

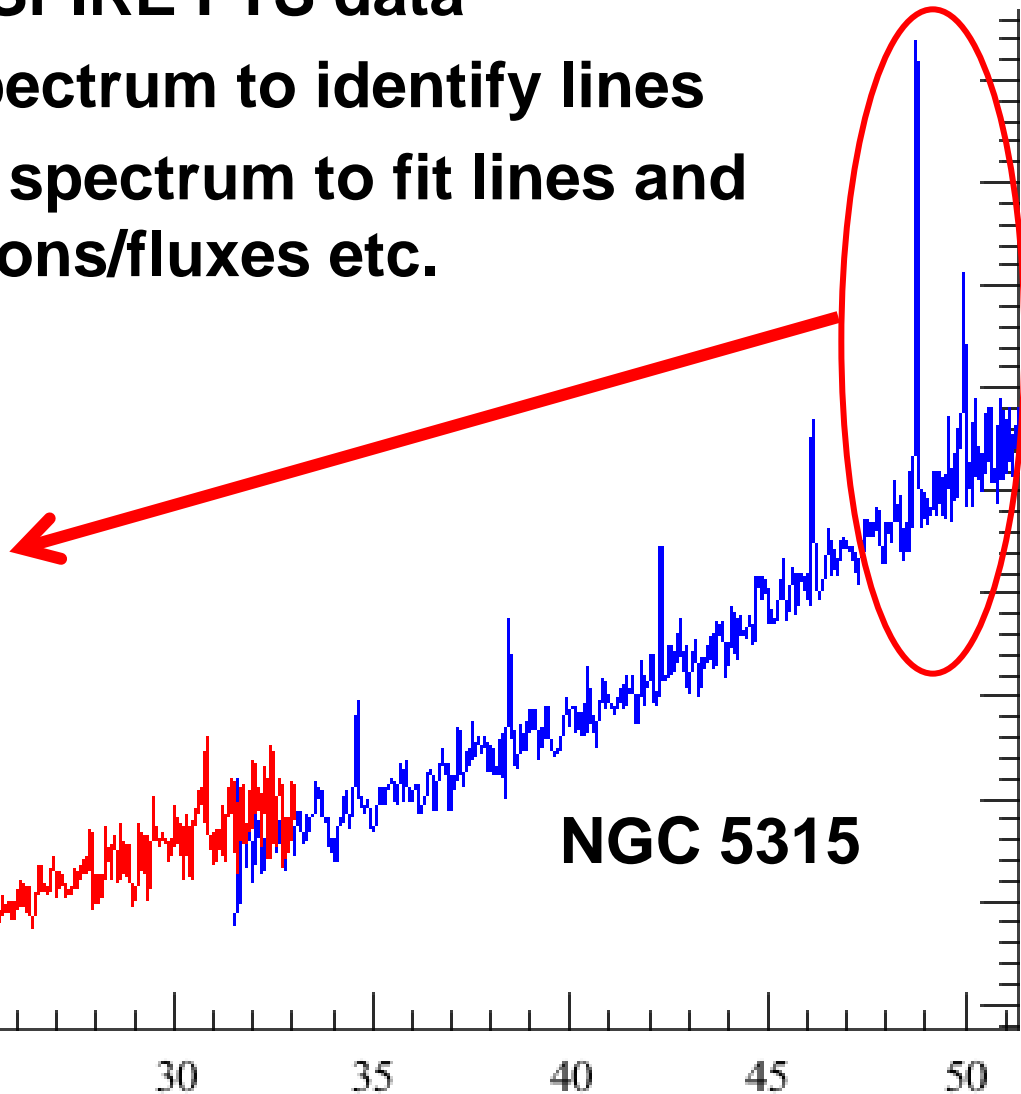
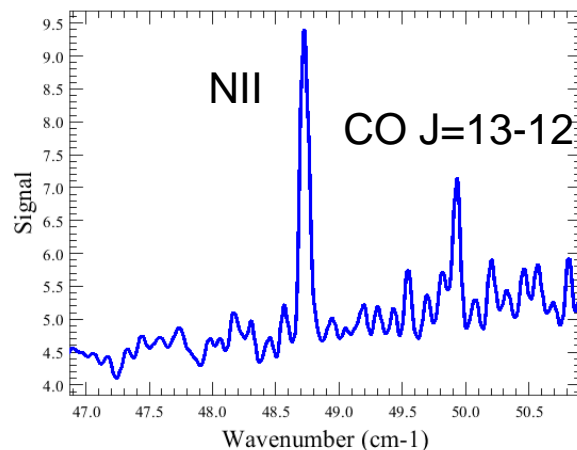
# Spectrometer Line Fitting

