

Single Dish Radio Observation

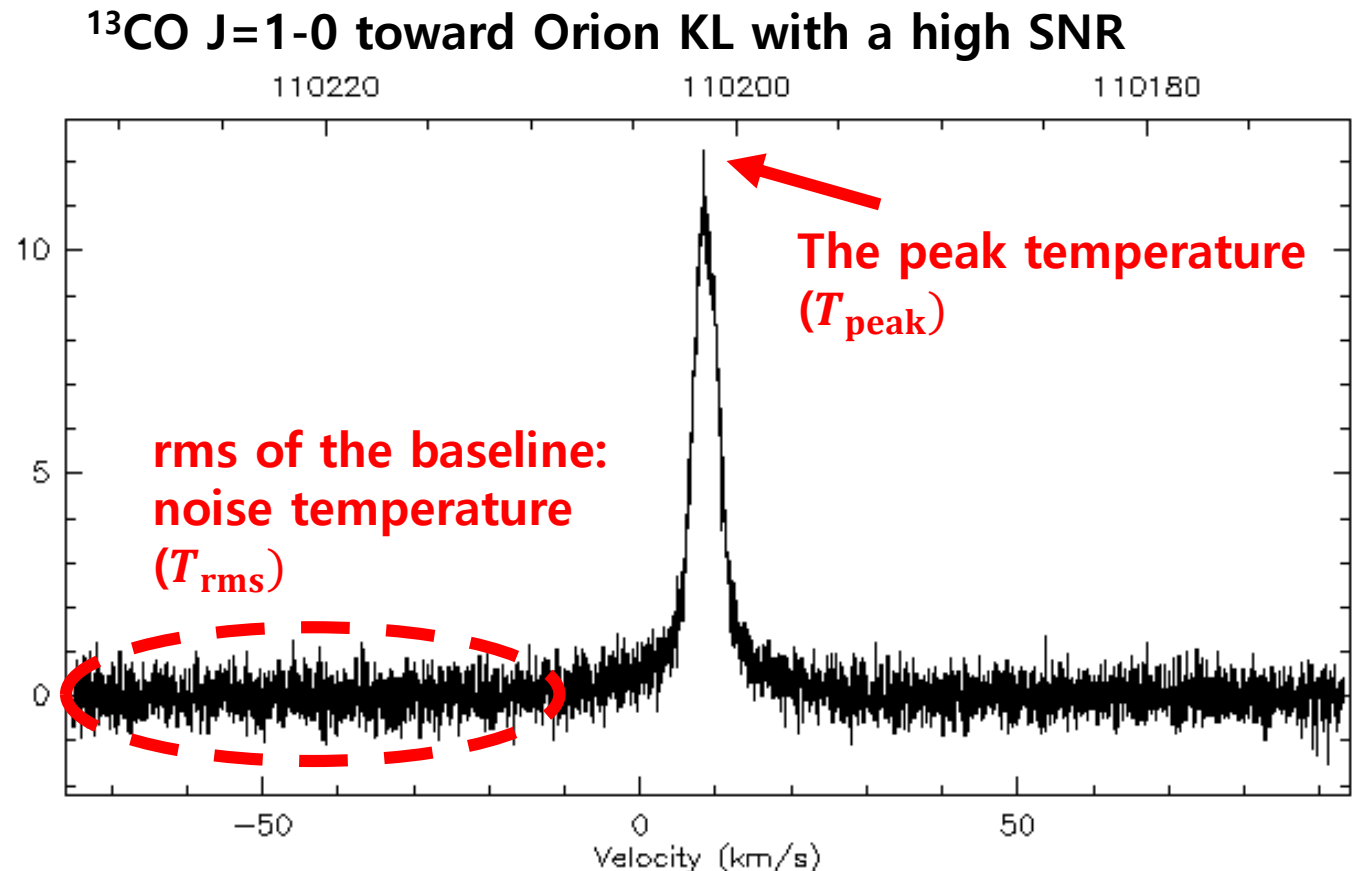
Signal to noise ratio; Map data; Data exportation

Hyeong-Sik Yun

Signal to noise ratio (SNR)

- One of the important parameter in observations.

