start()
```

[5]:
```
%run ../tools/echelle.py
em = EchelleImage('../resources/test_data/CCD_Example.SIF', clbr=cb)
```

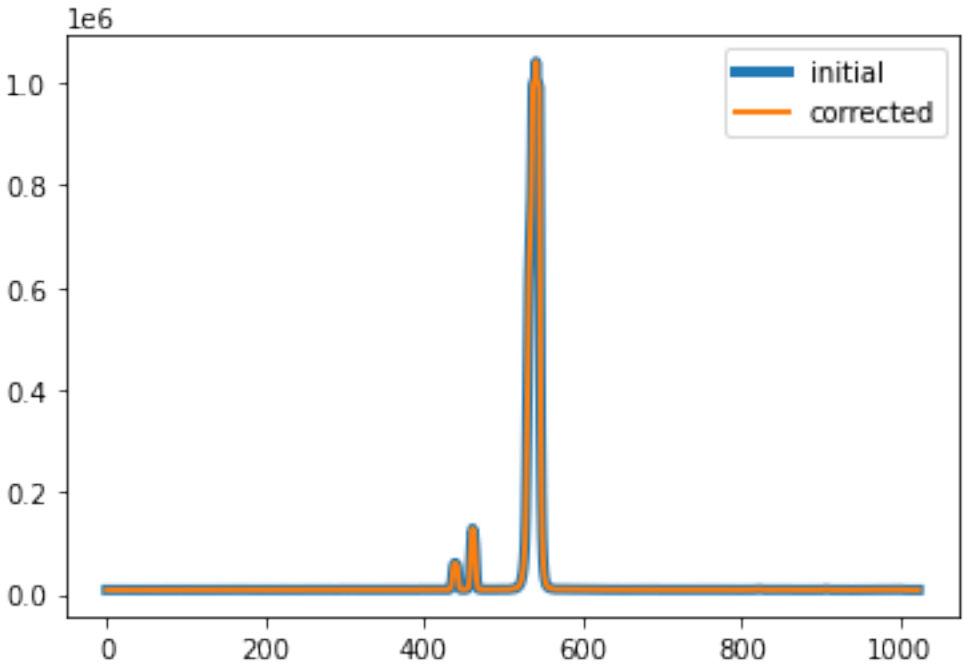
[6]:
```
# Calculate order spectra
em.calculate_order_spectra()
print("Initial order spectra shape:", em.order_spectra.shape)
os_init = em.order_spectra.copy()

# Apply corrections
em.correct_order_shapes()
print("Corrected order spectra shape:", em.order_spectra.shape)
os_corr = em.order_spectra.copy()
```

```
Initial order spectra shape: (30, 28, 1024)
Corrected order spectra shape: (30, 28, 1024)
```

