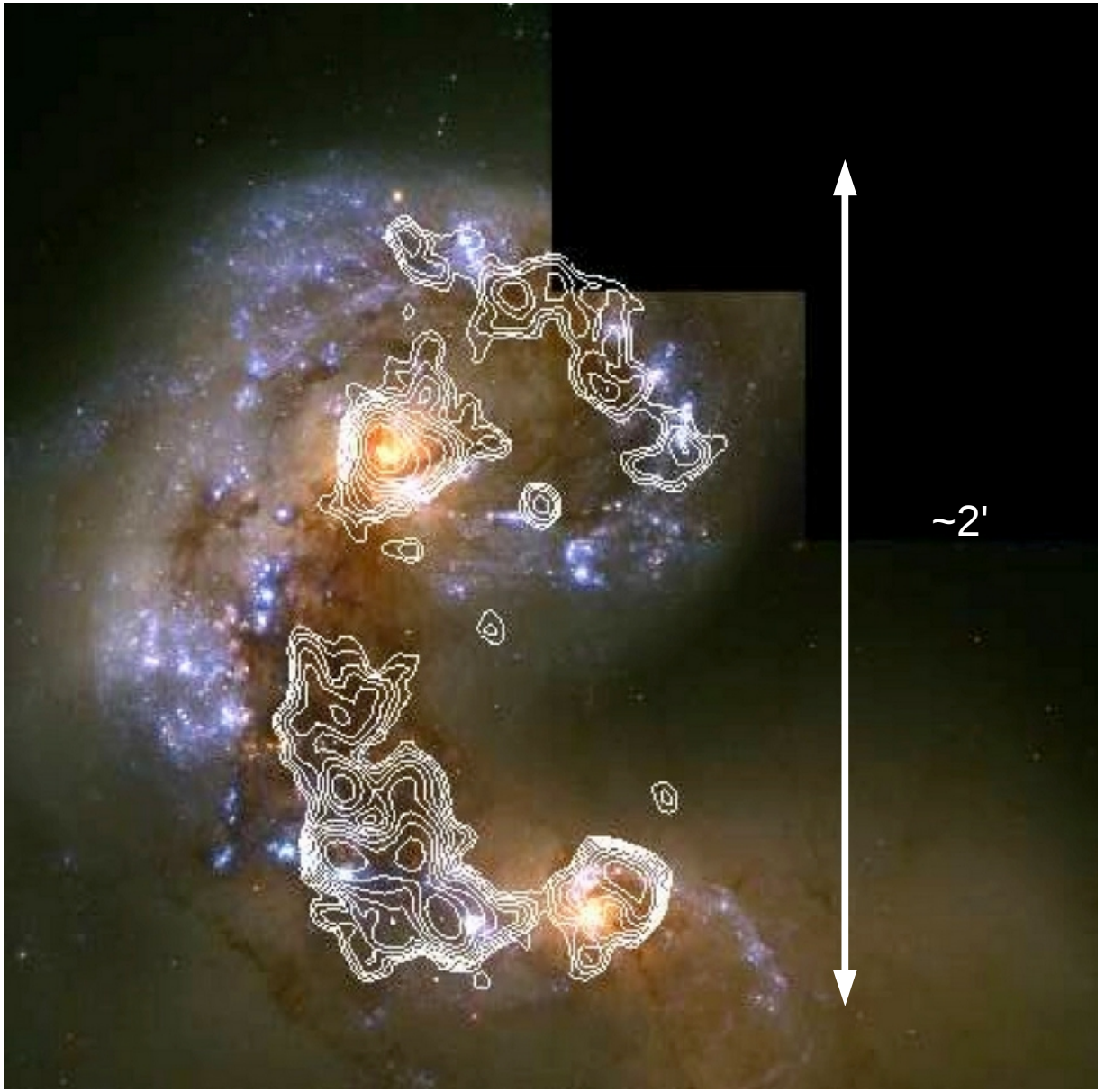
NGC4038/4039

Nearby
(z=0.005688)
interacting galaxies:
NGC4038 & NGC4039

NGC4038/4039



Wilson et al. (2000)