- $SNR = \frac{T_{\text{peak}}}{T_{\text{rms}}}$

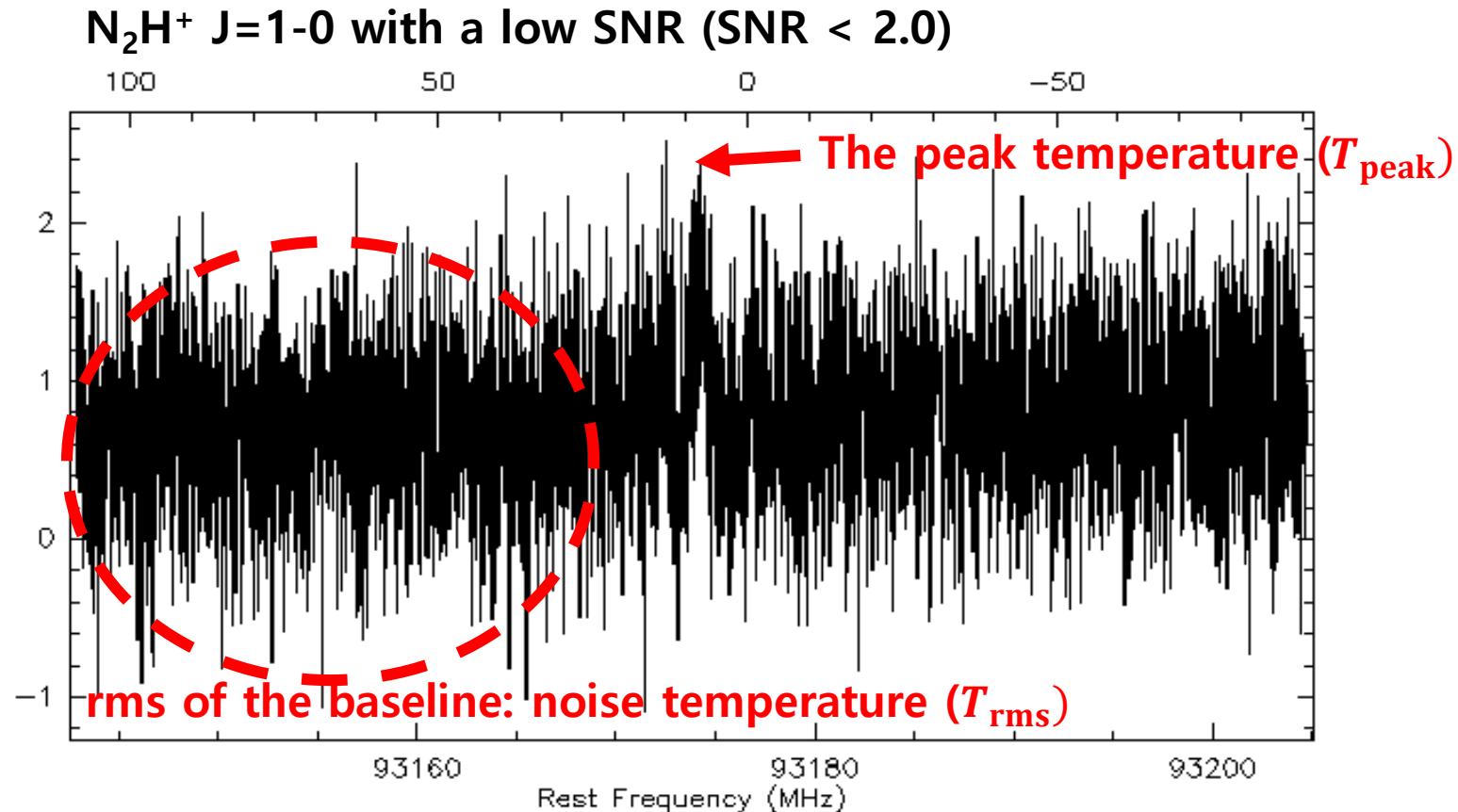


Signal to noise ratio (SNR)

- One of the important parameter in observations.

- $SNR = \frac{T_{\text{peak}}}{T_{\text{rms}}}$

- Hard to identify the observed line



How to increase the signal to noise ratio (SNR)?

