

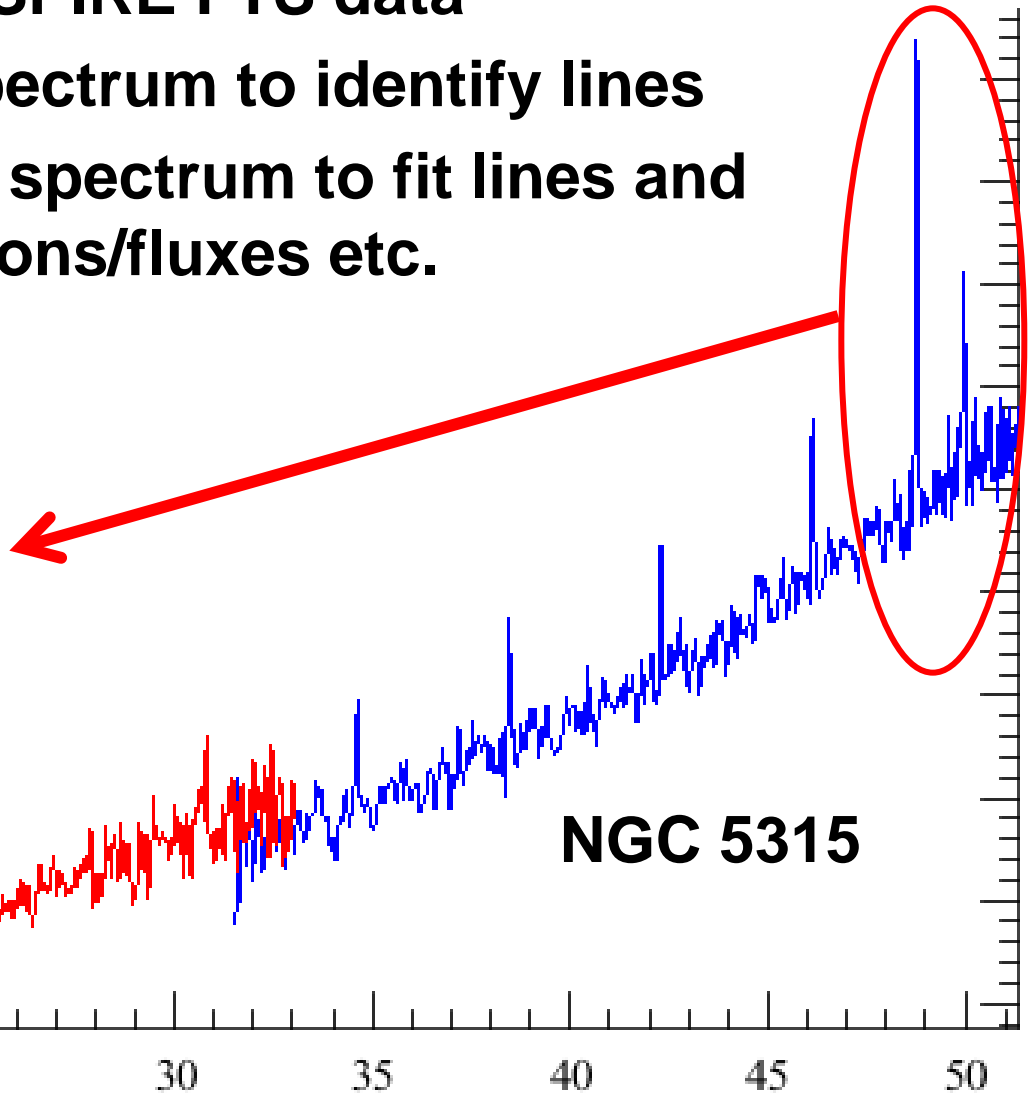
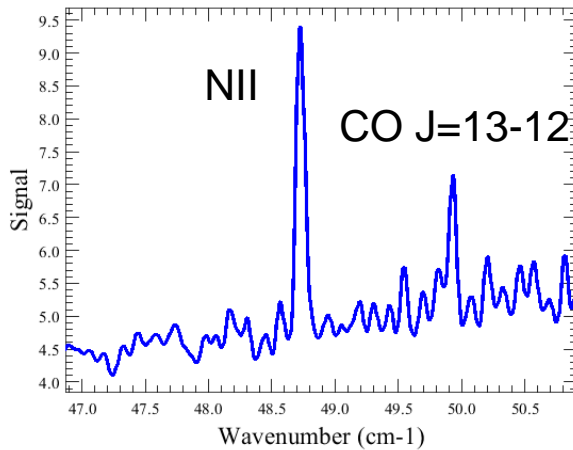
# Spectrometer Line Fitting