Observations of CO(1-0)
resolution 3”x4”

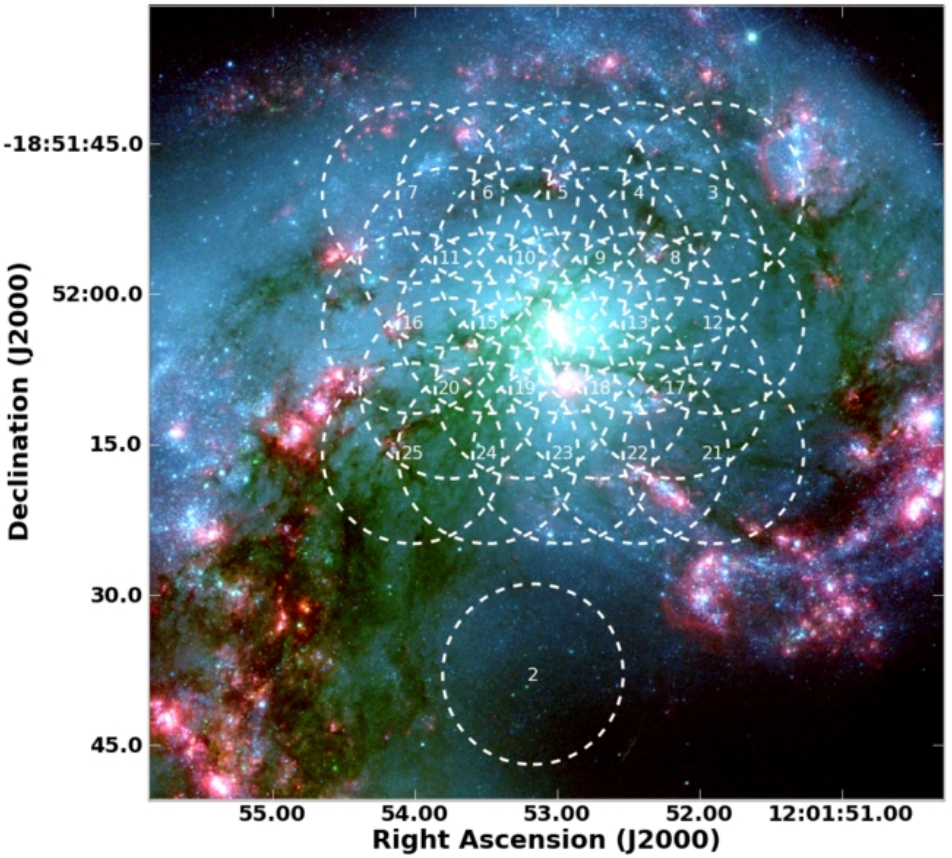
Antennae ALMA SV

ALMA Science Verification data targeting the CO (3-2) line

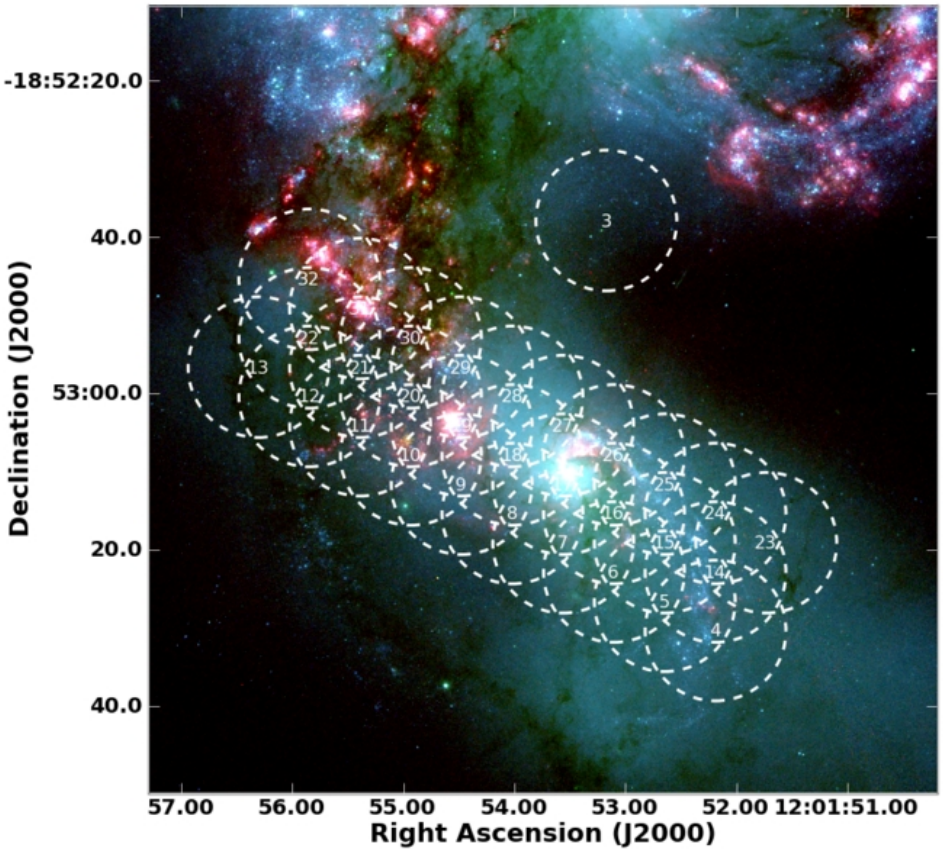
(rest frequency = 345.7960 GHz)

ALMA field of view ~ 15 “ ----> mosaics

North



South



Antennae ALMA SV

Southern mosaic dataset:

uid://A002/X1ff7b0/X1c8

uid://A002/X207fe4/X1f7

uid://A002/X207fe4/X4d7

uid://A002/X215db8/X1d5

uid://A002/X215db8/X392

uid://A002/X215db8/X18

Northern mosaic datasets:

uid://A002/X1ff7b0/Xb

uid://A002/X207fe4/X3a

uid://A002/X207fe4/X3b9

uid://A002/X2181fb/X49

- **Calibration of one single dataset.**
- Imaging and analysis of combined datasets.

uid___A002_X1ff7b0_X1c8	Ambra Cristina
uid___A002_X207fe4_X1f7	Federica Francesca
uid___A002_X207fe4_X4d7	Roberto Alice
uid___A002_X215db8_X18	
uid___A002_X215db8_X1d5	
uid___A002_X215db8_X392	

uid___A002_X1ff7b0_Xb	Stefano Marco
uid___A002_X207fe4_X3a	Marco Luca
uid___A002_X2181fb_X49	Claudio Giuseppe
uid___A002_X207fe4_X3b9	Andrea Marika

In applycal di Tsys
per applicare alle spw 1 e 3 le correzioni ottenute in spw 5 e 7

spwmap=[0, 5, 5, 7, 5, 5, 5, 7]