- During the observation
 - Longer integration time
- During the data reduction
 - Smooth a spectrum
 - Combine multiple spectra (Average spectrum)

[HyeongSikYun/Singledish_class3 \(github.com\)](https://github.com/HyeongSikYun/Singledish_class3)

Example: Average

```
LAS> file in weak_N2Hp_spectra.class
```

```
LAS> find
```

```
LAS> get first
```

```
LAS> pl
```

...

...

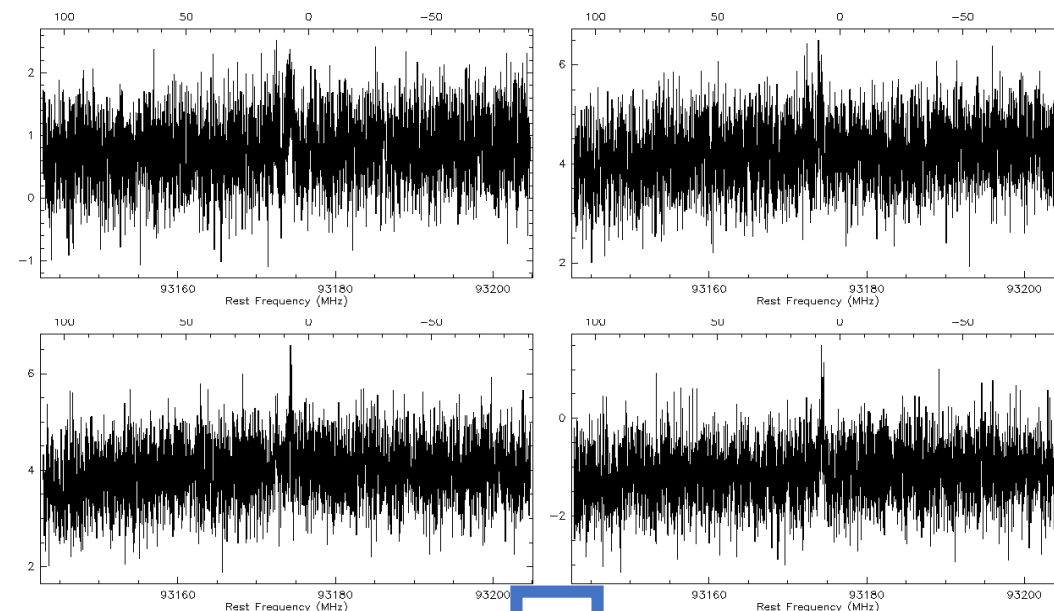
```
LAS> find
```

```
LAS> average
```

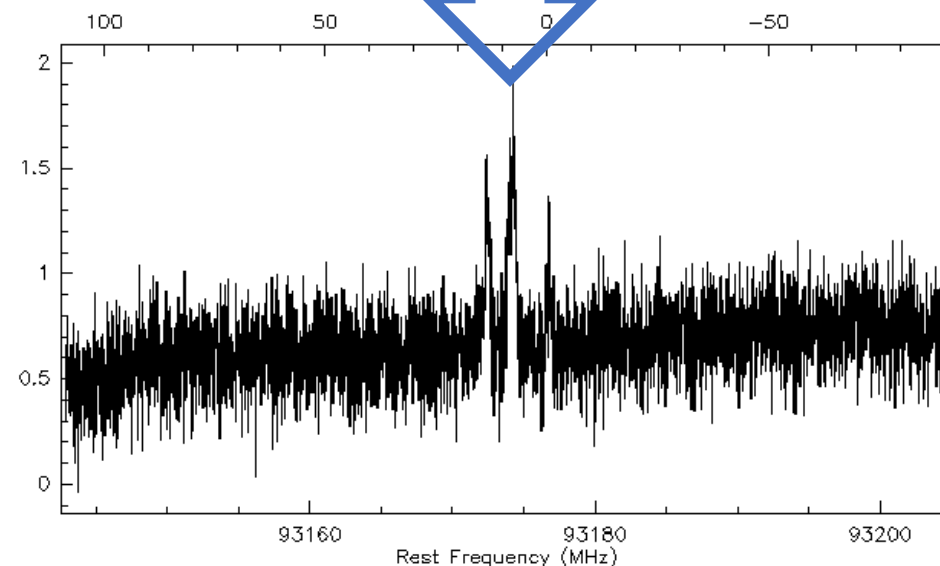
```
LAS> pl
```

$T_{\text{peak}} \sim 1.0 \text{ K}$
 $T_{\text{rms}} \sim 0.15 \text{ K}$
 $\text{SNR} \sim 7$

$\text{SNR} \sim 2.0$



Average



Map data

How to check the spatial distribution of the observed lines?