**Ed Polehampton**

**SPIRE ICC**

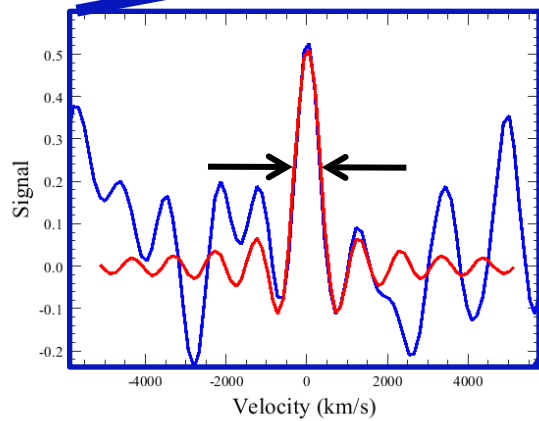
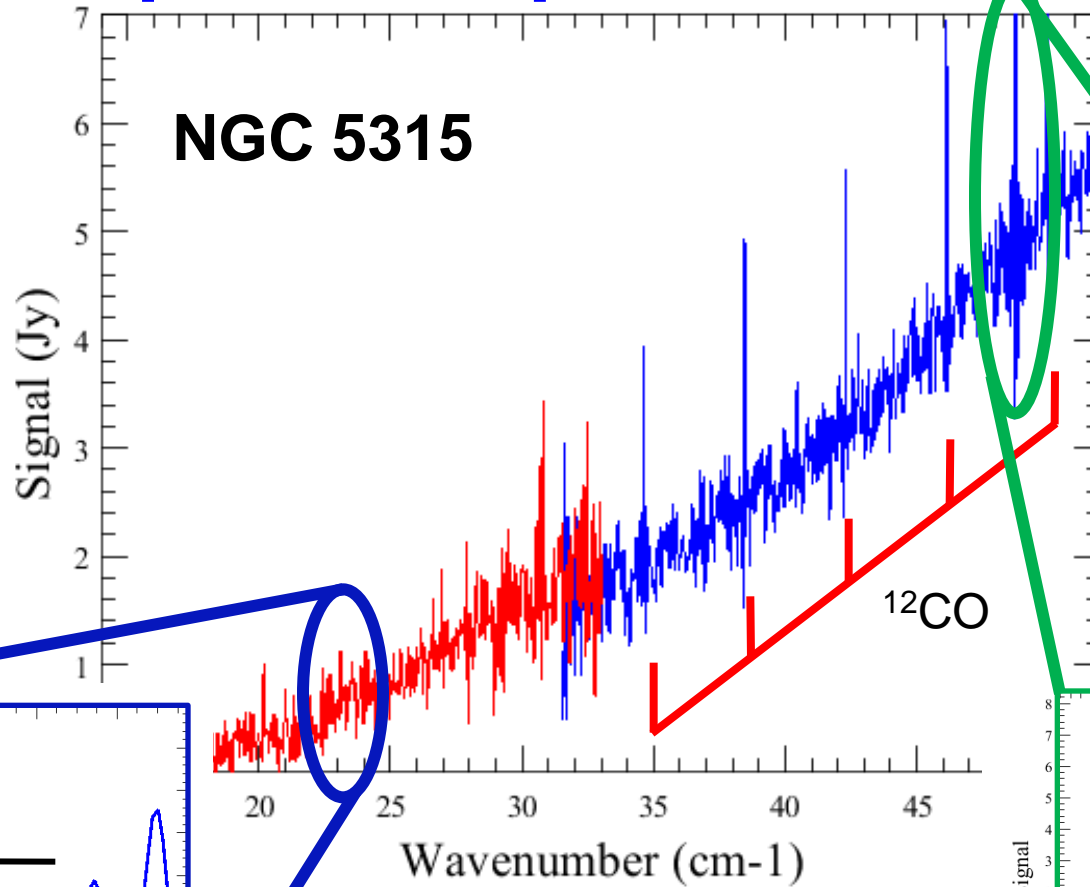
# Spectral Line Fitting