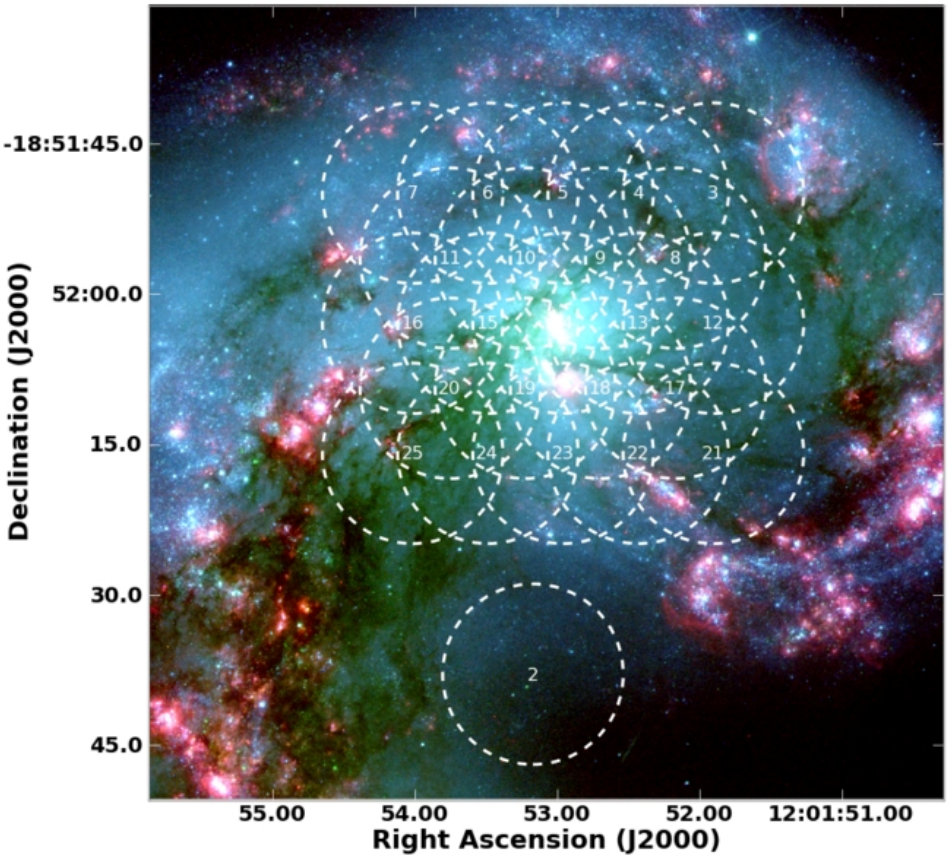
Antennae ALMA SV

ALMA Science Verification data targeting the CO (3-2) line

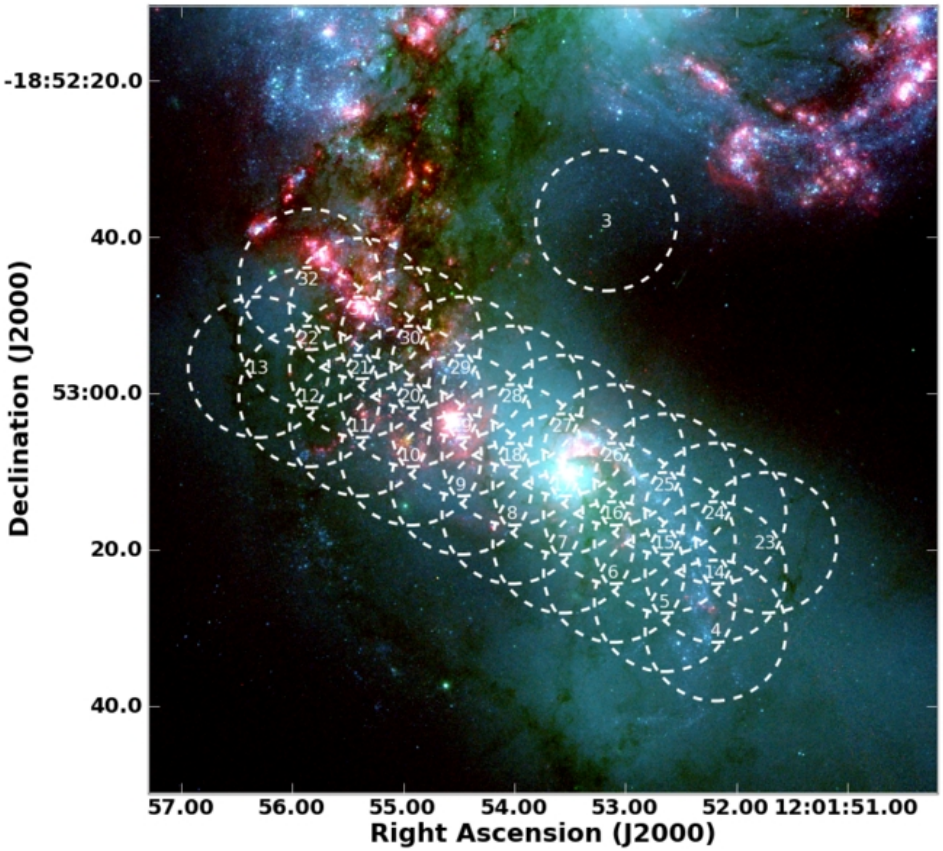
(rest frequency = 345.7960 GHz)