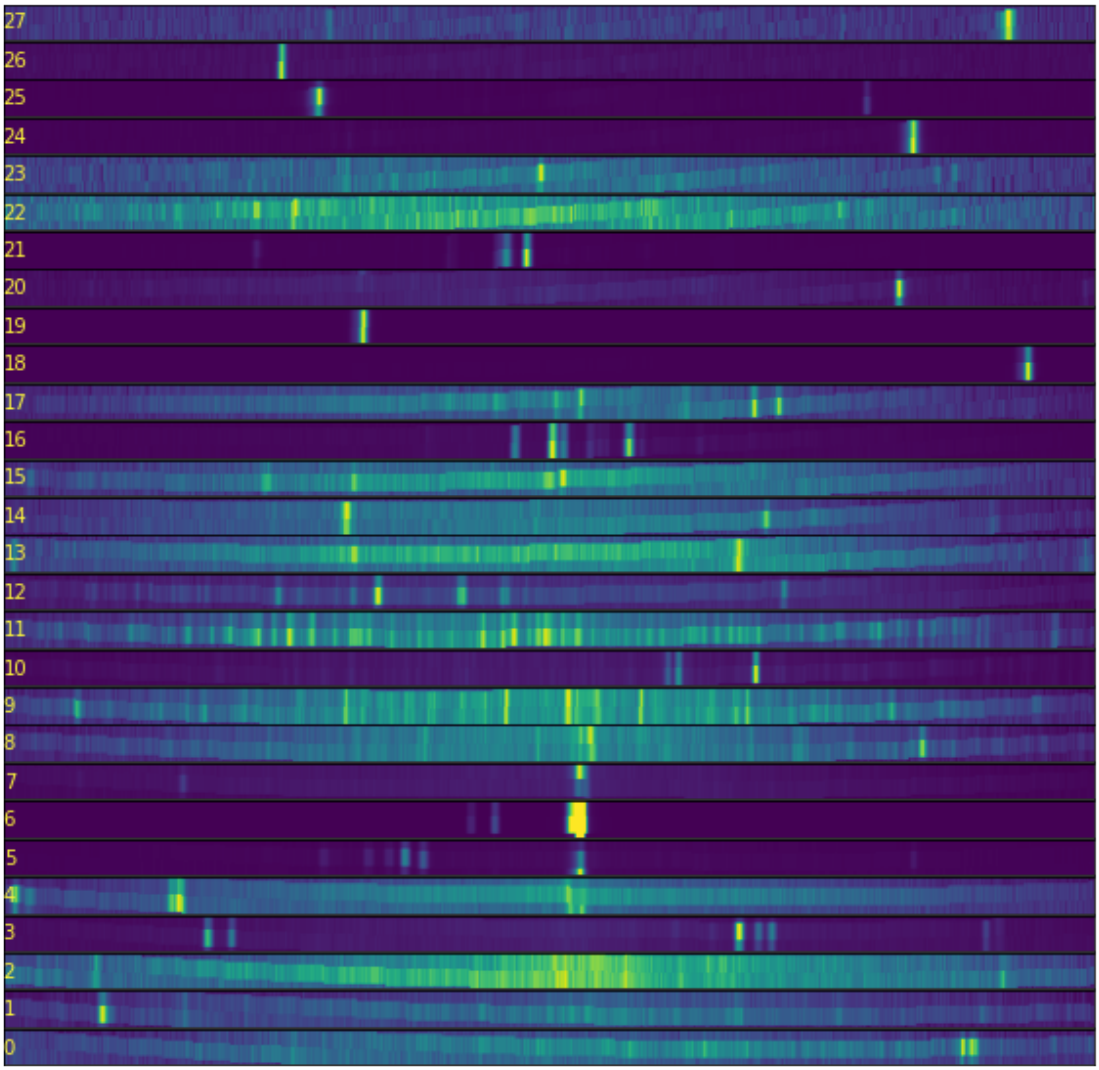
[7]:
```
# Visualise initial vs corrected order spectra
frame = 3  # select a single frame from image
order = 6  # select single order from frame
plt.plot(os_init[frame, order], lw=4, label='initial')
plt.plot(os_corr[frame, order], lw=2, ls='-', label='corrected')
plt.legend()
```

[7]:
```
<matplotlib.legend.Legend at 0x21b13300dc0>
```



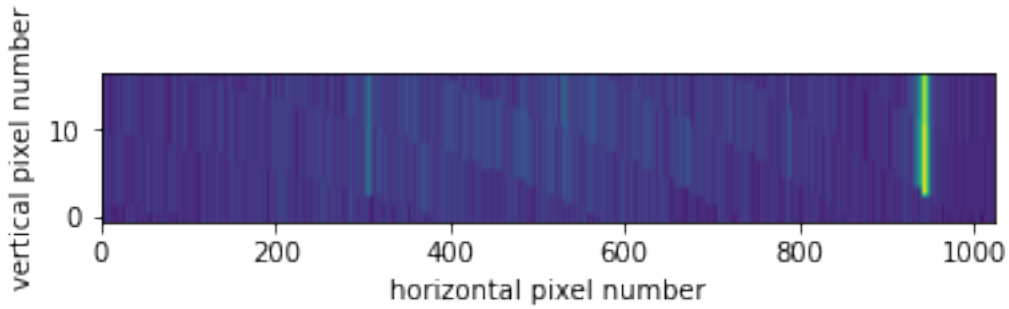
[8]:
```
# Prepare spectra for all frames
em.calculate_spectra()
# em.plot_order_image(28,6,20)
```

[9]:
```
# Plot diffraction orders for a given frame
frame = 7
em.plot_cut_image(frame, 2)