- Analysis steps for SPIRE FTS data
  - Use *apodized* spectrum to identify lines
  - Use *unapodized* spectrum to fit lines and determine positions/fluxes etc.

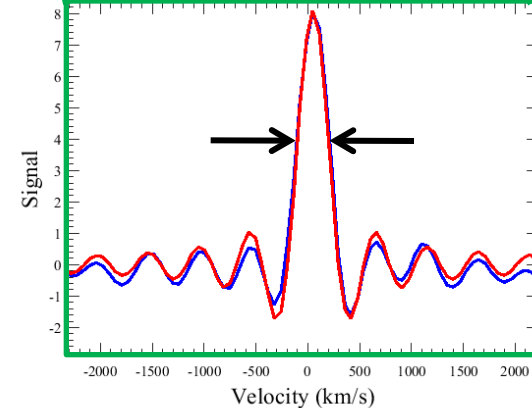


# Unapodized spectrum

## NGC 5315



*FWHM at CO J=6-5  
is 630 km/s*



*FWHM at NII is 300 km/s*

# Demo script

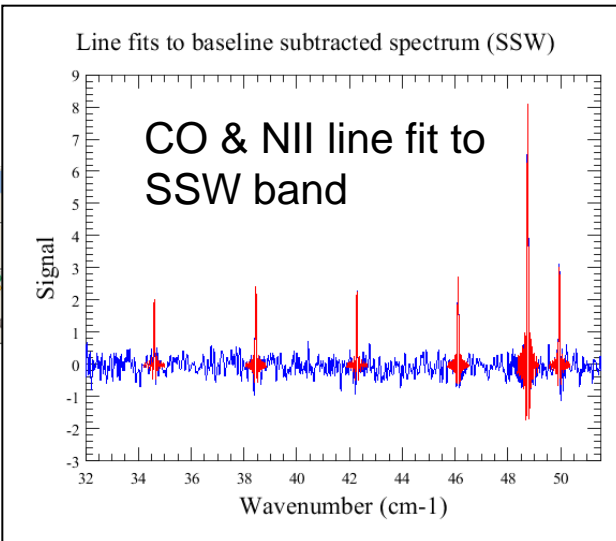
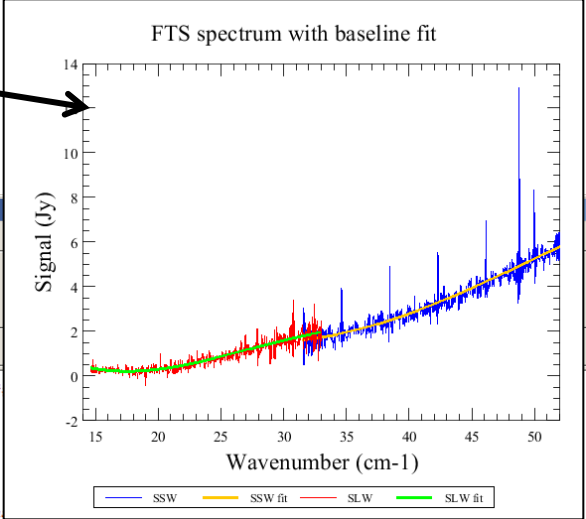
- Demo script supplied to fit a Sinc profile to the CO lines & NII line in the example data:

***SPIRE\_spectrometer\_lineFitting\_dec09.py***

***demo-spire-spec-0x5000198E***

- Very simple example of a line fit
  - For strong separated lines, we found that restricting the range of the fit improved the positional accuracy
- More complex iterative line fitting routines are under development (used for SDP data)

Unapodized spectrum with polynomial fit to continuum



```

HIPE 2.0 - SPIRE_sp...ec09.py
File Edit Run Window Help

Editor x
SPIRE_sp...ec09.py x
27 #####
28
29 # Specify the observation and the resolution
30 obsid=0x5000198e
31 resolution="HR"
32 # Add the path to the file CO.txt. This contain
33 # derived from the Cologne Database for Molecular Spectroscopy (http://www.astro.uni-koeln.de/cdms/)
34 coLineWavenumbers = "C:\\SPIRE\\dp_workshop\\finalScripts\\CO.txt"
35 # Choose the array to fit (ssw or slw)
36 array = "ssw"
37 # initialise the expected line width for the fitting routine
38 # - Low resolution ~1.0 cm-1
39 # - Medium resolution ~0.25 cm-1
40 # - High resolution ~0.04 cm-1
41 expectedResn = 0.04
42 # =====
43
  
```

Fit results

```

Console x
CO, J=9-8, 34.587674, 34.580227, 14.55, 9.34, 2.51e-017, 1.26e-018, 0.04105, 0.00063
CO, J=10-9, 38.426098, 38.424559, 12.00, 8.90, 3.00e-017, 1.63e-018, 0.03982, 0.00065
CO, J=11-10, 42.263054, 42.259302, 26.61, 7.41, 2.68e-017, 1.35e-018, 0.03926, 0.00059
CO, J=12-11, 46.098395, 46.092955, 35.38, 4.58, 3.28e-017, 1.11e-018, 0.03955, 0.00040
CO, J=13-12, 49.931974, 49.927034, 39.66, 6.21, 3.66e-017, 1.81e-018, 0.03986, 0.00059
Nitrogen II, 48.738114, 48.729604, 52.36, 2.36, 9.68e-018, 6.71e-019, 0.03984, 0.00022
HIPE>
  
```

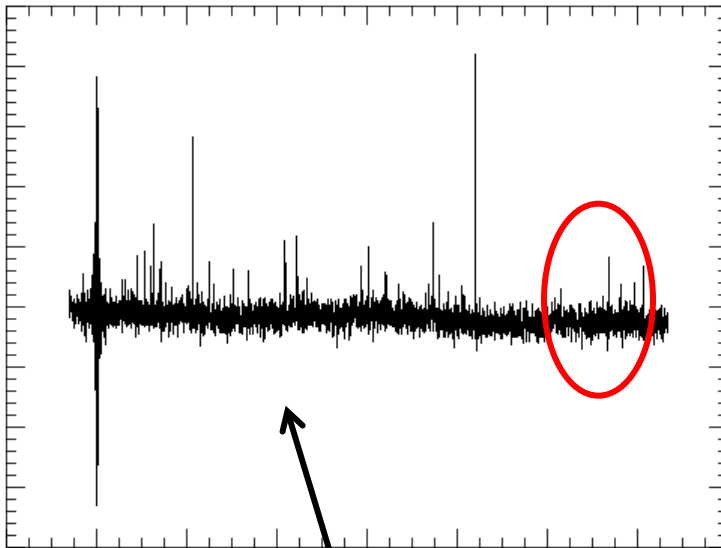
Velocity (km/s)  
(no LSR correction)

Integrated flux (W/m2)

Resolution =  $1/(2 \times \text{OPD\_MAX})$  (cm<sup>-1</sup>)  
(=FWHM/1.207)