ALMA field of view ~ 15 “ ----> mosaics

North



South



Cosa e' stato fatto su i dataset dopo la calibrazione

North

```
data_north=["uid___A002_X1ff7b0_Xb","uid___A002_X207fe4_X3a","uid___A002_X207fe4_X
3b9","uid___A002_X2181fb_X49"]


for nome in data_north:
    os.system('rm -rf '+nome+'.cal.ms')
    split(vis = nome+'.ms',outputvis = nome+'.cal.ms',
              field = 'NGC*',spw='0',width=23, keepflags=False)

cal_north_vis = [vis+'.cal.ms' for vis in data_north]

os.system('rm -rf Antennae_North.cal.ms')
concat(vis=cal_north_vis, concatvis='Antennae_North.cal.ms',
timesort=True)
```

Antennae_North.cal.ms

Cosa e' stato fatto su i dataset dopo la calibrazione

South

```
basename_south=["uid___A002_X1ff7b0_X1c8","uid___A002_X207fe4_X1f7","uid___A002_X2
07fe4_X4d7","uid___A002_X215db8_X18","uid___A002_X215db8_X1d5","uid___A002_X215db8
_X392"]
```

```
for nome in data_south:
    os.system('rm -rf '+nome+'.cal.ms')
    split(vis = nome+'.ms',outputvis = nome+'.cal.ms',
              field = 'Ant*',spw='0',width=23, keepflags=False)

cal_south_vis = [vis+'.cal.ms' for vis in data_south]

os.system('rm -rf Antennae_North.cal.ms')
concat(vis=cal_south_vis, concatvis='Antennae_South.cal.ms',
timesort=True)
```

Antennae_South.cal.ms

Parametri del Clean
per osservazioni di mosaici

Imagermode='mosaic'
Phasecenter= field corrispondente al centro del mosaico
Imsize = dimensione del campo coperto dal mosaico

North

Phasecenter='12'
dimensione= 65 arcsec

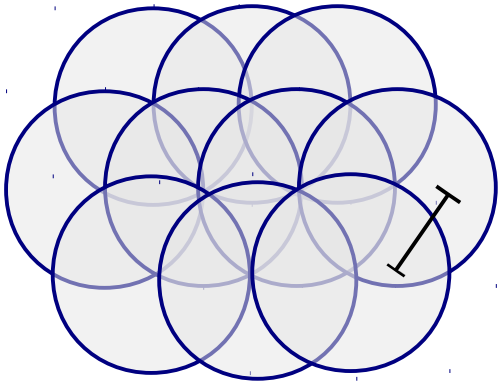
South

Phasecenter='15'
dimensione= ~100arcsec

expected sensitivity

$$\sigma = \frac{2k}{\eta} \frac{T_{\mathrm{sys}}}{\sqrt{\Delta t \Delta \nu} \sqrt{N_{\mathrm{ant}}(N_{\mathrm{ant}}-1)A}}$$