plt.gcf().set_size_inches(10, 10)
# savefig('CCD_cut.png', dvi=300, pad_inches=0, bbox_inches='tight')
```



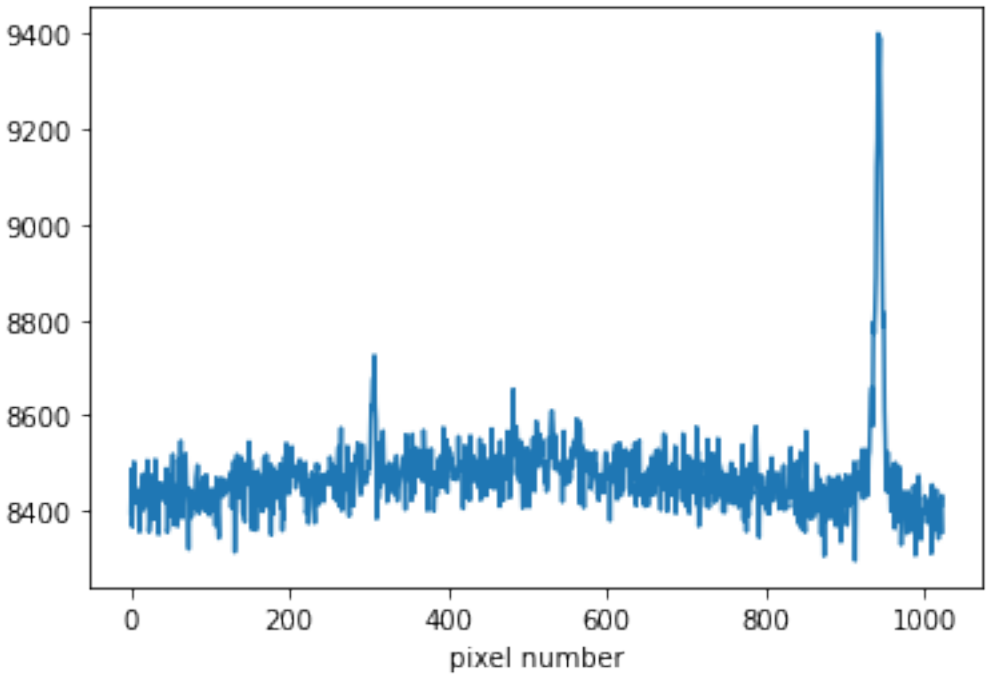
[10]:
```
# Plot one diffraction order
em.plot_order_image(7, 27, 10)
plt.xlabel('horizontal pixel number')
plt.ylabel('vertical pixel number')
```

[10]:
```
Text(0, 0.5, 'vertical pixel number')
```



[11]:
```
plt.plot(em.order_spectra[7, 27, :])
plt.xlabel('pixel number')
```

[11]: Text(0.5, 0, 'pixel number')

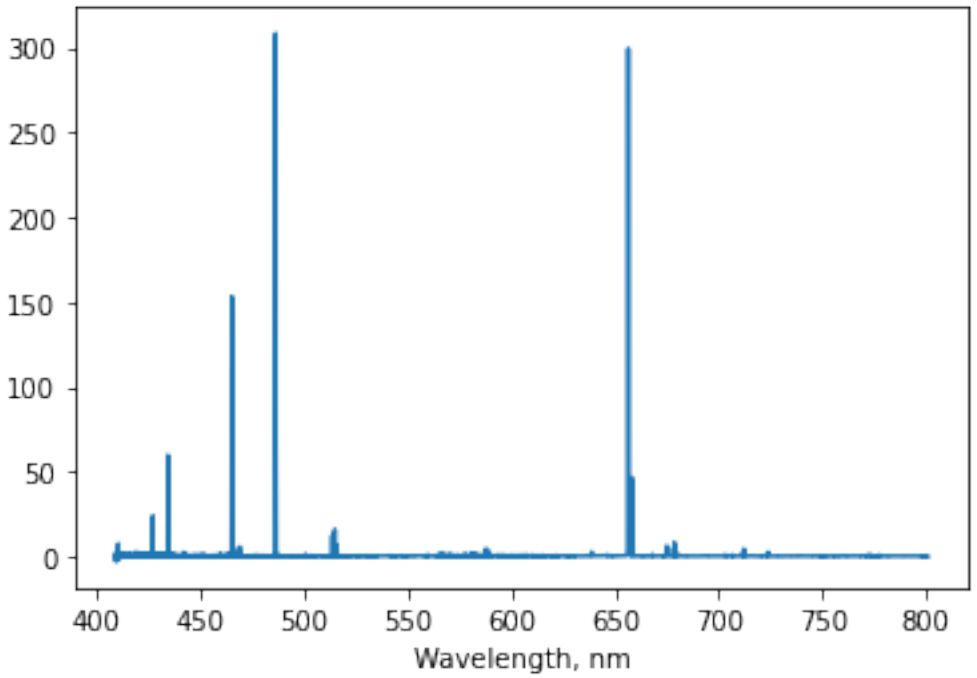


[12]:
```
# Convert an image into spectra
s = Spectrum(em)
```

[13]:
```
# Calibrated spectrum
frame = 6
x = s.wavelength
y = s.spectra_to_save['wm'][frame]
```

```
plt.plot(x, y)
plt.xlabel('Wavelength, nm')
```

[13]: `Text(0.5, 0, 'Wavelength, nm')`

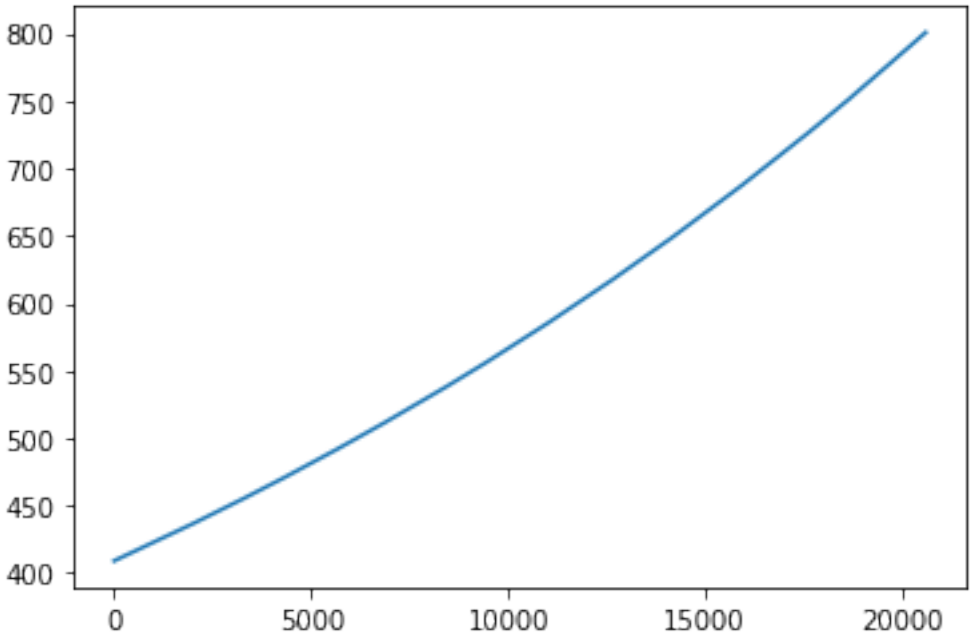


1 Wavelength vs accumulated pixel number

Accumulated pixel number: cut images for each diffraction order are stacked to form a continuous spectrum. The overlapping parts are cut, and a continuous spectrum is stored.

[14]:
```
plt.plot(x)
```

[14]: `[<matplotlib.lines.Line2D at 0x21b15814280>]`


800
750
700
650
600
550
500
450
400
0
5000
10000
15000
20000