**Ed Polehampton**

**SPIRE ICC**

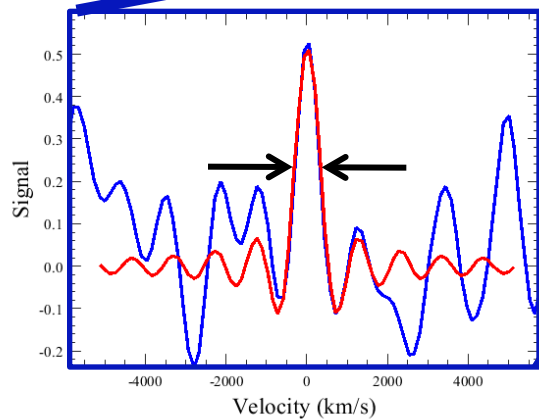
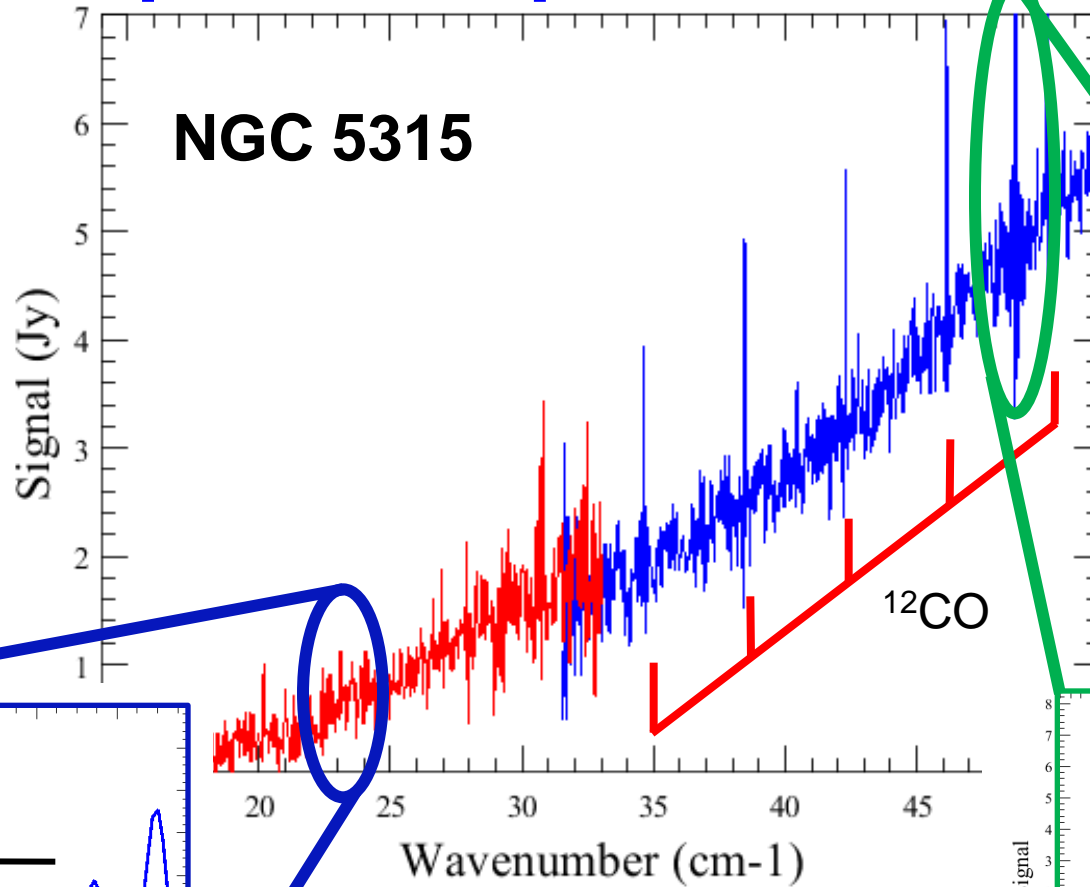
# Spectral Line Fitting