- Multi-beam obs.
- Grid mapping
- OTF mapping

} Integrate line intensities



Irregular grid spacing

- Interpolate
- Contour maps



Regular grid spacing

- Image map

What can we obtain from the line spectrum?

- A peak temperature
- A peak velocity
- An integrated intensity
- A mean velocity
- A velocity dispersion (line width)
- A line profile

...

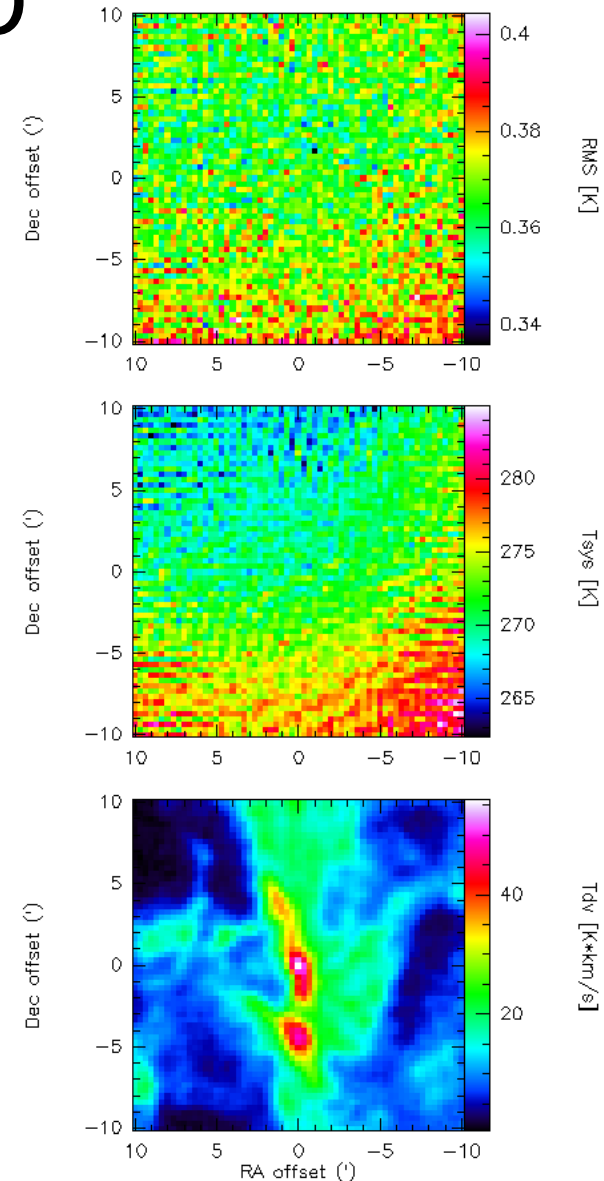
...

Example: Integrated intensity map

- Orion_13CO_baseline_subtracted.class
: the class file containing the baseline subtracted spectra
- plot_int_map.class
: the class code to produce the integrated intensity map

Example: Integrated intensity map

1. Check the velocity range where the line is detected.
LAS> set unit v f
LAS> average /nocheck
2. Run the class code using following command
LAS> @plot_int_map
3. Type the velocity range that estimated in the Step 1.
4. The Greg window would present the figures.



Export the spectrum into the ascii format

- `ascii_output.class`:

The class code to export the first spectrum of the class file.

- `output.dat`:

The output file, which containing the velocities (in km/s) and intensities (in K) of the spectrum.

Export map data into the fits format

Requirements: cube data (spectral data with a regular grid)

- Export the cube data using the 'gildas_fits' procedure.
- Orion_13CO_baseline_subtracted.class
: the class file containing the baseline subtracted spectra
- class_to_fits.class
: the class code to export a cube data into the fits format

Export map data into the fits format

1. Run the code

```
LAS> @class_to_fits
```

2. Type the velocity range where the line emission is detected (sw1 & sw2)
3. Type the velocity range that will be exported in the fits file (mx1 & mx2)
4. The code automatically produces the output fits file.