Time on source per pointing ~300 sec



$$\frac{\lambda}{\sqrt{3}\,D}$$

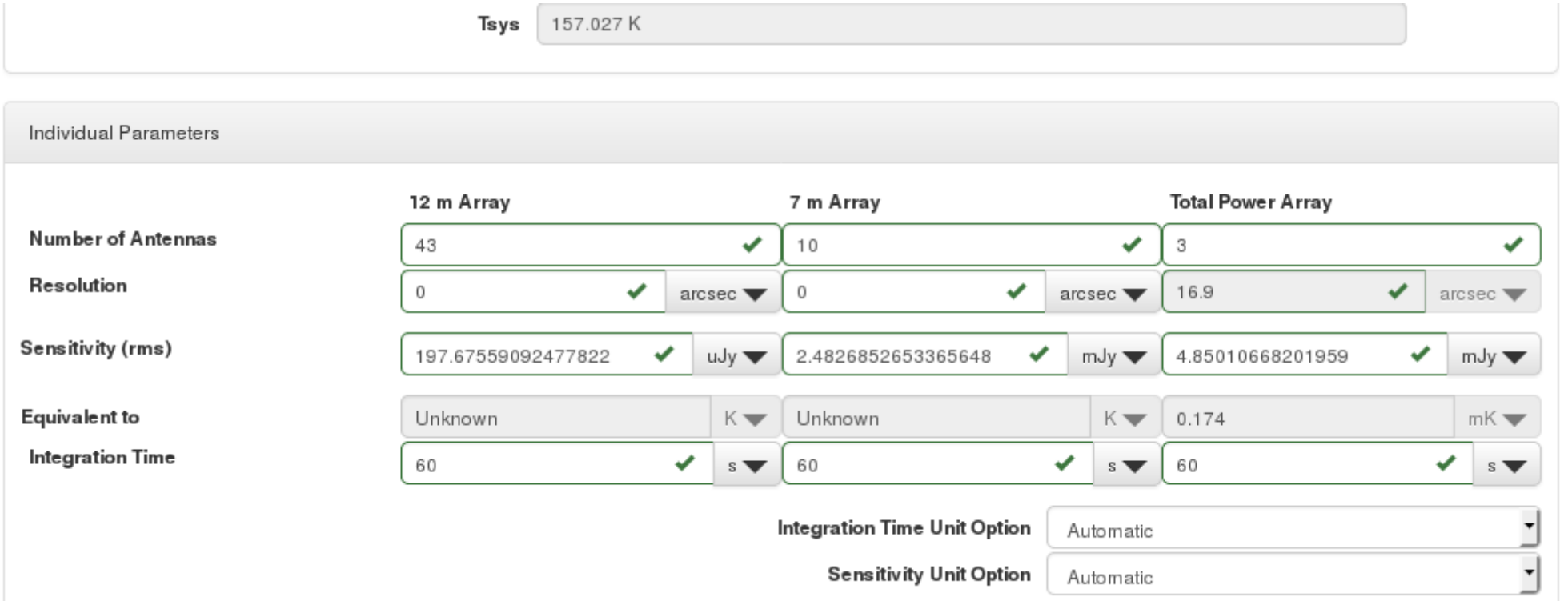
Hexagonal grid
Most efficient coverage with minimal non-uniformity