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

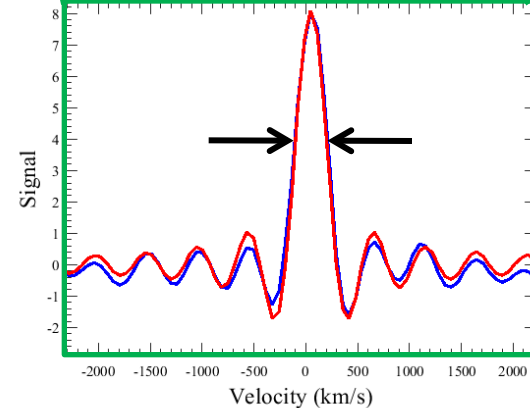


# Unapodized spectrum

## NGC 5315



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



*FWHM at NII is 300 km/s*

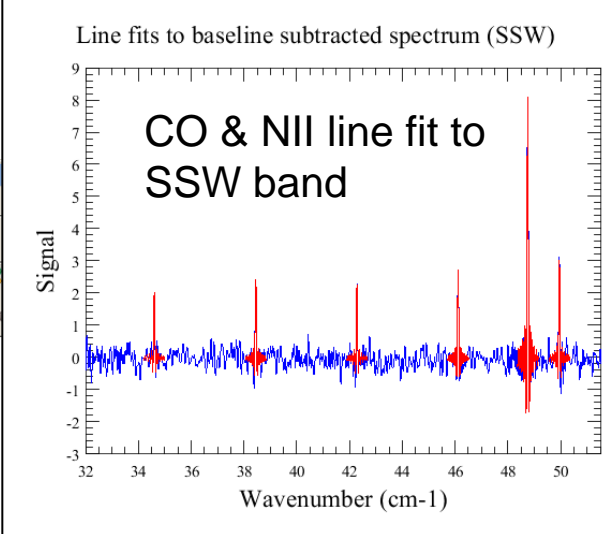
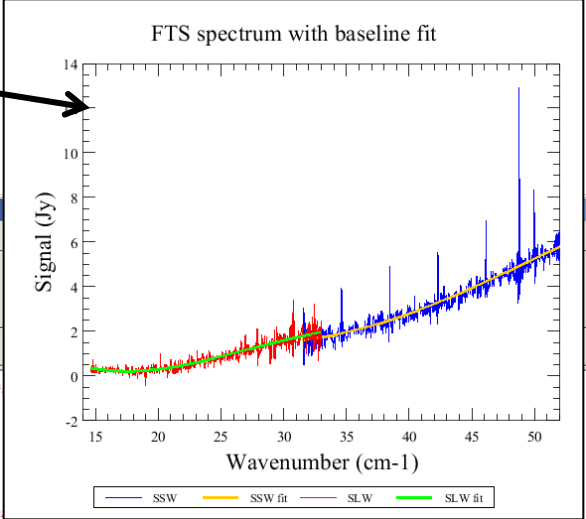
# Demo script

- 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 # Specify the observation and the resolution
29 obsid=0x5000198e
30 resolution="HR"
31 # Add the path to the file CO.txt. This contain
32 # derived from the Cologne Database for Molecular Spectroscopy (http://www.astro.uni-koeln.de/cdms/)
33 coLineWavenumbers = "C:\\SPIRE\\dp_workshop\\finalScripts\\CO.txt"
34 # Choose the array to fit (ssw or slw)
35 array = "ssw"
36 # initialise the expected line width for the fitting routine
37 # - Low resolution ~1.0 cm-1
38 # - Medium resolution ~0.25 cm-1
39 # - High resolution ~0.04 cm-1
40 expectedResn = 0.04
41 # =====
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,	9.68e-018,	6.71e-019,	0.03984,	0.00022,	0.00022

HIPE>

200 of 6222 MB

- coLineWavenum
- detectorL
- detectorS
- f
- fitFlux
- fitFluxErr
- fitParameters
- fitResult
- fitSigma
- fitSigmaErr
- fitStdDev
- fitVel
- fitVelErr
- fitWn
- flux
- fluxErr
- i
- expectedResn
- l
- l2
- l3

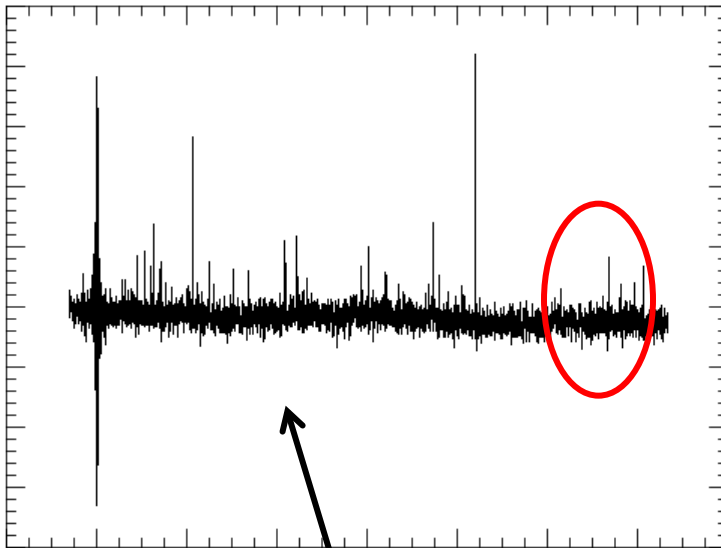
Velocity (km/s)  
(no LSR correction)

Integrated flux (W/m2)