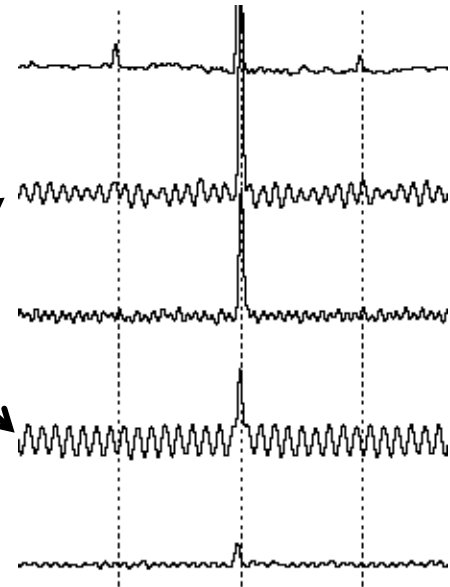
# Possible Calibration Issues

- **Effect of glitches: single glitch left in the processing causes sine wave through the data**



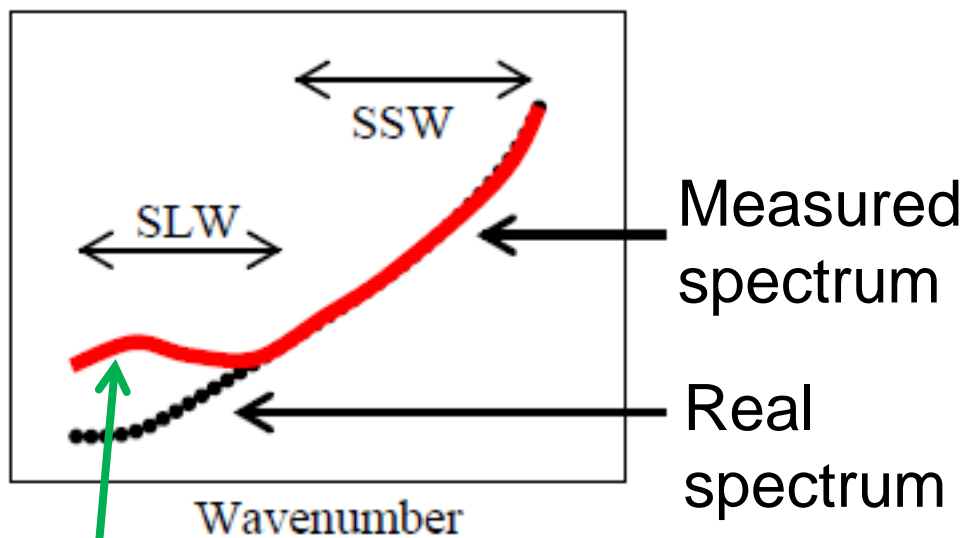
Interferogram before deglitching

Spectra with  
incomplete  
glitch removal



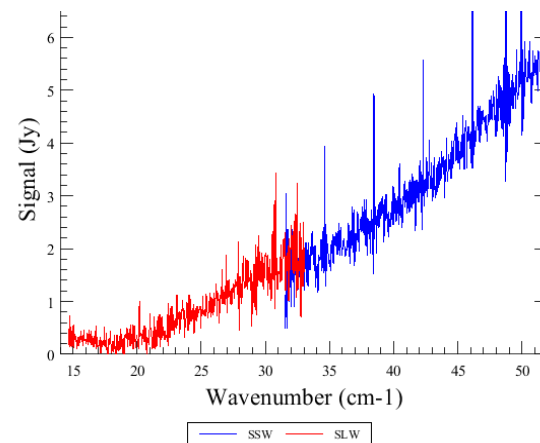
# Long Wavelength Array

## *background subtraction*



*Effect of instrument temperature changes between reference and source measurement – **correction is under development..***

demo-spire-spec-0x5000198E



demo-spire-spec-0x5000182E