Sensitivity per pointing improves by a factor 2.5

expected sensitivity

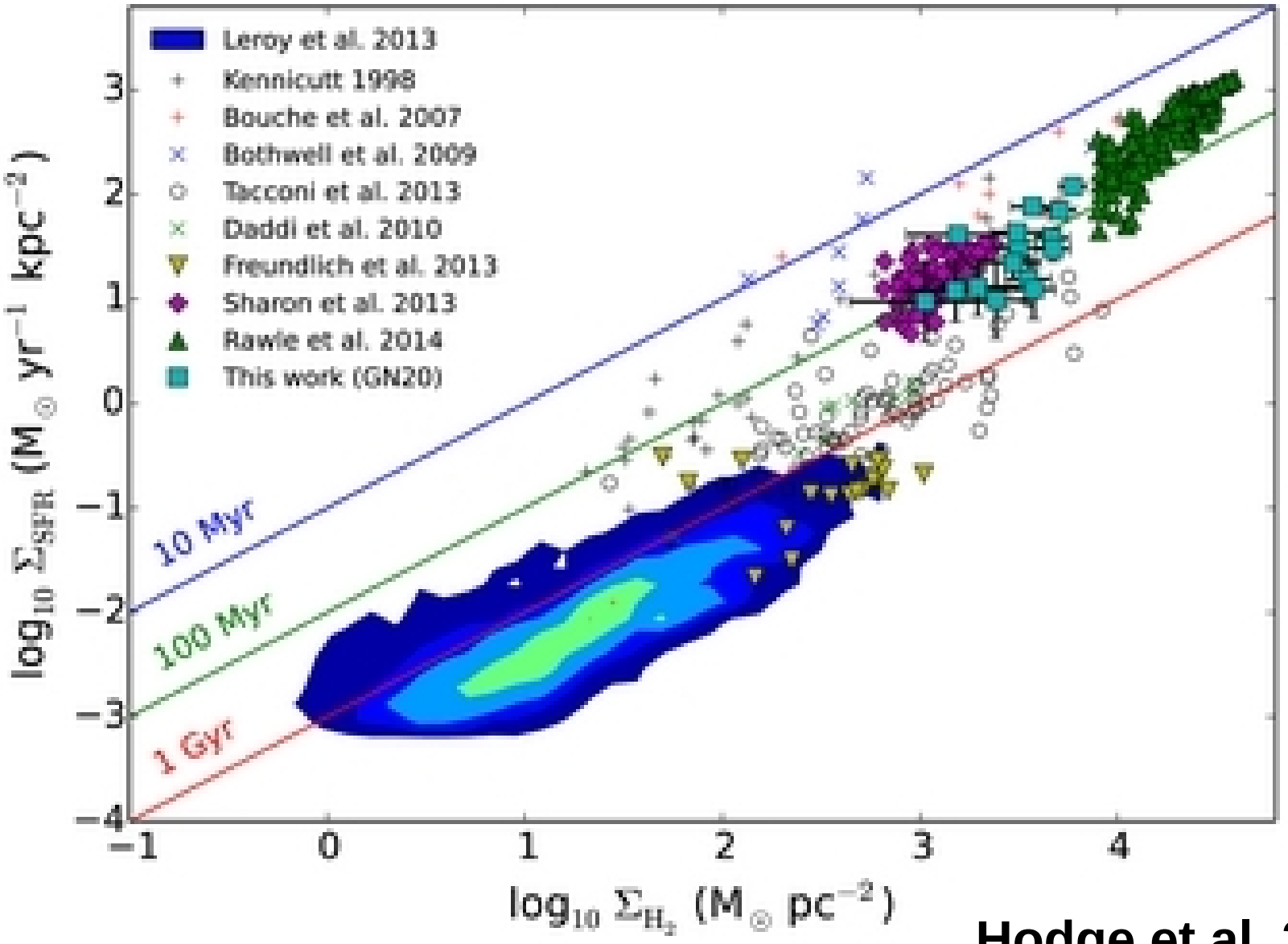
$$\sigma = \frac{2k}{\eta} \frac{T_{\rm sys}}{\sqrt{\Delta t \Delta \nu} \sqrt{N_{\rm ant}(N_{\rm ant}-1)A}}$$

https://almascience.eso.org/proposing/sensitivity-calculator



Misure di Σ_{H2} e SFR

Da Σ_{H2} potete ottenere un valore di SFR density



Hodge et al. 2012

Misure di Σ_{H2} e SFR

Relazione fra la luminosita' del CO e la massa del gas molecolare

$$M_{H2} = \alpha_{CO} L_{CO}$$

In Antennae:
α_{CO} = 4.8 M⊙ (K km s^{-1} pc^2)$^{-1}$ (Zaragoza-Cardiel 2014)

La luminosita' del CO si puo' calcolare usando:

$$L_{CO}[K\ km\ s^{-1}\ pc^2] = 3.25\times10^7\ \nu_{rest}^{-2}\ (1+z)^{-1}\left(\frac{D}{Mpc}\right)^2\left(\frac{F_{CO}}{Jy\ km\ s^{-1}}\right)$$

(Solomon 1992)

Per il nostro target D=22 Mpc, ν_{rest} = 345.796 GHz e z= 0.0056