Resolution = 1/(2xOPD\_MAX) (cm<sup>-1</sup>)  
(=FWHM/1.207)

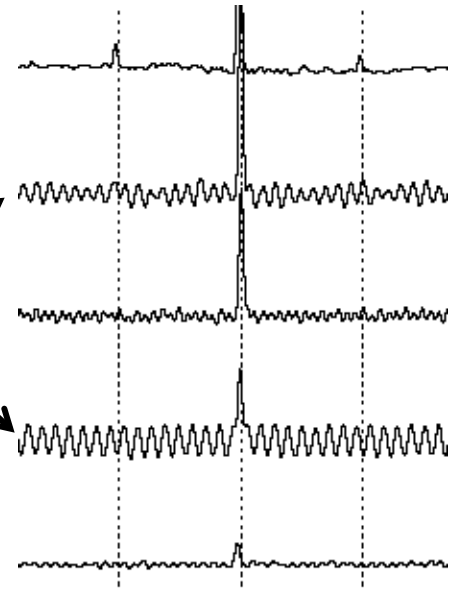
# Possible Calibration Issues

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



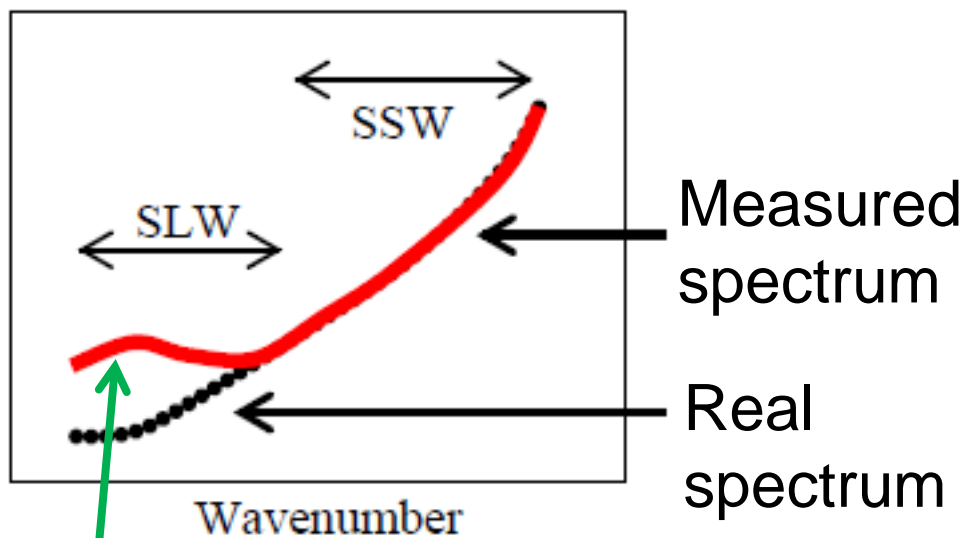
Interferogram before deglitching

Spectra with  
incomplete  
glitch removal

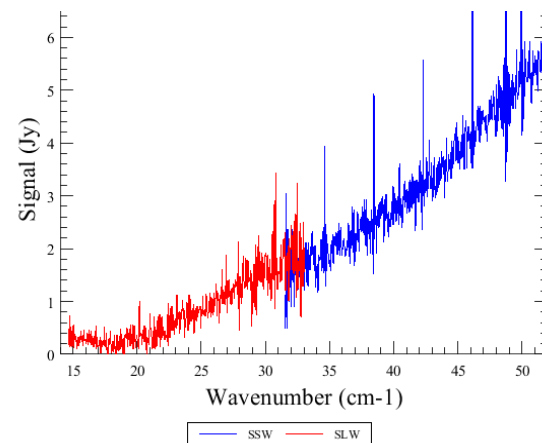


# Long Wavelength Array

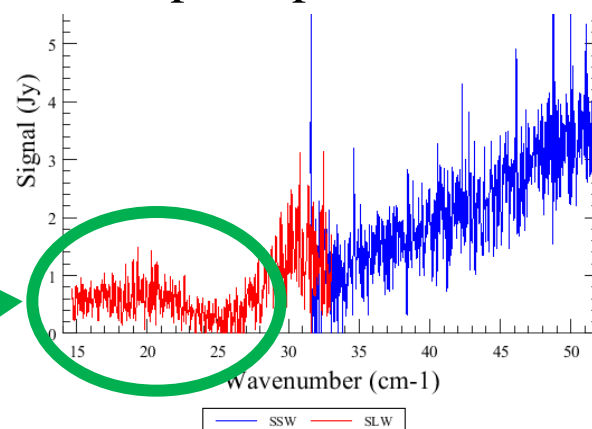
## *background subtraction*



demo-spire-spec-0x5000198E



demo-spire-spec-0x5000182E



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